

for thirty-two students. On the third floor a large and lofty central room, with open timber roof, partially lit from the roof, is intended for a museum. The basement story, extending under the whole of the ground floor, is lofty and well lighted, and contains store-rooms, rooms for special operations in physics and chemistry, a large room for mineralogy, rooms for living animals, boilers, &c. Altogether the building contains at present about 100 rooms. The heating and ventilating arrangements are upon a somewhat novel plan. Near the centre of the area rises a huge chimney-stack to the height of 160 feet, containing three flues divided by thin partitions. The smoke from the boiler passes off by the central flue and heats the air in the adjoining flues, which are used for ventilating the lecture theatres. The warming is effected by a coil of pipes containing 4,475 superficial feet, and fed with water from the large boiler in a vault in the sub-basement. The arrangements in fact are throughout of the most modern and approved types, having been adopted by the architect after mature consideration of all the best features of the principal scientific colleges in this country and on the Continent, which he visited at the request of the trustees.

The generous founder, who has taken a most active interest in the progress of the work, has built the college and furnished its various departments entirely at his own cost, so that the large endowments previously conveyed to the trustees remain untouched. Sir Josiah Mason has stated that his ambition was to afford all classes in the Midland district, where he had been born and bred, the means of carrying on those scientific studies of which he had felt the want as completely and thoroughly as they can be prosecuted in any of the great science schools of Europe.

We earnestly trust that the noble and benevolent intention of the founder will continue to be carried out, and that in time the institution will become as important and comprehensive a centre of higher education as Owens College is now.

#### THE PROPOSED LICK OBSERVATORY

MR. S. W. BURNHAM has printed his Report to the Trustees of the "James Lick Trust" of observations made on Mount Hamilton, California, with reference to the location of the observatory, for the erection and endowment of which funds are thereby provided. His object being to test the adaptation of the site for astronomical purposes by observations of double-stars mainly, Mr. Burnham took with him his 6-inch refractor, by Alvan Clark and Sons, which he has used in nearly all his astronomical work, and the excellence of which has been sufficiently proved by the number of difficult double-stars discovered with it during the last six or eight years. He remained on Mount Hamilton from August 17 to October 16, and in this interval was in the observatory on every clear night, with three exceptions. During the first thirty-seven nights he states vision was first-class on all occasions with these exceptions; on two nights the ocean fogs from the valley below reached the summit of the mountain and remained all night, and on two other nights there was only medium steadiness. The kind of weather for astronomical observations during the whole period of sixty days that Mr. Burnham remained at the summit, was forty-two first-class nights, seven medium nights, and eleven cloudy and foggy ones. In the whole interval there was not a single poor night when it was clear. By first-class seeing Mr. Burnham explains that he means "such a night as will allow of the use of the highest powers to advantage, giving sharp, well-defined images, and where the closest and most difficult double-stars within the grasp of the instrument can be satisfactorily measured." The conditions were generally very permanent for the whole night, which is not often the case in ordinary

localities. On many nights Mr. Burnham remained at the telescope until daylight, and so had abundant opportunities of noting this important fact.

Having provided himself with a series of cardboard disks, with apertures increasing from one inch up to the full aperture of the object-glass, Mr. Burnham observed a large number of familiar objects, contracting the light until the smaller star was just distinctly visible; many of these objects had been used elsewhere for a similar purpose. He considers some of the observations are remarkable, allowing for the difficulty of the objects with much larger apertures in other localities:  $\mu^2$  Herculis (the close pair) was very fairly seen with the full aperture, and the companion of  $\alpha^2$  Capricorni was plain with the aperture contracted to 4 inches, and was seen double with the whole six; these objects Mr. Burnham says he is confident have "never been seen before with so small an object-glass." The fifth and sixth stars of  $\theta^2$  Orionis were very plain at an hour-angle of  $4\frac{1}{2}$  hours;  $\zeta$  Herculis was well seen with  $3\frac{1}{2}$  in.; and  $\eta$  Cassiopeæ was easy when the aperture was reduced to  $1\frac{1}{2}$  inch. Forty-two new double stars were detected, and micrometrical measures of ninety of these objects previously named were put upon record. A great many were examined by daylight, but the air, during the greater part of the day at least, was not found to be steadier than is ordinarily the case elsewhere. It is mentioned, however, that the fifth and sixth stars of the trapezium of Orion were beautifully seen in broad daylight just before sunrise. At the epoch 1879.684 the first measure was made fifteen minutes before sunrise, and "both stars were readily seen for some time after this." Venus was very readily seen with the naked eye at any hour of the day, and easily found without any instrumental indication of its place. Mr. Burnham urges that the new double stars brought to light evidence better than anything else can, what may be done at Mount Hamilton, and remarking that these discoveries were effected with an instrument which in these days of great refractors would be regarded as a comparatively inferior telescope, he considers that it is impossible to overestimate the great discoveries which might be made at this station with a first-class object-glass, such for instance as the Naval Observatory, Washington, already possesses, or the proposed Pulkowa glass of twenty-five times the light-power of the one employed; and according to the terms of the Trust the telescope for Mount Hamilton is required to be "superior to and more powerful than any telescope ever yet made;" a condition, however, which perhaps may not be so easily fulfilled as laid down. Mr. Burnham concludes from his experiences on Mount Hamilton that it "offers advantages superior to those found at any point where a permanent observatory has been established." The station is about fifty miles south of San Francisco and twenty-six miles nearly east of San José, the nearest point of railway connection. The ocean fogs, which might have been feared, were not found to reach the elevation, except rarely. Nearly every night this fog, commencing soon after sunset, comes in from the Pacific between the Golden Gate on the north and the Bay of Monterey on the south, and covers the whole valley, but is ordinarily perhaps 2,000 feet below the summit of the mountain, which has an elevation of 4,250 feet above the level of the sea, and has no sensible effect at such altitude.

It will be seen that Mr. Burnham's knowledge of the locality is confined to the space of two months, but a letter from Prof. Davidson of the U.S. Coast Survey, who has had long experience at other seasons, is appended to the report, which is of a very favourable nature, and Mr. Burnham appears to have no hesitation in advising the adoption of Mount Hamilton as the site of the Lick Observatory, which we may hope will be successful in procuring an instrument worthy of the other great astronomical

advantages which it is likely to possess. The geographical position of the observatory peak is in longitude  $121^{\circ} 36' 40''$  W., latitude  $37^{\circ} 21' 3''$  N.

*THE UNITED STATES WEATHER MAPS FOR OCTOBER AND NOVEMBER 1878*

THE WEATHER MAP for OCTOBER 1878, which appeared in our issue of August 19, showed an area of barometric depression overspreading the whole of the United States except a narrow patch extending from Great Salt Lake northwards. The depression was deepest in the region of Minnesota, where it was  $0.150$  inch under the average, stretching thence in a west-south-west direction toward San Diego, where it was  $0.077$  inch below the mean. On the Atlantic sea-board of the States, pressure was  $0.014$  inch in the south and  $0.033$  inch in the north below the average, and continued relatively low right across the Atlantic, the depression deepening to another minimum over the region including the north-west of Ireland and Scotland, where the greatest defect from the average reached  $0.220$  inch. This widespread depression stretched still further to eastward over the whole of Europe, except the extreme north of Scandinavia, the southern half of Italy, and all Russia, except its north-western provinces; and to southward at least as far as the equator. Another extensive region of low pressure covered the whole of Asia to the south of a line drawn from Shanghai round by Lake Balkash to the Persian Gulf, and extended south-eastward over the whole of the East India Islands and Australasia as far as the east coast of New Zealand, where atmospheric pressure rose to the average of the month. Pressure was also much under the average in Cape Colony and Mauritius.

On the other hand pressure was above the average over the head waters of the Platte and Missouri rivers, and from Vancouver Island northward over the north-west of America, rising to an excess of  $0.180$  inch in Alaska. But the most important area of high pressure covered Greenland, where it rose in the south to  $0.244$  inch above the mean, and spread to the south-westward over Labrador, Newfoundland, and the Dominion of Canada as far as Montreal, and to the eastward over Iceland and the north of Scandinavia. A third area of extensive high pressure embraced the southern half of Italy, Greece, Egypt, Syria, nearly the whole of European Russia, and all Asia to the north of the area of low pressure already pointed out.

The distribution of the temperature anomalies of the month were of the simplest character in their relations to this anomalous distribution of the pressure. In the States to westward of the line of greatest barometric depression a reference to the map will show an extraordinary prevalence of strong north-west winds, where, consequently, temperatures were low, the defect from the average being  $4^{\circ}.8$  at Winnipeg,  $4^{\circ}.0$  on the Platte,  $3^{\circ}.6$  on the Lower Columbia, and  $2^{\circ}.6$  at San Diego. On the other hand, temperatures were everywhere above the average to the east of the Mississippi, the excess being nearly  $5^{\circ}.0$  in the New England States, but only about the third of a degree in Florida in the south, and in Newfoundland in the north.

Turning now to the great depression north-west of the British Islands, winds were northerly in Iceland and South Greenland, and there the temperature was respectively  $2^{\circ}.3$  and  $1^{\circ}.1$  below the average. Pressure rose higher from west to east over Europe as far as the Ural River, and into Asia as far as the Tobol, where it was fully  $0.100$  inch above the mean pressure of October. Westerly and southerly winds accordingly ruled, and temperatures were everywhere above the average over this large tract of the earth's surface, the greatest excess being in the basin of the Dnieper, the maximum  $7^{\circ}.6$

being recorded at Kiev. Pressure was  $0.012$  inch in excess of the average in Syria and Egypt, but the northerly winds in Syria indicate a lower pressure southward, and in accordance therewith temperature was  $2^{\circ}.0$  at Beyrout and  $0^{\circ}.7$  at Alexandria below the mean. From the rivers Ural and Tobol eastward through Siberia to the Sea of Okhotsk, temperatures were at all places below the average, the defect being from  $2^{\circ}.0$  to  $3^{\circ}.0$  in the basins of the Obi, Yenisei, Amoor, and Peiho.

It has been stated that pressure was  $0.244$  inch above the average in South Greenland. At the two more northern stations however the excess was only  $0.205$  inch and  $0.112$  inch; and in accordance with this diminution of the pressure northwards over Greenland it is to be noted that whilst in the extreme south of Greenland the temperature was below the average, it rose above it at the stations further north successively to  $0^{\circ}.5$ ,  $3^{\circ}.1$ , and  $4^{\circ}.0$ .

NOVEMBER, 1878, the U.S. Weather Map for which accompanies this notice, is memorable as the commencement of a period of unprecedentedly cold weather in the British Isles, which was protracted with scarcely even a temporary interruption to the middle of December, 1879.

In the United States pressure was above the mean to westward of the Mississippi and Missouri, the greatest excess,  $0.090$  inch, being near the sources of the latter river. Over the rest of the States and Canada pressure was under the average, there being at least three distinct centres of greater depression formed in this extensive region, one over Minnesota and Lake Winnipeg; a second along the St. Lawrence valley, and thence northward probably away towards the head of Baffin Bay, the greatest observed defect from the average being  $0.131$  inch near Anticosti; and a third along the north of the Gulf of Mexico. In Alaska pressure was fully half an inch below the mean of November.

But the most marked feature of the month was the development of a region of high pressure in mid-Atlantic and thence northward over Iceland and Greenland; the greatest excess,  $0.362$  inch above the average, occurring in the north-west of Iceland. Immediately to eastward an area of low pressure overspread the whole of Europe, rising however to the average on the southern, eastern, and northern, as well as on the western, limits of the continent. Within this extensive depression, just as in the American depression, were developed several centres of still greater depression, viz., in the Baltic, North Sea, north-west of France, and Corsica. Another area of low pressure extended over India, the Philippine Islands, the East Indian Archipelago, Eastern Australia, Tasmania, and New Zealand. Over the whole of the rest of Asia, the north and east of Africa, and the south and west of Australia atmospheric pressure was above the average.

The temperature anomalies in the United States were quite extraordinary. Within and immediately to eastward of the western barometric depression temperatures were from  $12^{\circ}.4$  to  $13^{\circ}.7$  above the normal for the month, and over this region southerly winds prevailed; whereas immediately to westward, winds were westerly and northerly, and temperature fell to  $3^{\circ}.4$  above the normal, and on the Pacific coast to the normal. On the South Atlantic and Gulf States winds were northerly and the temperature only about half a degree above the normal. In connection with the St. Lawrence valley depression, the temperature anomalies were  $6^{\circ}.0$  in the Upper Lake region,  $4^{\circ}.0$  in Ohio valley,  $3^{\circ}.6$  in the Lower Lake region, and  $1^{\circ}.0$  in the St. Lawrence valley above the normal.

In the west of Greenland, the pressure anomalies of the three stations proceeding northward were  $0.130$  inch,  $0.048$  inch above, and  $0.016$  inch below the mean, and from the strong southerly winds resulting therefrom the temperature anomalies were respectively  $6^{\circ}.8$ ,  $9^{\circ}.0$ , and  $9^{\circ}.5$ , almost rivalling the relative excesses of temperature which made the weather of this month so memorable over large portions of the States. As higher pressures