means of education. Several of the largest gardens owe their origin primarily to the first cause, though they have proved valuable educational agents, and may ultimately have come to be used chiefly for instruction and research; but a considerable number are the property of colleges, and were from the first intended to subserve educational ends. The garden at Cambridge is of this class; and the report of its director, just published, shows that it is growing in usefulness. Beside the general collection of plants that every well-regulated garden is supposed to contain, the Cambridge garden is working toward extensive special collections to illustrate economic botany and the general morphology of phenogams. The groups in the latter, which can well be copied on a smaller scale, even where the name of 'botanic garden' would appear pretentious, are arranged in substantially the order laid down in the common text-books of botany, so that the different forms of leaves, flower-clusters, and flowers, can be easily recognized by any pupil. In connection with the economic plants — intended to exhibit variation under domestication by large suites of varieties of such plants as the cabbage, etc., and to promote the cultivation of vegetables that have come to be prized in Europe, though strangers to our tables — should be mentioned the large economic collection of trees in the Arnold arboretum at Jamiaca Plain, which is now reported by its director, Dr. Sargent, to be definitely planned so as to include a general collection of the native trees of eastern Massachusetts, and the most valuable species from other localities, planted singly, to admit of the maximum growth of each species, and also in groups, chosen so as to represent its main varieties, and calculated to show its mass-characters. This loosely planted general collection, arranged for the definite purpose of object-teaching, is supplemented by a more compact experimental and working collection, intended to supply material for study, and especially to receive doubtfully hardy or valuable species and transitory horticultural forms.

While Harvard — the oldest and strongest botanical centre of the country — is thus giving evidence of large resources and progressive intelligence, the fact that similar steps are taking in other sections of the country is not to be overlooked, and is even more indicative of progress, since it implies a wide-spread interest in better instruction and better research in botany. It is very desirable that this feeling may become more prevalent, and receive the financial backing that is necessary if it is to count for much.

So far as experimental work is concerned, persons who know that there is a botanic garden at Washington, enjoying the patronage of the government, might expect much from it, did not the majority of them know, at the same time, that it is so circumstanced as to improve its past record very little until the policy of its management is radically changed. Until then, such work must be done elsewhere; and it is being undertaken by the experiment-stations and agricultural colleges of several states enthusiastically, if, in most cases, with too limited resources. Meantime new gardens are being established and developed under hopeful auspices. The most prominent of these are the newly created Montreal garden, and the private garden of Mr. Henry Shaw of St. Louis, which has recently been placed in relation with the chair of botany of Washington university, and will, it is understood, be so amply endowed by its founder as to become within a few years, if properly developed, a leading centre for research, experiment, and instruction in pure and applied botany.

That these movements indicate a growing recognition of the needs of botany and a disposition to meet them, is suggested by rumors of similar steps soon to be taken in other quarters; so that the outlook for botanical and horticultural work of a high grade is more promising than at any time in the past. What is most to be feared, is that ill-advised influence may place the facilities for this work in incompetent hands, with the result not only of temporary delay, but of permanent disaster. This danger can be avoided only by proper care in the first instance, both in selecting men and in planning work.

DEEP-SEA SOUNDINGS IN THE SOUTH PACIFIC.

The navy department has received a letter from Commander A. S. Barker, U.S.N., dated Dec. 18, 1885, at Sandy Point, Magellan Straits, in which he reports having made a series of deep-sea soundings from Wellington, New Zealand, across the South Pacific to the Straits of Magellan. Fifty-seven casts were taken during the passage, from Nov. 6 to Dec. 16, over a distance of forty-five hundred nautical miles. The passage was made across that part of the ocean where strong westerly winds prevail, and many of the soundings were taken under trying circumstances. A few gales were encountered, but only one severe

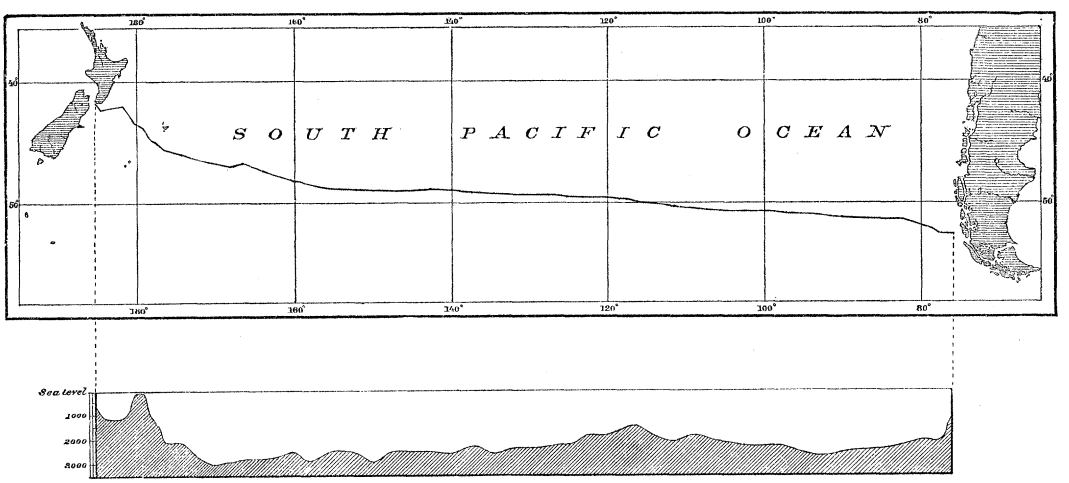
storm; and not a single cast was missed, from 180° west to the Straits.

The sounding-machine used was Sigsbee's improvement on Thomson's, and was mounted on the starboard end of the bridge, which is just forward of the smokestack. The soundings were taken head to sea, the wind a little on starboard bow; the ship was easily kept in this position by spanker, main topsail, and by working the engines slowly. The seas were too heavy to sound stern to wind, as was done by the Tuscarora when she did such excellent work under Commander Belknap.

This line of soundings, running as it does very close to the ice-limit, was chosen by the hydrographic office with a view of completing for the present the deep-sea survey of the lower South Pacific.

In 1875 the Challenger ran a line of soundings in about 40° south latitude. Between this and the line run by the Enterprise, the German ship Gazelle, in 1875, also executed a series of soundings, with somewhat greater intervals between than those of the two lines already mentioned. These three series give a fair idea of the general depths in this part of the Pacific, and will probably be sufficient for all purposes for some time to come. North of the Challenger's line, however, over the entire Pacific, lines of soundings should be run in all directions, and at short distances apart; and the hydrographic office has laid out a plan by means of which this can be done from time to time, by our war ships, most economically and effectively, to accomplish the practical result of determining the existence of dangers to navigation. The energies of the hydrographic office should be directed to clearing up the paths of commerce by searching for reported dangers, and this can only be done thoroughly by means of deep-sea soundings. The scientific consideration of the ocean-bed will naturally follow.

This line of soundings of Commander Barker would seem to show that the main bed of the South Pacific commences just south of Chatham Island, the depth increasing very rapidly for the first 300 miles, until 3,002 fathoms is reached, in longitude 170° west. Beyond this point the profile shows no remarkable irregularities except in longitude 150° west, where there is a depth of 2,915 fathoms, with 2,650 fathoms and 2,506 fathoms on each side. From longitude 135° west the depths decrease quite regularly until 118° west is reached, where the least depth, 1,562 fathoms, was found. Beyond this the depths increase again quite regularly to the base of the continent.



DEEP-SEA SOUNDINGS BY THE U. S. S. ENTERPRISE.
From Wellington, New Zealand, across the South Pacific to the Straits of Magellan.

This rise in the ocean-bed would point to the possible existence of a ridge running generally north and south, and limited, as far as known, by Easter Island, in latitude 27° 09′ south, longitude 109° 25′ west, and Dougherty or Keates Island in latitude 59° 21′ south, and longitude 119° 07′ west. This ridge is also indicated by a sounding of 1,600 fathoms, taken by the Challenger in latitude 38° 43′ south, longitude 112° 31′ west.

The lines of soundings taken by the Challenger and the Gazelle from 100° to 150° west run generally parallel to that of the Enterprise, and show a remarkable uniformity in the depths along the same meridian in the belt of the South Pacific, between latitude 40° and 50° south.

The surface temperatures agree with the results of previous observations for the same seasons and latitudes. It is to be regretted that no temperatures below the surface were obtainable, on account of the absence of deep-sea thermometers; but as the Enterprise is a cruising ship of war, and is not fitted especially for this kind of work, Commander Barker and the officers are deserving of great commendation for the valuable results accomplished. When the specimens of the bottom arrive, they will be sent to the Smithsonian institution for examination and discussion.

J. R. BARTLETT.

U. S. hydrographic office, March 8.

THE DISTRIBUTION OF RAINFALL IN NEW ENGLAND, FEB. 10–14, 1886.

THE rainstorm which occurred in the eastern part of the United States between the 10th and 14th of February of the present year was very severe in the southern part of New England. The amount of rain surpassed that of any preceding storm on record in that portion of New England where it was the greatest. In addition, there was a large quantity of snow and ice upon the ground, which was melted, and swelled the amount of water pouring into the rivers, thus causing most disastrous floods.

The meteorological conditions which attended this remarkable rainstorm are deserving of attention. On the morning of Feb. 11, the pressure in the eastern part of the United States was unusually high. At Anticosti Island the barometer (reduced to sea-level) indicated 30.01 inches; in New England the pressure ranged from 30.9 inches on the eastern border, to 30.6 on the western; while a trough of relatively low pressure, 30.0 inches, extended from the Gulf of Mexico to the lake region. Light rains were falling along the eastern front of this trough in the central states, heavy rains upon the Middle Atlantic coast, and the storm was just beginning in New England. During the day a centre of depression gradually developed in the central states, and the pressure began to fall. The fall was very rapid on the 12th; and on the morning of the 13th the pressure ranged from 29.8 to 29.6 inches in New England, with the centre of the depression, 29.45 inches, over Lake Ontario. During the 13th the storm-centre advanced rapidly down the St. Lawrence valley, but the rainfall had ceased to be excessive. On the 12th, the day on which the greatest rainfall was noted, the pressure conditions were peculiar. A careful charting of the barometric observations made by the U. S. signal service shows that in the morning a well-developed centre of low pressure existed in Indiana, moving northerly. In the afternoon a secondary depression formed on the Atlantic coast, which at ten P.M. was central at Washington. At seven A.M. of the 13th but one centre existed,—over Lake Ontario. The heaviest rainfall, therefore, occurred simultaneously with the development of a secondary barometric depression, south-west of New England. In its development the barometer fell rapidly. Between seven A.M. of the 12th and seven A.M. of the 13th, the fall was 0.54 of an inch at New York, 0.57 at New London, and 0.60 at Boston.

No peculiarities were noted in the other conditions. The temperature remained very nearly stationary during the 11th and 12th at a few degrees above the freezing-point, but rose on the night of the 12th and the morning of the 13th to above 50° F.

The region covered by the greatest rainfall includes the states of Connecticut, Rhode Island, and the eastern portion of Massachusetts. As there are many observers of rainfall in this region, it has been possible to determine the distribution of the rainfall with considerable approach to accuracy. The special reports collected by the New England meteorological society from one hundred and thirty-two observers show, that, in a region covering more than one-half of Rhode Island and the south-eastern part of Connecticut, over eight inches of rain fell. The amount diminishes rapidly west and east of this region, about two and one-half inches having fallen on Cape Cod, and less than one inch in the north-western part of Massachusetts. The region of heaviest rainfall is situated about two hundred miles north-east of the position of the centre of barometric depression on the afternoon of the 12th.

In order to give a general idea of the extent of territory covered by the rainfall, the following estimate has been made by the help of the accompanying map. The estimate includes the land-surface only.

Amount of rainfall.	Area in square miles.
Over 8 inches	750
Between 7 and 8 inches.....	750
" 6 " 7 "	1,500
" 5 " 6 "	1,850
" 4 " 5 "	2,750

The above embraces about five-ninths of the total area of the states of Massachusetts, Rhode