mounted on flexible arms which allow the lamp to be placed in any desired position. This seems to me preferable to either mounting we are using.

MAYNARD M. METCALF.
THE WOMAN'S COLLEGE OF BALTIMORE.

*WORK OF THE AGRICULTURAL EXPERIMENT STATIONS.**

THE agricultural experiment stations in the different States and Territories, as well as the colleges with which they are connected, have been unusually prosperous during the past year. Two things have especially contributed to the greater expansion and increasing efficiency of their investigations. These are their closer affiliation with this Department and the material enlargement of the resources of the agricultural colleges, by means of which the stations have directly or indirectly been benefited.

COOPERATION BETWEEN THE STATIONS AND THE DEPARTMENT.

Much progress has been made in determining the lines in which the stations can most effectively cooperate with the Department, and the methods of arranging and conducting cooperative operations. Since both the stations and the Department have had enlarged resources, it has been possible not only to increase the number of cooperative enterprises, but also to conduct them on a larger scale. In some cases it has been found desirable to form groups of stations to investigate some problem affecting a large region. Thus, for example, a group of stations, in cooperation with the Bureau of Plant Industry, are engaged in investigations on the breeding of varieties of cereals adapted to the Northwest. In other cases a single station is sufficiently aided by the Department to enable it to undertake the thorough treatment of problems in a special line. Thus the Pennsylvania Station, in cooperation with the Bureau of Animal Industry, is preparing to make elaborate researches in animal nutrition, and for this purpose has devised and built a respiration calorimeter for experiments with large animals, which in size and complexity surpasses any apparatus hitherto used for such experiments. In other cases, two or more branches of the Department combine to work in conjunction with a station on some complex problem. Plans are now being made, for example, for an extensive experiment on the problems of range conservation and improvement, in which the Arizona Station will unite with the Bureaus of Forestry and Plant Industry and the Office of Experiment Stations (irrigation investigations). It is evident that a very great variety of effective combinations can be made with the general result of a union of forces thoroughly acquainted with local conditions with those having broad views and relations. Such a strong combination of forces for attacking the problems of agriculture exists nowhere else. It is believed, therefore, that largely increased benefits will soon accrue to our agriculture from this union of the stations with the Department. At the same time the stations were never so strong locally, and are better equipped than ever before to work by themselves on problems of immediate importance to their own constituencies.

The records of this Office show that the Department is at present cooperating with the stations in 43 States and Territories. Among the subjects on which cooperative investigations are being conducted are the following: Tests of varieties of grasses and forage plants in many localities; special experiments with grasses and forage plants for the arid region and the improvement of range lands; breeding ex-

* Part of the Annual Report of the Director of the Office of Experiment Stations.

periments with plants, especially cereals; experiments with hybrid orange trees; the culture of sugar beets, dates and tobacco; planting forest trees; the nutrition of farm animals and man; the gluten content of wheat; plants poisonous to stock; soil investigations; injurious insects, especially the codling moth and locust, and irrigation investigation.

THE OFFICE OF EXPERIMENT STATIONS.

During the past year the work of the Office of Experiment Stations has continued to increase by the addition of new enterprises and the further development of those previously undertaken. Agricultural experiment stations under the direct management of this Office have been established in Hawaii and Porto Rico, and in Alaska the station work has been extended to include experiments in the Yukon Valley. Both the nutrition and irrigation investigations have been conducted on a larger scale than in previous years. The amount of material prepared for publication during the year has exceeded that for any similar period since the establishment of the Office. Unusual opportunities have been afforded for the study of the more general problems relating to the organization and development of agricultural education and research, and there is good reason for believing that along the lines already laid the Office may be able in the future to extend its usefulness in promoting these important interests.

ALASKA EXPERIMENT STATIONS.

The experiment stations at Sitka and Kenai have been continued and a station has been established at Rampart in the Yukon Valley. The chief new feature of the investigations in Alaska during the past year has been the more thorough study of the agricultural possibilities of the interior, especially of the Yukon Valley and the Copper River region. For this purpose Professor Georgeson made journeys through the Yukon Valley in the summers of 1900 and 1901, and Mr. Isaac Jones, who has been the assistant at Rampart, traversed the Copper River region in the summer of 1901. Through these journeys definite information has been obtained regarding the attempts at agricultural operations already made in the regions traversed and the possibilities for the extension of such operations. It was shown that considerable quantities of hardy vegetables, such as potatoes, cabbage, cauliflower, turnips, lettuce and radishes are already being grown in the interior and there are large areas which may be used for this purpose and also for the production of grasses and forage plants. At the station at Rampart rye and barley were matured. At Sitka the experiments with cereals, forage crops and vegetables were continued and a considerable number of varieties were successfully grown. Good silage was also made of native grasses stored in a log silo.

At Kenai the experiments with cereals and vegetables were continued with considerable success. Seeds were distributed to 400 persons living in different parts of Alaska and a considerable number of reports were received of those grown during the season of 1900. It is evident that the efforts of the Government to aid in the development of agriculture in Alaska are greatly appreciated by residents of that Territory, and that they have already received substantial benefits from the work of the Alaska Experiment Stations. The assistant director of this Office, Dr. E. W. Allen, made a tour of inspection to the stations at Sitka and Kenai and reported favorably on their work.

HAWAII EXPERIMENT STATION.

The first appropriation for the establishment and maintenance of an agricultural

experiment station in Hawaii was for the fiscal year covered by this report. A preliminary investigation of the agricultural conditions existing in Hawaii with reference to the establishment of an experiment station was made by Dr. W. C. Stubbs, director of the Louisiana Agricultural Experiment Stations, acting under the direction of this Office. On the basis of his report a station was established with headquarters at Honolulu, and put in charge of Mr. Jared G. Smith. The station was located on the tract of land in Honolulu known as Kewalo-uka, which was assigned to this Department by the Government of the Territory of Hawaii. About fifty acres of this tract have been cleared and several small buildings have been erected. The investigations have thus far been confined to studies of a fungous disease which seriously affects taro, and studies of the diseases of poultry. Plans are being made for experiments in horticulture, including both fruits and vegetables, and coffee culture. Cooperative investigations in irrigation will also be undertaken.

PORTO RICO EXPERIMENT STATION.

The first appropriation ($5,000) for agricultural investigations in Porto Rico was made for the fiscal year ended June 30, 1901, and was used for making a preliminary investigation of the agricultural conditions existing in that island, with special reference to the establishment of an experiment station there. This investigation was in charge of Professor S. A. Knapp, formerly of the Iowa Agricultural College, and on the basis of his report Congress made a second appropriation ($12,000) for the current fiscal year, which authorized the Secretary of Agriculture to establish and maintain an agricultural experiment station in Porto Rico.

In the spring of 1901 the investigations in Porto Rico were put in charge of Mr. Frank D. Gardner, who has since made his headquarters at San Juan. The work thus far has been largely confined to an agricultural survey of the island with reference to the best locations for experimental investigations. Experiments in coffee culture and with other crops have, however, recently been undertaken on leased land at Rio Piedras. Studies of injurious insects and plant diseases have also been begun. Improved varieties of seeds and plants have been distributed.

STATISTICS OF THE STATIONS.

Agricultural experiment stations are now in operation under the act of Congress of March 2, 1887, in all the States and Territories, and, Alaska, Hawaii and Porto Rico. In Connecticut, New Jersey, New York, Hawaii, Missouri, Alabama and Louisiana separate stations are maintained wholly or in part by State funds. A number of substations are also maintained in different States. Excluding the substations, the total number of stations in the United States is 60. Of these, 54 receive appropriations provided for by act of Congress.

The total income of the stations during 1901 was $1,231,881.55, of which $720,000.00 was received from the National Government, the remainder, $511,881.55, coming from the following sources: State governments, $303,892.61; individuals and communities, $1,580.59; fees for analyses of fertilizers, $82,322.40; sales of farm products, $93,363.98; miscellaneous, $30,721.97. In addition to this, the Office of Experiment Stations had an appropriation of $125,000 for the past fiscal year, including $12,000 for the Alaska experiment stations, $10,000 for the Hawaiian investigations, $5,000 for the Porto Rican investigations, $15,000 for nutrition investigations, and $50,000 for irrigation investigations. The

value of additions to the equipment of the stations in 1901 is estimated as follows: Building, $133,420.77; libraries, $26,153.49; apparatus, $15,009.48; farm implements, $13,050.45; live stock, $17,120.29; miscellaneous, $25,025.10; total, $229,779.58.

The stations employ 719 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 53; assistant and vice directors, 15; chemists, 146; agriculturists, 62; animal husbandmen, 14; horticulturists, 78; farm foremen, 21; dairymen, 31; botanists, 49; entomologists, 48; zoologists, 6; veterinarians, 29; meteorologists, 14; biologists, 7; physicists, 5; geologists, 5; mycologists and bacteriologists, 21; irrigation engineers, 8; in charge of substations, 12; secretaries and treasurers, 29; librarians, 11; clerks and stenographers, 40. There are also 72 persons classified under the head of 'miscellaneous,' including superintendents of gardens, grounds and buildings, apiarists, plant and animal pathologists, herdsmen, poultrymen, etc. Three hundred and nineteen station officers do more or less teaching in the colleges with which the stations are connected.

The activity and success of the stations in bringing the results of their work before the public continue unabated. During the year they published 445 annual reports and bulletins, which are many more than are required by the Hatch Act. These were supplied to over half a million addresses on the regular mailing lists. A larger number of stations than formerly supplemented their regular publications with more or less frequent issues of press bulletins, and most of the stations report a large and constantly increasing correspondence with farmers on a wide variety of topics.

FOREIGN EXPERIMENT STATIONS.

Instances of governmental activity for the advancement of agriculture in other countries are numerous, both in the Old World and the New.

The Russian department of agriculture and Imperial domains has inaugurated a system of commissioners of agriculture who will correspond in a general way to our commissioners of agriculture or to our secretaries of State boards of agriculture. Each commissioner's office will have connected with it a corps of agricultural specialists, who will work among the landowners and peasants. The Russian department of agriculture and Imperial domains is also displaying considerable activity in its soil and forestry investigations and in the establishment of stations for the investigation of special subjects, such as the growing of flax, cotton, olives, etc.

In Australia the Victoria department of agriculture is undergoing reorganization. The Victoria royal commission on technical education has brought to a close its study of Australian, European and American departments of agriculture, agricultural schools, and experiment stations, and published its final (sixth) report. The minister of agriculture is now seeking a director of agriculture, who will proceed to reorganize the department and put it on a better working basis.

In England the board of agriculture has made larger grants than formerly to agricultural colleges and societies for conducting agricultural investigations. The agricultural education committee is doing important work for agriculture and agricultural education by publishing circulars on various topics and nature study leaflets for teachers. During the year Mr. John S. Remington has established the Aynsome Experiment Station at Lancashire, a private institution.

The Austrian Government has recently

established several experiment stations, notably the station for plant culture at Brünn, the station for investigations in plant and animal production at Otterbach, and an agricultural physiological station, with divisions of chemistry, physiology and bacteriology, at Prague. In Hungary an experiment station for the analysis and study of wines was established last year at Fiune.

France has established at Nogent-sur-Marne a colonial garden to have administrative control over French colonial stations and botanic gardens in different parts of the world and to furnish these institutions with seeds and plants. During the year œnological stations have been established at Toulouse and Beaune and an agricultural station at Besançon.

In Germany five years of successful work at the Lauchstadt Experimental Farm, which is connected with the agricultural chemical experiment station at Halle, has given so much evidence of the value of experimental farms in connection with experiment stations that there is a movement in that country toward the extension of the so-called 'American system' of field experiments, conducted on a large scale and in a more practical way than has hitherto been customary in that country. Two new stations have been established during the year, a flax-culture station at Sorau and a viticultural experiment station at Weinsberg.

In the West Indies and South America also the claims of agricultural education and research have received much attention. The department of agriculture in the West Indies has established three new stations at Montserrat and one at Tortola, and has conducted several meetings of planters and investigators, at which great interest in the advancement of agriculture was displayed. The Bolivian Government has established an agricultural college at Cochabamba and an agricultural school for Indians at Umala. Brazil has recently established a botanical garden and experimental demonstration field at San Vicente, and the Argentine Republic has decided to establish four experiment stations on the same general plan as those in the United States.

A review of the progress of agricultural research during the year would not be complete without mention of the organization of a department of agriculture, with a small staff of experts, at Bangalore by the government of Mysore, India; the establishment of a dairy station at Gembloux, Belgium; a veterinary pathological institute and animal vaccine institute at Christiania, Norway; and an irrigation experiment station at Calgary, Canada.

A. C. TRUE.

OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

SCIENTIFIC BOOKS.

Mechanical Drawing. By F. W. BARTLETT, Lieutenant Commander, U. S. Navy. New York, John Wiley & Sons. Pp. viii + 190.

Although this book has been prepared primarily for students of the United States Naval Academy at Annapolis and indicates some of the distinctive features of the course in that institution, it must prove highly serviceable to the general student about to begin drafting. Without including either geometry or descriptive geometry—courses in which are given in another department of the Academy—the author restricts himself to the presentation and application of those practical methods which have commended themselves to the experts of the various departments of construction. The following, from the preface, will indicate the divisions cited: "As general methods differ slightly, the drawings referred to for the general instruction have been those of the Bureau of Steam Engineering of the Navy Department, and the methods of that Bureau have been followed. The special meth-