Russia as well as in Germany, where traffic was blocked for many days. Now it is often stopped on account of the melting of the enormous amount of snow accumulated in winter. Destructive floods have already begun, especially in Hungary and Galicia, and will extend northward and eastward as the season advances.

O. E.

St. Petersburg, April 2.

SCIENTIFIC NEWS IN WASHINGTON.

Manual Training in the Washington Public Schools. — Dr. Sternberg's Investigations in Regard to the Yellow-Fever Micro-Organisms. — Production of Copper, Lead, and Zinc.

Manual Training in Washington.

A YEAR ago Congress appropriated five thousand dollars to be used during the present fiscal year for the experimental introduction of manual training into the public schools of Washington, in accordance with a plan outlined by Prof. W. B. Powell, superintendent of schools of the District of Columbia. Industrial drawing had been introduced into the schools six or eight years ago. Beginning with moulding in clay and stick-laying and the study of the forms represented, the pupil is advanced, during the eight years of the course below the High School, to constructive drawing, free-hand and instrumental; to making working drawings of the hollow cylinder, of the bolt-head, of the bell, of the pulley, of the try-square, and of framing (the mortise and tenon); to the making of conventional ornaments, drawing plant-forms from nature and adapting them to ornament, etc. Professor Powell's plan was to supplement this by making work in shops a part of the regular course for the boys in the two higher grades of the grammar-schools and in the High School, and in the same way to ingraft instruction for the girls in cookery, upon the same grades.

With the funds provided by Congress there were fitted up, at the beginning of the present school-year, two schools of cookery, four schools of carpentry, one school of turning, moulding, and forging, and one school of sewing. The cost of furnishing and equipping each school of cookery with chairs, table, washstand, cupboard, dishes, range, boiler, and fittings, was $202.20; that of each school of carpentry, for benches, tools, lumber, and nails, a little less than $400; and that of the school of turning, moulding, and forging, including moulding tools, forges, lathes, and tools for same, shafting, belting, pulleys, and fittings, and steam-engine, $1,800.29. The estimated cost of materials for all of these schools for the current school-year, the estimate being based upon the actual expenditure to Jan. 1, is $631.53. Eight teachers are employed, — two of cookery at $500 a year each; four of carpentry and one of turning, etc., at $650; and one of sewing at $700. The teachers of carpentry, turning, and forging are all graduates of the Worcester (Mass.) Polytechnic Institute, specially trained to give this kind of instruction; and the teachers of cookery are graduates of the Washington Normal School, who have taken a special course in cookery under the supervision of Superintendent Powell.

The number of pupils now under instruction, drawn from the seventh and eighth grades of the grammar-schools and from the High School, is as follows: in the schools of cookery, 471; in the schools of carpentry, 660; in the school of moulding, turning, and forging, 112; in the school of sewing, 600. These schools, except the sewing-school, the instruction in which is given in the regular classrooms, are divided into classes of about twelve pupils each, which succeed each other during each school-day at intervals of one hour each. Every class, therefore, has one hour's instruction in the shops each week. It is Superintendent Powell's desire to increase this to two hours a week as soon as sufficient funds are available, and shops have been provided for all the pupils in the grades mentioned. In the cooking-schools, each lesson consists of instruction in the chemistry of foods and cooking, in the relative nutrient qualities of different articles, in the selection of food at the markets and the groceries, and in the practical preparation of one dish. During the week intervening between the lessons, the pupils are requested to make a trial of the dish last made, and to report success or failure.

The interest of the pupils in this work is very great. The teachers have been surprised to find how many of the girls in the two higher grades of the grammar-schools and in the High School are entirely ignorant of even the plainest cooking. This is true not only of the daughters of wealthy parents, but of those of families of small income, like clerks in the government departments. In a large majority of cases no instruction at home seems to have been given the girls in the public schools. Again: the more wealthy parents are, as a rule, the more anxious that their daughters shall join the classes in cookery. Some of the pupils at first objected to washing the dishes and making the kitchen ready for the next class, but this false pride has already disappeared. A healthy emulation has sprung up among the girls of each class to be able to report the most successful experiments in cookery at home; and in many a family in Washington an improvement in the methods of preparing food has already taken place, as a result of the few months' instruction that has already been given.

The schools of carpentry are also divided into classes of twelve pupils each, and the course comprises two years' instruction. During the first year the boys in the seventh and eighth grades of the grammar-schools are practically taught the correct methods of using planes, handsaws, chisels, gouges, brace and bits, hammer, gauge, and other tools in the working of wood; the laying-out of work with knife and pencil, using try-square, bevel, and dividers, and working from drawings executed by the pupil himself; the making of plain and more complex mortise-and-tenon joints; dove-tailing and plain cabinet-making; the making of articles of practical utility for the schools and shops; the putting-together of work with brads, nails, screws, and glue; the care and sharpening of edged tools; and the use of circular saws.

A visit to the schools of this grade showed wonderful progress during the few months since they were established, and this progress was especially striking when some of the earlier work was compared with some of the later. In one of these schools, each pupil was engaged in making a shoe-blacking box. The designs were all original, and no two of them were alike. Some of them showed considerable invention in the form and arrangement of the boxes. Working-plans had first been made, and submitted to the teacher for his approval, and every pupil was required to construct his box in accordance with the plans submitted. The work was well advanced when seen; and some of it would have been highly creditable to a skilled cabinet-maker, while the average of it all was certainly as high as that which would be done by the average Washington mechanic. Benches for use in the shops, shelves and cupboards for the use of the schools, geometrical blocks for the primary schools, and many other articles, had already been made by the classes of this grade.

In the turning, moulding, and forging shop the boys from the eighth grade of the grammar-schools and from the High School are taught the use of all the hand wood-turning tools, embracing plain and fancy turning in hard and soft wood, inside and outside; the use of chucks and face plates; pattern-turning; bench-moulding in sand; casting soft metal, embracing the use of slickers, trowels, riddle, etc., using patterns made by the pupil himself; the forging of small articles of soft iron and steel, and steel tools, with instruction in the simpler methods of manufacture of iron and steel; practice in welding iron and in hardening and tempering steel, and by lectures on metallurgy.

It is the intention to give each class two hours of practical instruction a week; but, owing to the small number of shops and the limited number of teachers, they are receiving but one hour a week this year. But their progress has been very satisfactory. The work in turning, moulding, and forging, while showing great differences of adaptability on the part of the pupils, proves that every boy is capable of learning to use common tools, and of making with them a thousand and one articles which, before the few lessons he has received, he would not dream of undertaking. Among the useful articles already made in this shop are a set of filter-stands for the physical laboratory of the High School, handles for tools, etc.

The interest of the boys in the work of the shops is as great as that of the girls in cookery. They are all bright, wide awake, and there is no listlessness, no idling the time away. As all the members of each class are engaged upon similar work, there is a healthy emulation among them to produce the best results. It is also noticeable that the wealthier parents take more interest in these

shops than those in more moderate circumstances, and, as a rule, desire that their sons shall have the manual training, even though they intend to enter professions.

What is claimed for the Washington experiment is, that it is an attempt to ingraft upon the common schools a system of manual training that shall give to all the boys a practical knowledge of the use of the most common tools used in working in wood and iron, and to all the girls a similar knowledge of plain cooking and sewing. This it is intended to do without interfering with the regular studies; each class, when the schools are completely organized, devoting two hours a week to the manual training.

The shops in Washington have not been established long enough to make it possible to determine whether the experiment will be successful or not. The only thing that can be said of it is that the results thus far seem to be encouraging. Of the single school of carpentry established in the High School last year, and attended by 225 pupils, Superintendent Powell says, "The work was successful. It was not difficult to manage it with the other regular courses of study of the school. The boys seemed to like the work, and showed no disposition to withdraw from the class. Although but one hour's instruction per week was given each pupil, a marked improvement in the use of tools was noticed; and it is known that many boys did corresponding work at home for practical and useful purposes, which was furthered at least, if not induced, by the training and suggestions received at the school shop." The late principal of the High School, in his annual report of the first year's instruction in carpentry, said, "It is certain that it did not hinder the general progress of any boy engaged in it, and it is equally certain that the influence of the work was beneficial in various ways in the school."

Superintendent Powell recommended an appropriation of ten thousand dollars for manual training in the Washington schools for the next year, and it is probable that eight thousand will be granted. This will make it possible to increase the number of schools of cookery and of the shops, and to provide additional instruction. Opportunities will thus be provided for all the pupils of the highest two grades of the grammar-schools and of the High School, and probably the number of hours of instruction can be increased from one to two hours a week for each class.

The Yellow-Fever Germ.

Something more than a year ago it was positively announced that a Mexican physician had discovered the yellow-fever germ; that it could be cultivated; and that, by inoculation with it, human beings could be rendered unsusceptible to the disease. Subsequently a similar report was received from Brazil, and together they caused wide-spread discussion both in this country and Europe, not only in the medical journals, but in the popular press. So important was this matter considered in Washington, that the President determined to have a special inquiry made in regard to it, and Dr. George M. Sternberg of Johns Hopkins University, a man of large practical experience with fevers, was appointed to make it. He visited Mexico and Brazil; and, although he has not yet submitted his official report, he obtained permission to prepare and read in advance of it a paper on the subject, setting forth in a general way the results of his inquiry. This paper was read before the College of Physicians, of Philadelphia.

The amount of time accorded Dr. Sternberg not only prevented the investigation from being as thorough as was desirable, but it made it necessary for him to visit Brazil in June, which is in the winter season south of the equator, and Mexico in September, when there were comparatively few cases of yellow-fever. His opportunities for observation, therefore, were not as good as could be wished. But his inquiries did go far enough to justify him in saying that he found really nothing to sustain the sanguine expectations of the Mexican and Brazilian scientists. Such examination as he had been able to make in Havana, Vera Cruz, Rio Janeiro and other Brazilian ports, which had yellow-fever, had not discovered any such micro-organisms as these gentlemen say they have found. These investigations were not confined to the blood alone, but to the alimentary canal and other parts of the digestive organs, and were extended also to the muscles and other tissues.

In order to show the exact degree of success in preventing yellow-fever by inoculation, Dr. Sternberg said that out of 44 inoculated in Rio Janeiro, 22, or 50 per cent, had been seized with the disease; and of these, 9, or 40 per cent, had died. "This is important," observed Dr. Sternberg, "when taken in connection with the usual rate of mortality, which is 30 per cent, as showing, that, so far from being a protection, inoculation increased the effects."

Dr. Sternberg said that in his official report to the government he had laid stress upon the fact that certain experiments which ought to have been carried out were rendered abortive by his having to return to Washington in accordance with his official orders. Under these circumstances, he had thought it best to advise that the investigation be continued by means of autopsies and with the blood taken from the living patient. In accordance with this recommendation, the President had directed him to continue his inquiry. So far as a practical analysis of the blood of the subjects referred to by the Mexican and Brazilian doctors was concerned, he had failed to find any such condition as they had described. At the same time further experiments ought to be made, although he had found no evidence to prove that the Mexican and Brazilian doctors had solved the problem of preventing yellow-fever by their inoculation and microbe theories.

Copper, Lead, and Zinc.

Prof. David T. Day, geologist in charge of the Division of Mining Statistics and Technology, of the United States Geological Survey, has issued a preliminary statement of the production and consumption of copper and of the production of lead and tin in the United States for the year 1887. The production was as follows: —

	1885. Pounds.	1886. Pounds.	1887. Pounds.
Domestic copper	165,875,766	156,735,381	177,420,524
From imported pyrites and ores	5,086,841	4,500,000	3,750,000
Total	170,962,607	161,235,381	181,170,524
	Short Tons.	Short Tons.	Short Tons.
Desilverized lead	107,437	114,829	135,552
Non-argentiferous lead	21,975	20,800	25,148
Total	129,412	135,629	160,700
Spelter	40,688	42,641	50,340

It is very difficult to secure trustworthy statements of stocks of copper in producers' and dealers' hands, and *in transitu*, and therefore Professor Day has adopted the plan of obtaining statements from the consumers of the country of the amount of copper used by each for a series of years. Answers were received from every brass and copper mill and from every brass foundery of any consequence in the country. The consumption of the copper and brass rolling-mills and wire-drawers was, in 1885, 51,110,522 pounds; in 1886, 63,921,217 pounds; and, in 1887, 72,521,287 pounds. The brass-founders used, in 1886, 8,146,866 pounds, which rose to 9,822,731 pounds in 1887, — an increase of 20.5 per cent in one year. Adding the two series of figures, a total consumption is reached of 82,344,018 pounds in 1887, as against 72,068,083 pounds used in 1886 by the same establishments, — an increase of 14 per cent. Professor Day reaches the conclusion, therefore, that the copper-consumption of the United States has been generally overestimated, and that in 1887 it was not much, if any, in excess of 100,000,000 pounds of new copper.

ELECTRICAL SCIENCE.

Intensity and Consumption of Different Sources of Light.

THE following are results of careful measurements, the unit being a standard English candle. The tables are summarized.

Petroleum Lamps.

A number of different lamps were used. The general result was