

eight days after the end of the month, all punishable absences to the notice of the magistrate, if he has not previously brought the parents to their duty by an admonition, or had the child fetched to school by the school beadle, to whom a small fee is due from the parent for his trouble. If, however, the matter goes before the magistrate, this functionary inflicts a fine, which may go as high as 30s., and if the fine is not paid the penalty is changed to one of imprisonment. In Saxony the law prescribes that the number of scholars in a class shall not exceed 60, and that the number of scholars to one teacher shall not exceed 120. In schools with from 60 to 120 children, therefore, if the commune is not rich enough to do more in the way of providing teachers than the law actually requires, two classes are formed, and a reduction of school time takes place for each, in order to allow the one master to conduct them separately."

The rural population greatly prefer the half-day school, as it is called, because they thus have the older children at their disposal for half the day.

Mr. Arnold concludes his valuable paper with three comments: 1. The retention of school fees is not a very important matter; something can be said for and against it, but the weight is in favor of their retention; 2. Keep improving our schools and studying the systems of other countries; 3. Organize the secondary instruction not only in the interest of that instruction itself, but in the interest of popular instruction. This last remark applies with peculiar force to education in the United States.

Mr. Arnold's report is free from official dryness, and reads more like an essay than a government document.

#### THE EDUCATIONAL INSTITUTIONS OF PRUSSIA.

DESPITE all that has been said and written in this country during the past few years concerning the respective merits of the *gymnasium* and the *realschule*, there are very few educators who are able to describe accurately the character and relative status of the various educational institutions of Prussia. Therefore the following summary will be of value.

At the head of the education department in Prussia is the minister of education, whose duty it is to look after the administration of church matters as well. In each of the twelve provinces of Prussia is a *provinzial-schul-collegium*, having charge of the secondary schools. The elementary or primary schools are under the supervision of district boards, of which there are from two to

five in each province. Every commune is compelled by law to build and support a number of elementary schools sufficient to provide primary instruction for all the children of the community. Where the means are not sufficient, a grant is allowed by the central government. The assistance of this sort given in the year 1885 amounted to nearly 21,500,000 marks. The inspection of these elementary schools is very thorough; and every teacher, no matter what his grade, must have passed a government examination. In the towns a rector is placed over the teachers; in the country a local school inspector, usually a clergyman, acts in the same capacity. These rectors and local inspectors are under the surveillance of district inspectors. Gradually laymen are superseding clergymen as incumbents of these district-inspectorships. The district inspectors report to the district boards, and these themselves not infrequently overlook the inspectors' work. In the eye of the law, all schools, no matter what they teach, that have no *berechtigung*, — a term used to express the privilege of preparing students for an examination the passing of which shall absolve from part of the full period of military service, — are elementary schools. All schools having *berechtigung* are classed as high schools, and are under the administration of the above-mentioned *provinzial-schul-collegien*; and in this way the high schools are very closely connected with the military system. After 1812, military service was made compulsory for every Prussian. The period of service in the standing army is three years; but those who have received a higher education have the privilege of serving one year only, if they apply to the authorities at the proper time. These are the so-called 'one-year volunteers' (*einjährige freiwilliger*). They receive no pay, and must keep themselves. In order to increase the intellectual standard of the army, and also to reduce expenses, the high schools have the right (*berechtigung*) to grant certificates for one-year volunteers.

These high schools are of various kinds, and include, 1°, the *gymnasien*; 2°, the *pro-gymnasien*; 3°, the *real-gymnasien* (formerly known as *real-schulen* of the first class); 4°, the *real-pro-gymnasien*; 5°, the *ober-realschulen*; 6°, the *realschulen*; 7°, the *higher-burgher schools*, and a few industrial and agricultural schools.

The *pro-gymnasium* is merely a *gymnasium* without the highest class, and the *real-pro-gymnasium* and the *realschule* stand in similar relation to the *real-gymnasium* and the *ober-realschule*. Those students who have satisfactorily attended for one year the second class of a *gymnasium*, *real-gymnasium*, or an *ober-realschule*, or the first class of a *pro-gymnasium*, a *real-pro-gymnasium*,

or a *realschule*, are entitled to a one-year volunteer certificate. In the case of the *higher-burgher schools*, and such others, excepting the above named, as have the right to grant the certificate, its acquisition is made to depend on the final examination at the completion of the course.

The following table will show the various studies pursued in the several kinds of higher schools, and the proportion of time allotted to each. The figures represent the number of hours per week — taking all the classes together — given to the subjects named :—

	Religion.	German.	Latin.	Greek.	French.	History and geography.	Mathematics.	Description of nat. objects.	Physics.	Chemistry.	Natural history.	Writing.	Drawing.	English.
Gymnasium.....	19	21	77	40	21	28	34	10	8	—	—	4	6	—
Real-gymnasium.....	19	27	54	—	34	30	44	12	12	6	—	4	18	20
Ober-realschule.....	19	30	—	—	56	30	49	13	14	9	—	6	24	26
Higher-burgher school.....	13	21	—	—	40	22	29	13	—	—	8	8	12	13

Singing and gymnastics are taught in all these schools after the regular school-hours, which are from eight to twelve, and from two to four o'clock, and Hebrew is similarly taught at the *gymnasien* to future students of theology.

It will be observed that the *real-gymnasium* differs from the *gymnasium* in teaching no Greek, in adding English to the course, and in reducing the time given to Latin. The time thus taken from the classics is given to French, German, mathematics, physics, chemistry, and drawing. The *ober-realschule* omits Latin and Greek entirely, greatly increases the instruction in French, and adds to the courses in English, drawing and the sciences. The higher-burgher schools have only a six-year course instead of a nine-year, and the studies occupy the times shown in the table. Some of these secondary schools have *vorschulen* attached to them. Into the secondary schools, children do not enter before the completion of the ninth year; and they are required to possess an ability to read easily Latin and German text, a knowledge of the parts of speech, a legible handwriting, ability to write a dictation exercise without too many mistakes in spelling, an accuracy in using the four fundamental rules of arithmetic, and a general acquaintance with the historical events narrated in the Old and New Testaments.

Besides the *berechtigung* for one-year volunteers, which all these high schools possess under the conditions named above, certain other privileges

as to positions in civil life are possessed by them, but these privileges are by no means the same for all.

The final examination certificate (*reifezeugniss*) entitles the holder to the following privileges :—

I. That of a *gymnasium*, 1°, to enter any university, and to compete in any examination for positions in the higher divisions of the civil service; 2°, to enter the technical high schools for engineering at Berlin, Hanover, and Aix-la-Chapelle, and to admission to the government examinations for engineering in all its branches; 3°, to

enter the academies of mines at Berlin and Clausthal and the affiliated technical high school at Aix-la-Chapelle, and to admission to the examinations for the first-class certificates in the departments of mining and smelting; 4°, to enter the academies of woods and forests at Eberswalde and Munich, and to admission to the higher examinations in this department; 5°, to admission to the first-class posts in the post-office, from postmaster-general downward.

II. That of a *real-gymnasium*, 1°, to attend lectures at a university with a view to matriculating in the philosophical faculty for the purpose of pursuing the study of mathematics, the natural sciences, or modern languages; 2°, to admission to the examinations mentioned under I., 2°, 3°, 4°, 5°.

III. That of an *ober-realschule*, 1°, to admission to the examinations mentioned under I., 2°; 2°, to admission to the same studies and examinations to which the certificate of a *real-gymnasium* entitles, on condition of passing a special examination in Latin.

IV. That of a *real-pro-gymnasium*, chiefly to unconditional admission to the highest class (*prima*) of a *real-gymnasium*.

V. That of a *realschule*, 1°, to nomination for civil-service posts in provincial administration and in the railways; 2°, to nomination to clerkships in the department of mines and smelting; 3°, to nomination as a land-surveyor; 4°, to admission

to examinations for apothecary, on condition that Latin has been an obligatory subject.

VI. That of a *pro-gymnasium*, 1°, to admission to the examination for apothecary; 2°, to admission to industrial technical schools.

VII. That of a *higher-burgher school*, 1°, to attend an industrial or technical school; 2°, to nomination for junior clerkships in the law courts; 3°, to admission to the examinations for art teachers; 4°, to admission to the high school for music in Berlin; 5°, to nomination for junior posts in the post-office.

The high schools are supported by the state, by the commune, or by both. If supported by the state alone, they are known as royal high schools. In the budget for 1885-86 the state subsidy for the high schools amounted to 4,712,118 marks.

#### THE SOURCE OF THE MISSISSIPPI.

THE readers of *Science* will recall our announcement a few weeks ago, of the despatch of an exploring party to the head waters of the Mississippi River to examine and locate all the streams and lakes tributary to Lake Itasca. Our explorers have now accomplished their task, and we have received from them a detailed report, and a map of the entire region, which includes the basin of Lake Itasca.

This map, which we have engraved on the scale of about one mile to the inch, divided into sections corresponding with the U. S. land-office surveys, is presented herewith. Other maps are also presented for the fuller explanation of the details of the report.

Preliminary to the report, it is proper that we should make some statement of the considerations which led to the despatch of this party. There have been a number of explorations and excursions to the head waters of the Mississippi during the present century. Of these, we have a more or less accurate record of the trip of Morrison in 1804; of Schoolcraft in 1832; of Nicollet in 1836; of Charles Lanman in 1846; of the Ayers in 1849; of William Bungo in 1865; of Julius Chambers in 1872; of A. H. Siegfried and his party in 1879; of W. E. Neal in 1880 and again in 1881; of Rev. J. B. Gilfillan and Professor Cooke in May, 1881; and of Captain Glazier in July, 1881. We also have the maps of the government surveyors who spent two weeks in this township in September and October, 1875, and the paper of Mr. O. E. Garrison, contributed by him to the tenth annual report of the State geological survey of Minnesota, for the year 1880.

Of these explorers, we know that Nicollet carefully explored all the feeders of Lake Itasca; that

Chambers explored Elk Lake, which he called Lake Dolly Varden; and that Messrs. Gilfillan, Cooke, and Morrison, proceeding from the south, also visited the sources of the lake lying in that direction. Therefore, as to the general facts regarding the size and character of the basin of the lake, we did not hope to add any considerable amount of information to that already possessed. But of all these parties of explorers and surveyors, it is safe to say, that, with the exception of Nicollet and the government land-office surveyors, there has been little attempt at accurate investigation. Only these two have added any thing material to what Schoolcraft told the world in 1832. It is well, therefore, to note the difference in methods, of these two principal explorations of the Itasca basin.

"Nicollet was a trained scientist, but he worked under limitations; and very sensibly, also, with a limited and definite purpose. His work was mainly done alone, and his chief instruments were the thermometer, the barometer, the sextant, and the compass. Hence he gives us details of temperature, elevation, latitude, longitude, and the general direction of the parts he visited. He rarely used the chain — if, indeed, he carried such a piece of property. His details of distance were either estimated — as in the case of a day's tramp or of an object within sight — or figured out by mathematical rules, as when he computed the length of a section of the river from the data of the latitude, longitude, and the direction from each other of a given number of points in its course. Hence his outline of the course of a river or creek, or of the form of a lake or pond, was only as accurate as might be expected from a trained explorer, whose eye was accustomed to take in and measure distance, direction, and form, on a large scale, and under a thousand varying conditions. In the matter of general relief forms, and the general trend and drainage of the country, he was, without doubt, the best equipped and most competent single explorer who has undertaken the study of our country; and his work has been of inestimable value to hundreds of thousands who never heard of his name. So far as relates to the subdivision of areas, and the surveying and platting of the surface of the land, considered as a horizontal plane, his work did not profess to have any accuracy or value whatever.

"On the other hand, this last is the chief, if not the only, object of the government land surveyors. Their instructions are limited and specific. They take no note whatever of relief forms: they follow up and trace only the streams and ponds intercepted by the boundary-lines of sections. In the matter of horizontal area, in the meandering