SCHOOL SANITATION AND DECORATION

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A Practical Study of Health and Beauty in their Relations to the Public Schools

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FOREWORD

Our country shall be filled with a race of royal men and women. They will be strong and beautiful, for they will have physical and intellectual health. They will be righteous and happy, for they will have the piety so happily defined by Dr. William T. Harris, — "the piety not merely of the heart, but the piety of the intellect that beholds truth, the piety of the will that does good deeds wisely, the piety of the senses that sees the beautiful and realizes it in works of art."

It is hoped that this little book may contribute to the forces which are coöperating to produce the crowning race in America.

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INTRODUCTION

THE sanitation and decoration of schools is a subject that in the last few years has received much attention. Teachers and school boards have become interested in it and have made much progress, but there has been no concise work that they could use as a guide. It is hoped that such a guide will be found in this book.

There are two ways of treating a subject of this kind. One is to deal with it rabidly, trying to impress the reader with the idea that the public schools are teeming with dirt and filth, that they are the chief factors in the spread of disease among children, finally leaving the impression that the public school must be an exceedingly bad place to which to send boys and girls. The other way is to treat it with reason, quietly admitting that there are conditions to be improved, that there are some unsanitary and unsightly schools, and showing how such conditions may be remedied, and how lessons may be learned from experience for the better construction and conduct of new buildings.

If the writer should choose the first method, he would be apt to discourage his readers so that little or nothing would be done to improve matters, and the object of the book would not be accomplished. It is the intention throughout these pages to treat the subject as reasonably and helpfully as possible, to encourage, not discourage, reforms in the sanitation and decoration of our public school buildings, to the end that money expended upon the construction, decoration, and renovation of our schools may be used to the best advantage, and that cities and towns may become more attractive and beautiful by having artistic and healthful schools. In this way we may contribute to future communities the possibility of a more healthy and vigorous manhood and womanhood.

Educational theories have so far broadened that it is no longer claimed that the old schools were the best schools, where hard benches, poor print, plain walls, and bad air were the constant companions of the pupils while they studied. Because Benjamin Franklin, or Abraham Lincoln, or anybody else, was successfully reared under such unfavorable conditions, is no reason why the boys and girls of to-day, who have an entirely different environment, should be subjected to any unnecessary hindrances or dangers.

In any community there are a few exceptionally healthy and bright pupils who will make their marks, no matter how poor their instruction and surroundings. But it is the object of the public school system to educate *all* of the children. It is recognized that all cannot stand hardships and unfavorable conditions such as are mentioned above. In fact, comparatively few children of the present time could go through the old school system without receiving some mental or physical scar resulting from the bad conditions. Perhaps the child of to-day is a more delicate organism than the child of fifty or a hundred years ago. Whether this be true or not, unnecessary stumbling-blocks must not be placed in the path of his educational career.

In order to realize that this fact is appreciated by modern educational authorities, it is but necessary to step into some recently built school and compare it with any schoolhouse of long ago. The difference is at once seen. The present tendency is toward making the work as easy and interesting as possible, and the surroundings healthful and beautiful. The studies are arranged in their proper sequence, the hours of work and recreation are balanced and regulated, the rooms and halls are more or less decorated with pictures, statuary, photographs, and plants, — all tending toward the rounding out of the pupil's character. While we may take great pride in this advance, the fact must not be overlooked that there are many schools that are in this respect behind the times. It happens here also, as in every reform, that there are some instances of overdoing, in which matters are carried so far that much if not all of the benefit is lost. Some teachers are naturally more enthusiastic than others, and perhaps carry the "open-window" idea or the "picture-hanging" to excess, while others turn their backs on the whole thing as being outside their province of work. It does not seem right that one school in a community should have beautiful architecture, sanitary surroundings, and fine interior decorations, while the schoolhouse only a few blocks away may be poorly located and constructed, badly ventilated and heated, and may have no beautifying features inside or out. It is evident in such a case that all the children in this town are not given equal opportunities for education. Furthermore, if we compare the amount and kind of decoration in the various rooms of a single building, we cannot fail to notice the lack of harmony. One room may have a few fine works of art, good taste being shown in the selection and hanging; another may have its walls literally papered with photographs and pictures cut from magazines; and still a third may have no decorations whatever. Such variations are largely, if not wholly, due to the teachers.

It will be admitted by all that there are reforms to be carried out, faults to be remedied, unsanitary conditions to be removed, and proper ideals in architecture and decoration to be maintained. We hope that teachers and school officials will find the facts, ideas, and illustrations set forth in the following pages valuable to them in pushing forward the work that has already been so well begun in the sanitation and decoration of our public school buildings.

SCHOOL SANITATION AND DECORATION

CHAPTER I

LOCATION OF SCHOOLS

EVERY condition and consideration which enters into the selection of a site for a dwelling becomes doubly important when applied to the selection of a schoolhouse site. It is not customary for a man who is in his right mind to select for his home a site in the vicinity of a powder magazine. He is fearful lest the powder explode and destroy his life and property. Yet men, apparently sane, select most unsanitary and unsightly places for their dwellings, and for schoolhouses as well.

It is probable that the average individual in this climate spends from 85 to 90 per cent of his time indoors. In the case of school children, perhaps more than half of this indoor life is in their homes, and nearly all of the remainder would be spent in the schoolhouse. During school hours the children are subjected to the influence of their surroundings, be they good or bad. If the children are compelled by law to attend school, the authorities should spare no pains to make their environment the best.

The question of school location includes the consideration of a number of important points, such as the character of the soil, the condition of neighboring lots of land, the proximity of hills, trees or buildings that would tend to shut out the sunlight. Usually it is the expense of the land and the central position of the lot that are the prime factors in the determination of a school site, but this should not be so. The greatest attention and care should be given to the healthfulness of the site and the architectural possibilities that it may possess. If possible, the architect who is to construct the building should be consulted in regard to the lot before the final selection is made. In this way the public schools may become the most beautiful architectural features of the town, as numerous examples show. In considering the location of country and city schools the problems that arise are so vitally different that it will be more instructive to study them under separate heads.

LOCATION OF THE COUNTRY SCHOOL

The modern community is tending toward the abolishment of the district school, collecting the teaching force into one large, central building, and transporting the distant pupils to it, thus not only saving considerable expense for fuel and other items, but at the same time giving to the pupils many advantages that they could never get in the rural school. Although this is the tendency, country schools will have to be built for many years to come, and there are a number of important points to be observed in the selection of a rural site.

The character of the soil bears an important relation to the healthfulness of the site. Land which consists largely of clay is always to be avoided, because it takes up moisture and holds it, making the surroundings damp and unhealthful. Peaty soil also holds moisture, and should it be necessary to locate on either clay or peat, the greatest care and skill must be exercised in draining the lot. Sand and gravel are easily drained, and therefore should be selected if possible. Rock may furnish a good foundation for a site, if it is not so formed as to retain surface water. A lot that is of rock, if at the foot or on the side of a hill, may become moist at unexpected times and places. A thorough geological study is therefore necessary before deciding upon a rock site. In fact, in the selection of any site, it is essential that the survey should extend over all the adjoining country. A study of the school lot alone should never form the basis of selection. *All* the neighboring lots and the surrounding country should be included in the examination.

The general slope of the land in the vicinity of a school lot should be such as to insure perfect and proper drainage. Swampy land, duck ponds, piggeries, or any other conditions that would give rise to temporary or permanent moisture, naturally are not the chosen companions of the ideal school lot. At certain times of the year, when the organic matter is in a state of putrefaction, such places would give rise to very unhealthful conditions. It is not desirable to place a school on or below the north slope of a steep hill, because in the winter months the sunlight could have very little if any access to the schoolhouse. No large trees should stand on the south or west sides of the building, nor should they stand on the other sides if they be near enough to check the free passage of air and light to the windows.

A good and sufficient water supply must be obtainable at all times. This is often overlooked until after the building is completed, and then it not infrequently happens that it is a matter of great expense to secure good water. It is really one of the most important factors in the selection of a country school site. Children are apt to crave a good deal of water, and it should be accessible to them at all times. At no other period of healthy life is the want of a drink of water so cruelly felt. Without it children are deprived of one of their most necessary foods, upon which the maintenance of good health depends. No water should be supplied that is not absolutely pure and above suspicion.

LOCATION OF THE CITY SCHOOL

The selection of a site for the city schoolhouse is not usually open to much choice. Few good lots can be obtained, and perhaps the prices of these are of such a nature as to make them impossibilities to the average school board. But as a matter of fact, in the city even greater discrimination should be shown in choosing a site than in the country. The number of factors that tend to influence the sanitary condition of the building in the city is far greater than in the rural section. Under these circumstances it becomes a very important matter to decide what considerations may or may not be disregarded in the choice of a convenient locality.

It is not uncommon in the city that the choice of lots includes some thất are designated as "made" or "filled" lands. This filling may consist of street sweepings, house refuse, and garbage. The gradual putrefaction of this organic matter would at times give rise to bad odors which would make the school yard unhealthful, and they might even affect the building itself. Therefore, such sites should be avoided if possible; but if it ever becomes necessary to use "filled" land, every precaution must be taken to shut out these odors of putrefaction by carefully paving or cementing the whole school yard. If this be thoroughly done, the principal objection to "made" land has been removed so far as the sanitary conditions are concerned, but there are serious objections to this pavement or cement if the yard is to be used as a playground for the children.

The relation of the surrounding objects to the city school is of far greater importance than in the country. Naturally the environment of the city site affects it much more directly.

It is not advisable to locate the school building on a main street. This is particularly true if the street in question is paved with cobblestones or other form of noisy pavement. Noise is distracting to the children and seriously affects the nerves of both pupils and teachers. Children, more particularly the younger ones, are subjected to great dangers in such a locality from the large amount of traffic always prevalent on main thoroughfares.

Neither should a schoolhouse be built in the vicinity of a noisy factory or of an establishment otherwise offensive, and after the schoolhouse is located and completed, the city should prohibit the erection of any such nuisance in the neighborhood. Naturally anything as noisy as a railway station or saw-mill, or anything as bad-smelling as a soap factory, tanyard, rubber works, glue factory or gas works, is exceedingly objectionable as a schoolhouse neighbor. Stables, slaughter houses, and markets may be objectionable and often very unsanitary, if proper disposition of the refuse is not made. Hospitals and cemeteries are best avoided; also police stations and fire-engine houses, where sudden and distracting activity is apt to occur, are best far away from the schools.

It is unnecessary to dwell upon the importance of avoiding a section that is infested with any of the moral nuisances common to the cities. The social and moral character of the vicinity has a great influence on the school children. This matter should be carefully investigated, and any doubtful locality religiously avoided.

No building should stand within sixty feet of the schoolhouse on any side, and large trees or any obstruction that could prevent the free access of both fresh air and direct sunlight to the school building should be removed. Sunlight is nature's great disinfectant, and it must not be prevented from doing its work of purification in and about the schools. The necessity of a playground is conceded, and no site should receive serious consideration where such cannot be provided. Outdoor recreation must not be discouraged or hindered by the lack of a proper place for wholesome play.

Probably no country gives less attention to the careful location of schools than our own United States. In many countries there are strict laws regarding it, and certain men or commissions are appointed to attend to such matters. For example, in Scotland, under the regulations of the Educational Act of 1872, schools must be placed in a healthy neighborhood, as far as possible from noise, and having an uncovered area of at least twelve hundred square yards. In Belgium, all plans and schemes of schools, including their location, construction, opening, ventilation, warming, lighting, drainage, and closets, etc., must be examined and approved by the Bureau d'Hygiene. In Germany, plans for new school buildings, or alterations in school buildings already built, must be examined and approved by a district doctor. He is intrusted with the superintendence of school hygiene in general. In Vienna, the site chosen for the school cannot be definitely accepted until the doctor has given his opinion as to the suitability of the land from a sanitary standpoint. The plan must then be examined by a commission composed of men skilled in teaching, in technology, and in medical hygiene.

CHAPTER II[1]

CONSTRUCTION AND REQUIREMENTS OF SCHOOL BUILDINGS

THE development of our public school system, of which the schoolhouse is the outward and concrete expression, belongs to this century. With the exception of residences, there is at the present day no kind of buildings in which all classes of community take a deeper interest. The doctor, the architect, the teacher, the parent, and the taxpayer, all contribute their criticism and offer their advice.

The architectural development of the school building has not, however, progressed as rapidly as that of most other parts of our educational system. It is of comparatively recent date, perhaps within the last twenty years, that schoolhouse architecture has received the attention which such an important subject demands.

The school age includes the period of the greatest physical development. During this period the child spends a large part of his time within the school building. It is desirable that he should not be subject to physical, mental, or moral detriment by reason of its bad arrangement or faulty architectural features.

In Europe, prior to the thirteenth century, the schools

[1] This chapter is written by Mr. Arthur Bohn, architect, of Indianapolis, who also kindly furnishes plates and illustrations.

PLATE I.—TWELVE-ROOM SCHOOL BUILDING, WITH ASSEMBLY HALL.

Vonnegut and Bohn, Architects,

were closely connected with the church, were generally conducted in the monasteries, and were chiefly devoted to the education and training of the clergy and nobility. There were not, in our sense of the term, schools for the benefit of the common people.

During the latter part of the thirteenth and the fourteenth centuries there began to be established schools for the people, in which the elements of reading and writing were taught. These feeble organizations received a quickening impulse when Martin Luther took up the cause of education, and in 1524 published a pamphlet addressed to the cities and towns, urging the advantage and necessity of establishing more common schools. Throughout Northern Europe from this time there was a gradual, although slow, improvement and widening of the scope of common schools.

Up to this time it had been deemed proper to conduct a school in any place, or in any part of a building, where shelter could be found. With the growth of population, and the growing importance of the common people, came also the desire and necessity for special buildings for school purposes. These early buildings were of a primitive character, planned without reference to hygienic laws, and devoid of special adaptation to the purpose for which they were to be used.

It is interesting to note, however, that in Germany, as early as 1649, Josef Furtenbach published a book in which he made a plea for the construction of healthful schoolhouses, and pointed out that schoolrooms should be cheerful and airy, and that each child should have a liberal allowance of floor space. It was a long time, however, before these good rules were put into practice.

As the education of the common people began to spread, its far reaching influence was recognized. Various nations saw therein their chief element of strength, the stability of their governments, and power to compete with one another. Governments took an increasing interest in public education, and at the beginning of this century all civilized countries had active laws for the care and fostering of educational systems.

SANITARY LAWS

The better knowledge of hygiene and its recognized importance have also brought about the enactment of laws relative to the proper hygienic construction of school buildings. In this country, particularly in the Eastern states, — foremost the state of Massachusetts, — these laws embody much of the present advanced knowledge of school architecture and sanitary science. In Massachusetts public attention was early drawn to the importance of this subject by the writings of Horace Mann, who, in 1837, said that not one-third of the schoolhouses of that state were fit for habitation. The following year his report as Secretary of the Board of Education discussed at length the subject of better schoolhouses, and their heating and ventilation.

While in a few of the Middle and Western states there are not as yet particular laws defining the construction of schoolhouses, much is included in the general building laws of these states, which the authorities enforce for the safety of the children, and with the power given to vigilant state Boards of Health much is done for proper sanitation.

In the Report of the Commissioner of Education for 1893–94 is a summary of the sanitary legislation affecting schools in the United States. From this report it appears that thirty-three states and territories had at that time enacted laws upon the subject, and in sixteen of the states provision is made for the inspection of schoolhouse plans or buildings by some higher authority than the local Board, and in the majority of the states are statutes, more or less specific, requiring proper sanitation. Since the publication of this report several states which had not previously passed laws upon this subject, have enacted them.

The last decade has brought about a greater willingness on the part of school authorities and taxpayers to consider these matters. This change of attitude has been due to several causes, among which may be enumerated the conclusions of the International Educational Congress held in 1880, the reports of the sessions of the International Congress of Hygiene, and the collection of statistics showing the death-rate of children of school age in American cities as compared with European cities. These statistics showed that the death-rate among school children in America is higher than in Europe, presumably for the reason that hitherto we have paid less attention to the proper hygienic construction of school buildings.

THE FINANCIAL PROBLEM

Owing to the rapid growth of population and to the enforcement of the truancy laws, there has been such rapid increase in the number of pupils for whom accommodations must be provided, that, although immense sums are annually spent for new buildings, nearly all communities, large and small, have within the last few years been unable to provide school room proportionate to this increase, and many expedients have been resorted to, — such as half-day sessions and the renting of vacant rooms.

Naturally, where school authorities have had to face the problem of inadequate accommodations, they have not always had the financial resources or the freedom of choice necessary to secure the most desirable form and arrangement of school buildings. Yet, in the majority of instances, the new buildings have been in every way superior to those that were built a few years ago.

The public school system has risen to be the most important department of our government, and the number of people connected with it and the sums of money which are expended are enormous. For the school year 1896–97 the expenditure for public schools was $187,320,602. For several years the number of new school buildings erected has been nearly 6000 per year, and the annual increase in the value of school property has been nearly $14,000,000.

It is interesting to note, for example, what is done by a single great city, such as New York. The budget for schools for 1897 was about $6,000,000, and the appropriation for schoolhouses for the same year was $10,000,000, beside $2,500,000 for the erection of four new high school buildings.

The city of Chicago has recently purchased sites for the erection of thirteen new school buildings. The president of the School Board states that these buildings, which will cost $4,000,000, will do little more than care for the annual increase in population.

In smaller towns public education forms relatively an equally important factor, as is shown by the fact that the town of Anderson, Indiana, — with a population of 20,000, — annually erects one building, containing from eight to ten schoolrooms.

CONSTRUCTION REQUIREMENTS

The schoolhouse should be built substantially, of enduring materials, and with the best workmanship. The first outlay for the cost of any building erected in this manner is but a small per cent above one erected with cheaper materials and poor workmanship. The difference in the first cost is more than saved in a few years by reduced cost of repairs; this is particularly true of the schoolhouse by reason of the severe wear and tear to which it is subject by the nature of its usage.

All schoolhouses should be built of brick. Frame houses are first of all a great source of danger from fire. The walls being thinner and more porous, the temperature of the room is more subject to changes of heat and cold; the economy of fuel in cold weather on this score forms quite an item. The necessity of repeatedly painting a frame building forms a continuous source of expense and annoyance. A brick schoolhouse should not only have its exterior walls of brick, but all the main interior partition walls, and the walls inclosing stairways, should be of the same material. The expedient of cheapening the building by making interior walls of frame is too often resorted to, with the result that by reason of shrinkage of the interior frame walls and the stability of the outside brick walls, the plastering of walls and ceilings becomes badly cracked and floors are thrown out of level, and in case of fire it may spread so rapidly as to endanger the lives of the children.

The floors of the schoolroom should be stiff and sound-proof. Where the floor is constructed with a single span of joists, 25 feet or more in length, it is likely to have considerable vibration unless the joists are heavy and closely laid. This continuous vibration in the course of time will deteriorate the plastering on the ceiling and cause it to fall, to the great danger of the occupants. Many architects now remedy this by laying across the room one or two steel beams upon which the wooden joists rest, thus diminishing the span. All floors should be sound-proofed, which is best done with mortar deafening between the joists. Where economy forms an object, double flooring may be used with a heavy layer of building paper between the upper and under flooring. This is not as good as mortar deafening, but is much cheaper and still very effective. The upper or finished floor for schoolrooms should be hard wood, preferably oak. This should also be used in the corridors, if it is not possible to make these floors of tile. The basement floor should be cement or asphalt.

Even where the attic is not used it should be floored over with common boards. This will admit of using the attic for storage, and will also help to keep the rooms warmer in winter and cooler in summer. The cost is not very great and in a few years will pay for itself in economy of fuel. Where there is no such flooring, the ceiling will become very much chilled and will materially interfere with the working of the heating and ventilating system in rooms so exposed.

All the interior walls should be plastered with good common mortar, except a dado to the height of about four feet, which should be made of cement mortar to withstand the rough usage to which the walls to this height are subjected. This cement mortar dado should be in all schoolrooms and corridors, and along stairways. In many modern schoolhouses this dado is made of glazed brick, which is of course still better, being more sanitary and more durable. The great expense of such work, however, will bar its general adoption. Wood wainscoting should not be used for sanitary reasons; it has been found in many cases to form a home for vermin. Where a mortar dado is used, it should be painted with oil paint.

The interior finish should be hardwood reduced to a minimum in size, and with few and plain moldings; large and projecting moldings, which are inaccessible and may catch dust, should be avoided. It is still better to avoid wood finish around windows and doors altogether, and simply finish around these with hard plastering with rounded corners. In many of the later schoolhouses this is now adopted. In this regard the principles and usage applied to the treatment of hospitals also hold good for the schoolroom. The base should be as low as possible, and should finish against the floor with a cove, as shown by the accompanying sketch (Fig. 1); this admits of easy sweep-

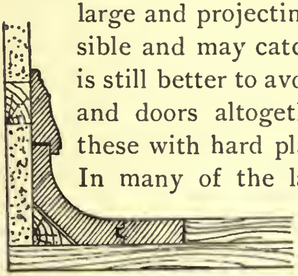


Fig. 1. — Cove Base Molding.

ing and avoids accumulation of dirt in the angles. This style of base is used in the Boston school buildings throughout.

The windows should be constructed with great care, filling in behind the frames with mortar, and where the wood sills join the stone sills it is well to insert a small steel strip, as shown by accompanying sketch (Fig. 2). The mortar and the steel strip will check draughts. On the exposed sides of the building it is well to provide double sash as described in Chapter III, under heating.

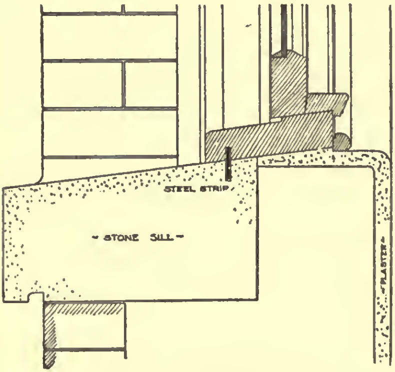


FIG. 2.—WINDOW SILL.

PROTECTION FROM FIRE

The causes of fire in schoolhouses are many; one of the most common causes is to be found in the furnace room. Investigation of such fires has generally revealed the fact, however, that the furnaces have been cheaply and faultily installed. In many cases the basement was not deep enough properly to receive the furnaces and the hot air pipes, the top of the furnace being jammed close to the wood ceiling-joists; sometimes the ceiling of the basement and furnace room was not even plastered, the wood being directly exposed. Where the building is reasonably well built and the heating plant properly installed, there should be little danger from this source.

Schoolhouses which are not more than two stories high, containing from eight to twelve rooms, and built with brick partition walls with sufficient stairways and exits, but with wooden floor and roof construction of sufficient strength, seem to be reasonably safe for children to occupy. There are few cases on record where the spread of fire in such buildings was so rapid that the children could not be removed with safety.

In a large number of schoolhouses, apparatus such as stand pipes, fire pails, and fire extinguishers, is provided to fight fires, but experience has shown that not much reliance should be placed on this. In many schools it is customary to have so-called fire drills, for the orderly dismissal of the children in case of such an event, and there are instances on record where these have been effectually executed in actual need. More effective than these fire drills and other precautionary measures, however, is the sense of security among teachers and children, which will tend to avoid such panics as often happen with disastrous results, even where there is no need for alarm. It would be well therefore to build at least all stairways fireproof and enclosed in brick walls.

In schoolhouses that are three stories or more in height, all stairways should be fire-proof, well enclosed, and if possible all corridors should be of fire-proof construction. This method is now being generally adopted, and should not add much to the per cent of cost of an otherwise well-built building. The revised building laws of Boston require that all schoolhouses built in that city must be entirely of fire-proof construction. In Indiana, according to the new law, all schoolhouses of three stories or more must be provided with fire escapes.

THE EXTERIOR DESIGN

The exterior of a schoolhouse should possess merit and artistic excellence in architecture, should be beautiful and dignified in design, and express the purpose for which it is used. Artistic results can be achieved by a skillful designer, through good proportion and careful disposition of masses. An artistic, beautiful, and well-balanced design does not necessarily increase the cost of a building. All architectural and decorative forms about the schoolhouse should be refined; it costs no more, nor does it take more material, to execute beautiful forms than ugly forms. The schoolhouse should possess all the characteristics described, and should exert an elevating and educational influence.

The most prominent feature and determining factor in the appearance of a schoolhouse is the quality and color of the material chosen for the exterior walls. Entire outside walls built of stone give the building a substantial and monumental appearance, but stone is seldom employed on account of expense. Next to stone, both in cost and appearance, comes pressed brick. Wall surfaces of pressed brick, when laid up in colored mortar to match the brick, have much the same quality of uniformity as those of stone. The great advantage of pressed brick over common brick is the possibility of choice in color. A building of plain gray or buff

ENTRANCE TO
PUBLIC SCHOOL No. 10,
INDIANAPOLIS, INDIANA.

PLATE II.

ENTRANCE TO
PUBLIC SCHOOL No. 45,
INDIANAPOLIS, INDIANA.

Vonnegut and Bohn, Architects,
Indianapolis.

THE INTERIOR DESIGN

The planning of schoolhouses is based, first of all, on the unit of all schoolhouses, that is, the schoolroom. One of the chief determining factors in designing such buildings is the size of the room, which is established by the maximum number of pupils to be seated in it. Experience and careful consideration of the usefulness of instruction, the control of discipline, and sanitary reasons, have led to the general acceptance of not more than 45 pupils as the best number for each schoolroom. A good size and proportion of a room for 45 pupils is : width, 24 or 25 feet, length, 31 feet. The story height should be from 13 to 14 feet. These dimensions will give the number of square feet of floor space and cubic feet of air space required by hygienic laws and described more fully in Chapter III.

The doors of a schoolroom should swing outward. It is well to put a large transom over the door for the purpose of ventilation. Every well-arranged schoolroom should be provided with a cabinet or closet for placing books and the utensils used for school work. These cabinets are often arranged to be placed in the wall, but in such instances they must often of necessity be so shallow as to be of little use, and generally cut into valuable blackboard space. Plate III shows a cabinet built separately and set at the rear wall, where it also forms an ornament to the room.

Next in importance to the schoolroom are the corridors, stairways, and entrances, and the proper size and arrangement of these form an important factor in promoting discipline and in caring for the safety of the

PLATE III.—AN ATTRACTIVE SCHOOL CABINET.

Such a cabinet is the place for illustrative material when not in use. It should be the local museum of fine and applied art.

occupants. The entrances, vestibules, and corridors should be of liberal dimensions; the latter should have an abundance of light and be cheerful in aspect; it is also desirable to give to them such decorative features and large proportions that they may express the noble purpose for which the school building stands. The vestibules and corridors, by reason of their dimensions and light, form a good architectural frame for the hanging of pictures and the disposition of casts where they can often be shown to better advantage than in the rooms; provision for these should be made in the original design. Where corridors are long, they should not be less than 10 or 12 feet wide, and all corridors should have direct light.

Every entrance should be provided with a vestibule to which there should be, besides the outside doors, a set of inner storm doors which will prevent the direct cold coming into the corridors and keep them free from draughts. All of these doors should swing outward.

When possible, the staircases should be built of iron throughout, having the treads either roughed or fitted with some of the recently invented lead and steel treads. The risers for the staircase in a schoolhouse should not be more than 7 inches high, and the treads not less than 11 inches wide. A good proportion is 6 inches rise and 12 inches tread. The balusters and rails, where these are used, should be constructed strongly and put up firmly, so that they may not give way during a panic. Many schoolhouse architects lay great stress on isolating the stairs as much as possible, and advocate box stairs enclosed with brick walls. Such stairways, however, do not present a good appearance, and rob the architect of one of his best opportunities to develop such an attractive architectural feature as a grand and open staircase. Where there are sufficient stairways, and the building is not more than two or three stories high, it would seem safe to build the open staircase. Every staircase should have a landing for each story. Winding stairways should not be used anywhere.

The cloakroom or wardrobe is a necessary adjunct to the schoolroom. There are at present three or four methods in common use for the reception of the clothing. One is the cloakroom adjoining the schoolroom, with a door leading from the schoolroom to the cloakroom, and a door leading from the latter to the corridor. This method adds considerable to the area and cost of the building. In primary schools it has many advantages and should be used. For higher grade schools the garments are all concentrated in one or more rooms, usually situated in the basement. In such instances many of these cloakrooms are provided with individual lockers, with key or combination locks. This latter plan is expensive and complicated in its working.

Another plan, and one which is considerably used in the East, is the ventilated wardrobe arranged in the corridor along the outside of the schoolroom wall. These wardrobes are heated and ventilated with the main halls, thus saving considerable expense. They are easily accessible and enable the designer to cut down the total area of the building considerably, and otherwise facilitate the planning.

The toilet rooms should be conveniently located.

PLATE IV.—STAIRWAY LANDING.

PLATE IV.—ASSEMBLY HALL.

Usually they are placed in the basement, where water and sewerage systems are to be had. Where it is necessary to separate the toilet rooms from the main building, they should be connected with it by closed passageways, so as not to expose the children to the inclemency of the weather.

The methods of furnishing the toilet rooms and the styles of fixtures to be used are described fully under Chapter IV.

In addition to the requirements of a schoolhouse described above, the following rooms and provisions are desirable, and are now usually incorporated in new buildings: —

Principal's office,
Teachers' retiring room,
Recitation rooms,
Assembly hall,
Store rooms,
Lunch rooms,
Bicycle rooms,
Rooms for manual training.

SPECIAL PROBLEMS

One, Two, Four, and Eight-room Buildings.

The number of one-room or district school buildings being erected, and the aggregate amount of money invested in them, is relatively large, particularly in the more thinly populated Middle and Western states, where they form and will form for the near future, at least, an important part of our schoolhouse architecture. The great wave of agitation going over our country for the erection of better schoolhouses, demanding that there be incorporated into these buildings our modern and enlightened ideals, applies with particular force to the little one-room district schoolhouse. If it is true that the good architectural design of the schoolhouse, with its thoughtfully developed plan and cheerful interior, should contribute its share of elevating influence to the child, and be the source of a pleasant reminiscence in after life, then this is even more necessary in a small community where other outside refining influences and opportunities are less numerous than in the larger towns and cities.

There is no good reason why the lighting of the schoolroom in a one-room building should not receive the same careful study as that of the rooms in a larger building, nor is there any reason why the air in a one-room building should not be just as pure as that of the rooms of larger buildings. These features of the schoolhouse are not elements of cost, or at least not to the extent that is often assumed; where these requirements have not been fulfilled, it is usually found to be due to a lack of knowledge of their importance, or to a want of care and conscientious performance of duty by those in charge.

It often seems to the community in a country district that it requires no effort or sacrifice on the part of the city or town to erect a school building that meets all modern requirements and has an air of elegance. If one considers, however, that the city or town has not one, but many buildings to erect, it becomes clear that the burden is relatively quite as heavy in the towns and cities as in the country districts. It is true, however, that the comparative cost of the one-room building is greater than that of a many-room building; but the total cost of the one-room building is always within reasonable limits, and a building once erected will serve for many years.

The brilliant examples cited in foregoing chapters of what is being done, should incite in every community the desire to provide for every new schoolhouse, at least, those features which are now generally regarded as necessary for the welfare of the children.

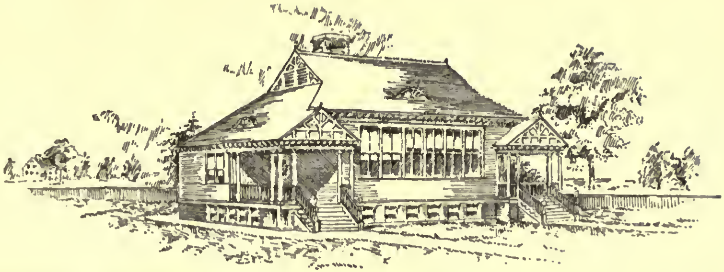
The obstacles in reaching a good final result for the one-room schoolhouse are numerous. One of the chief difficulties is probably the fact that, because the greater constructional features which enter into the planning of larger buildings do not arise here, it seems to the minds of many that the services of a trained architect are not required, and the erection of the little schoolhouse is often left to the neighboring village builder who has never had time or opportunity for the development of taste, and who consequently does not appreciate the value of it, and whose attention has never been called to the scientific principles of schoolhouse architecture. The one-room schoolhouse probably shares that same indifference which is usually the lot of the smaller things in this world. In the one-room schoolhouse there are problems quite its own, not common to larger buildings, the proper solution of which is worthy of the best efforts of a trained architect, particularly versed in schoolhouse architecture.

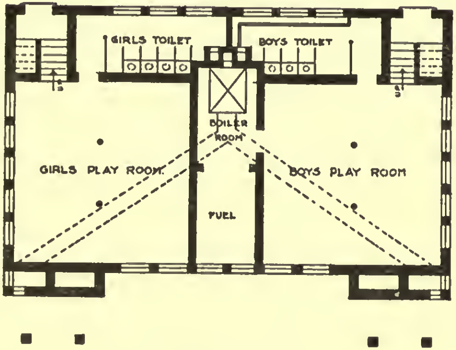
The difficulty in the way of finding such talent conveniently in the remote school districts, and the element of expense which such work entails, have led the school authorities of the state of New York to develop with great care a normal plan of a one-room school building, which was put in such form to be conveniently sent to the various school districts of the state that desire to avail themselves of it. These plans have been largely used and have been the means of the erection of better and improved schoolhouses. In other cases they stimulated to still better efforts, and many communities had plans prepared to meet their particular needs.

Well-prepared plans can be used to better advantage for a one-room building than for a building of any other size, for they are suited to almost any size and shape of ground, and in the great majority of cases they can be readily adapted to the points of the compass for which they are intended.

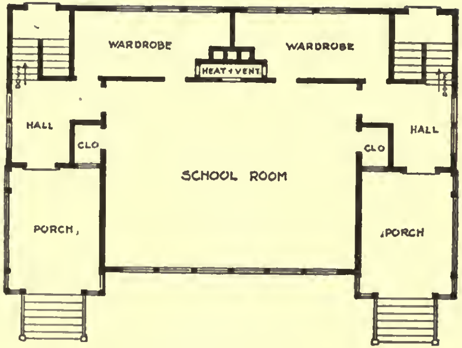
There is probably a greater tendency to build the one-room schoolhouses of frame than to use this material for the larger buildings. The reasons for this are: first, that this material is better adapted for use in small buildings; further, in the outlying districts lumber is more readily to be had than brick or stone; and the mistaken idea of larger economy also has its influence. Among the district schoolhouses recently erected, there is a greater percentage of substantial brick buildings than formerly, and with the rise in cost of lumber, by reason of its greater scarcity, it is to be hoped that brick district-school buildings will become general.

The schoolroom of the one-room building is usually larger than that in larger buildings, it being customary, and often necessary, to put a larger number of children in the room of the district school. From fifty to sixty children are sometimes compelled to attend the ungraded school, the latter number however being unusual.





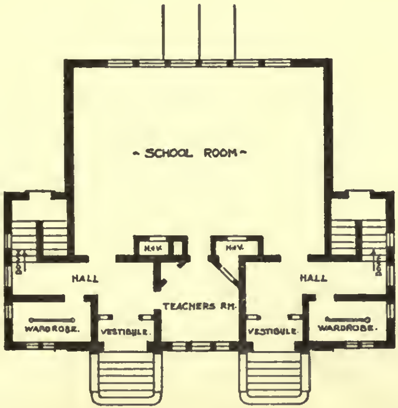
BASEMENT PLAN.



FIRST FLOOR PLAN.

PLATE V.—ONE-ROOM BUILDING.

Warren R. Briggs, Architect,
Bridgeport, Conn.



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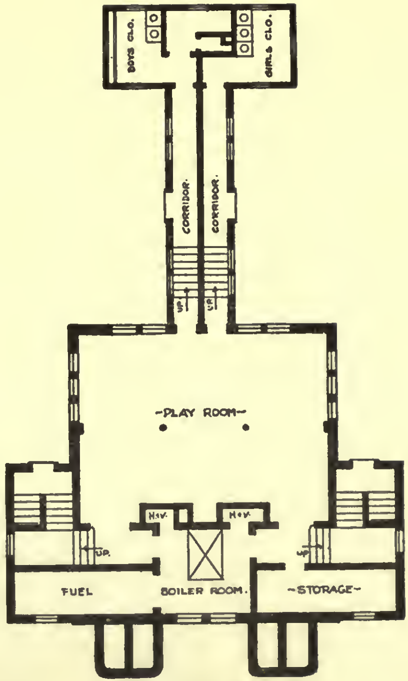


BASEMENT PLAN.

PLATE VI.—ONE-ROOM SCHOOL BUILDING.

Warren R. Briggs, Architect,
Bridgeport, Conn.

In the one-room building it is possible to obtain light from both sides, and in some plans from three sides; but the light should be chiefly from one side — the left; other light should be from the rear. Windows opposite those along the side of chief light should be small and placed above the blackboards; they should serve for the purpose of ventilation and for the entrance of some rays of sunlight if the house is so situated as to have the main source of light from the north. If windows are placed in the rear wall, these should be so arranged as not to be objectionable to the teacher, who will have to face them a considerable portion of the day.

In many of the more recent plans, particularly in the East, there has been a tendency to attach the toilet rooms to the main building. While this has many advantages as to convenience, especially in inclement weather, it is quite offset where there is no sewerage by the very objectionable feature of having the toilets so near; and where the most thorough ventilation cannot be provided this becomes a serious consideration, especially in warm weather.

Every one-room building should have a vestibule with doors from the outside and doors from the vestibule to the schoolroom, to avoid cold draughts into the latter. The vestibule should be as large and spacious as possible, and where a furnace is used it should have a small register to moderate the severe cold.

The plans shown on Plate V, taken from the book on schoolhouse architecture and designed by Mr. Warren R. Briggs, of Bridgeport, Conn., show the toilet rooms in the basement. In this case, however, they are arranged with water and sewerage, that is, they are connected with a catch basin in a remote part of the lot. The water supply is pumped into a tank by means of a windmill. While this is expensive, it is no doubt the proper solution of this vexed question for the schoolhouse in remote places where neither water nor sewerage is to be had.

The design on Plate VI shows a one-room schoolhouse with the closets detached, but connected with covered passageways. The arrangement for water supply and sewerage is the same as in the first case; this building is likewise the work of Mr. Briggs. These plans otherwise have much merit, and embody some requirements not considered absolutely necessary, but which should be more generally adopted. Where the funds do not permit the installation and cost of maintenance of the toilet system as here described, a dry-closet system could be used to advantage, described in Chapter IV.

Plate VII shows the elevation, of a one-room schoolhouse in Center Township, Porter County, Indiana. This is considered the most expensive one-room school building in the state of Indiana, and is said to have cost $5000. It is the pride of the community of Center Township, and many come from the surrounding country to inspect the building. The schoolroom is 34 by 36 feet, with a seating capacity for sixty-four pupils. It is provided with an organ. There is an entrance hall, a teacher's room, a cloakroom, and a playroom in the basement, — where there is also a well. Part of the basement is divided off for the heating plant. The lighting of the room is equal from both sides, which is not to be recommended. The building is a story and a half, with a room for district meetings on the second

PLATE VII.—ONE-ROOM SCHOOL BUILDING, CENTER TOWNSHIP, PORTER COUNTY, INDIANA.

floor. The belfry has been made more conspicuous here than usual, by developing it into a full tower.

Plate VIII shows an arrangement which has been suggested as particularly adapted for the work in the district school. In this room the teacher sits at the rear, with the scholars facing away from her. The recitation benches are at the back of the room and face the teacher. With this arrangement the teacher has a better opportunity of overseeing the class, and when recitations are going on the pupils who recite do not much disturb those who are studying. The teacher is not annoyed by looking into the glaring light of the windows, which in this case are on either side.

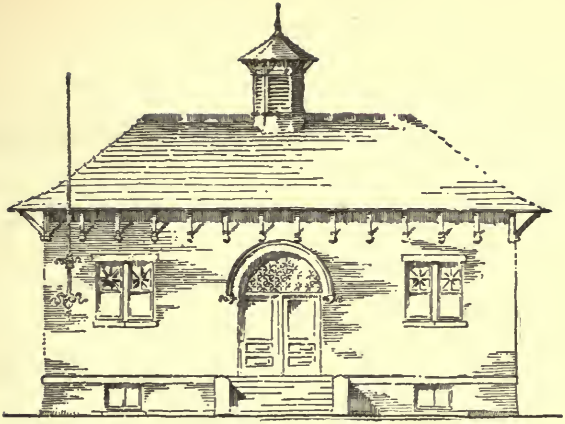
In these small buildings the schoolroom should be arranged with the same care as in other buildings for the hanging of pictures and casts, of which good examples can now be provided at a relatively low cost.

The exterior of a small brick building, which would generally be built of common brick on account of expense, should be laid up in red mortar, which lets the wall appear in solid masses, giving a more quiet appearance than where ordinary white mortar is used. The deep red brick walls generally contrast well with green surroundings. If the roof is of shingles, they should be painted — a shade of green will give the whole a picturesque and pleasing appearance.

In the district schools of Indiana, the school bell is still generally retained, although in the city and town schools the bell is a feature of the past. For the district school the bell has its purpose. The belfry on a one-room building offers opportunity for a good architectural feature, helps much to enliven the sky lines of the roof, and is the means of adding height to the low building. The belfry has come to be such an accepted feature of the one-room building that it is a distinguishing mark to interpret to the stranger the purpose of the building.

Plate IX shows the basement and first story of a two-room building. This building is in one of the suburbs of Boston and was designed by Mr. Edmund M. Wheelwright, city architect of Boston at the time. In the basement are located the toilet rooms and play-rooms, with separate stairways for boys and girls. There are separate wardrobes for boys and girls for each room. This schoolhouse shows a liberal arrangement in planning, and is a model building of this character. The exterior is treated in colonial style. The dry-closet system was adopted, since there was no sewer available. The heating is by steam with indirect radiation.

Plate X shows the first and second story plan of a four-room building. One advantage of this plan is that all four rooms are turned toward the same point of the compass, thus making possible a uniform arrangement of light and heating. This building has one large stairway, which is safe and ample for the ninety children on the second floor. The entrance is through a spacious vestibule, the floor of which is only six inches, or one step, above the outside walk. The steps leading up to the level of the first floor are inside the building, where they should be for every schoolhouse, since outside steps become covered with snow and ice in winter and are a source of danger. Separate stairs for boys and girls lead from the vestibule down to the basement,



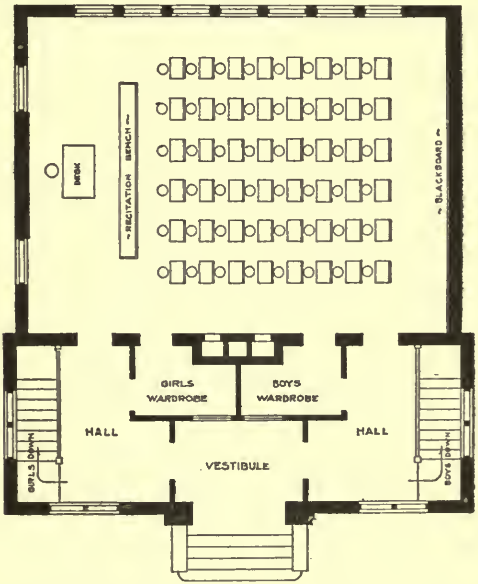
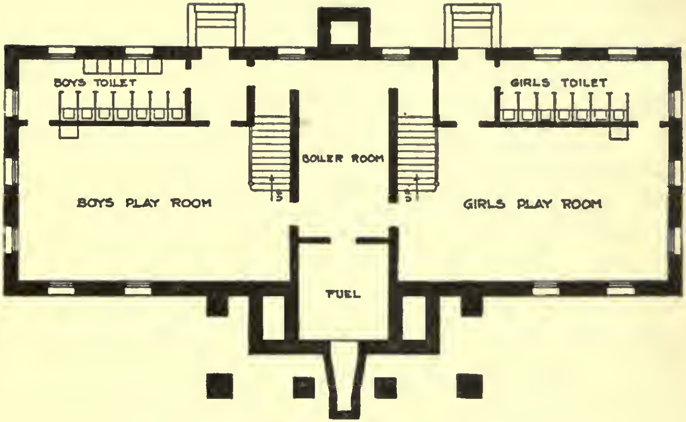


PLATE VIII.—ONE-ROOM BUILDING.

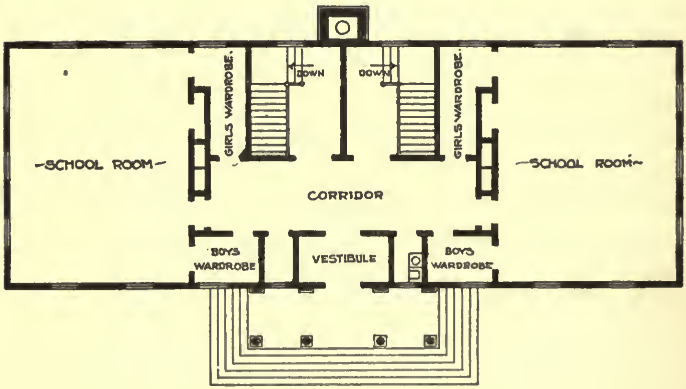
FRONT ELEVATION AND FIRST FLOOR PLAN.

(Teacher behind pupils.)

Vonnegut and Bohn, Architects,
Indianapolis, Indiana.



BASEMENT PLAN.



FIRST FLOOR PLAN.

PLATE IX.—TWO-ROOM SCHOOL BUILDING.

Edmund M. Wheelwright, Architect,
Boston.

where the play and toilet rooms are located. Opposite the main entrance is a passage which leads out to the playground. The steps leading to the level of the yard are likewise inside the building, and this entrance is also provided with a double set of doors to prevent draughts. The cloakrooms are large, conveniently located, and have direct outside light. The corridors are large and airy, with an abundance of light. On the second floor a teacher's room occupies the space which is used on the lower floor for a passage to the rear.

The cost of this building, executed in brick, with interior brick partition walls, slate roof, basement under the whole building, heating and ventilation by means of large, hot-air furnaces, flooring deafened, and of good and safe construction, is about $12,000.

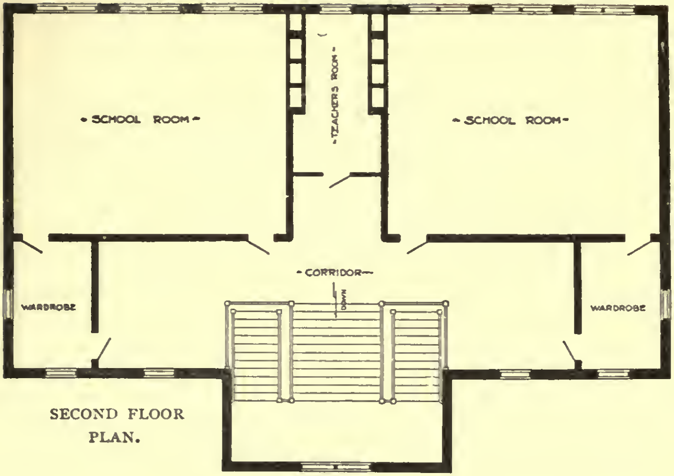
Plate XI shows the first and second story plan of an eight-room building, with assembly hall on the second floor. Plate XII shows the exterior of this building, with the assembly hall well expressed in the central part.

The entrance is large, leading to a spacious vestibule with a double set of doors and steps entirely inside of building, leading from the level of the outside walk to the first floor. The exit to the playground is toward the rear, under the main stairway, separated for boys and girls. From the rear vestibule separate stairs for boys and girls lead down to the toilet rooms in the basement.

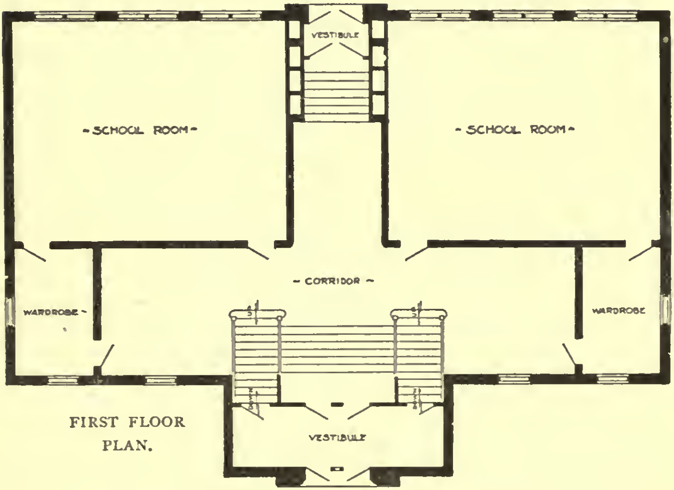
On the first floor, located near the entrance, are the principal's office and teachers' retiring room, besides storerooms and cloakrooms. The basement has two direct exits into playgrounds, and these are also used as bicycle runs to bicycle rooms in basement.

There are four schoolrooms on the first floor and four on the second floor. These receive their light chiefly from one side, through large windows which come within six inches of the ceiling. The base around the rooms and corridors is cove-shaped, as shown in the illustration on page 15. There is no finish around the doors or windows. The angles formed by walls and ceilings are occupied by coves with about six inches radius, thus avoiding an accumulation of dust and aiding in the free movement of air. The dados throughout are of cement plastering covered with oil paint. One grand stairway leads from the first to the second floor. This stairway is altogether 28 feet wide, formed of one wide middle run and two side runs. The platform is large with room for flowers, as shown in Plate IV. From this platform a door leads directly out to a good fire-escape. The entire stairway is constructed of iron.

The main feature of the second floor is the assembly hall shown on Plate IV. This assembly hall is large enough to seat all children attending the school. The building is heated with direct-indirect steam heating for schoolrooms, and direct steam for other parts of the building. In the assembly hall a steam pipe runs along the full length of the hall, and serves as a foot warmer. The exterior of the building is laid up in common brick richly trimmed with cut stone work. The total cost was $26,000.



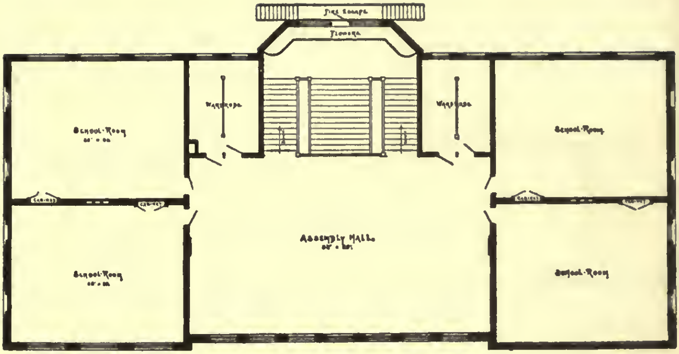
SECOND FLOOR
PLAN.



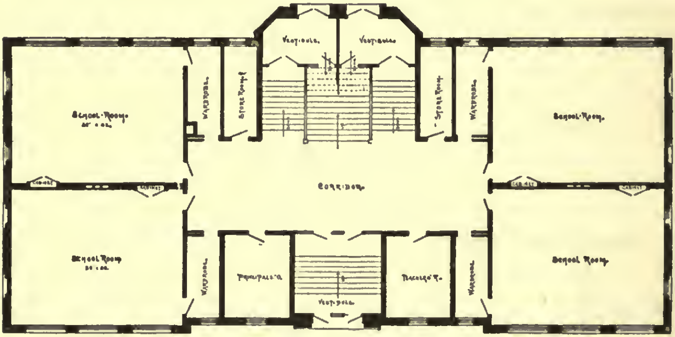
FIRST FLOOR
PLAN.

PLATE X.—FOUR-ROOM SCHOOL BUILDING.

Vonnegut and Bohn, Architects,
Indianapolis.



SECOND FLOOR PLAN.



FIRST FLOOR PLAN.

PLATE XI.—EIGHT-ROOM SCHOOL BUILDING, WITH ASSEMBLY HALL.

Vonnegut and Bohn, Architects,
Indianapolis.

CHAPTER III

PRINCIPLES OF VENTILATING, HEATING, AND LIGHTING

Sir Edwin Chadwick did not exaggerate when he said that good ventilation, heating, and lighting of a schoolroom will augment the capacity of attention of the pupils by at least one-fifth as compared with that of the children taught in schoolrooms of common construction. In order to ventilate a schoolroom properly, it is necessary to remove quickly the air vitiated by respiration, and to replace it with fresh air. This must be done without producing perceptible draughts. The oxygen obtained from the air is absolutely essential for the continuance of all forms of animal life, school children not excepted.

Expired air contains about four per cent of carbonic acid gas, besides having its volume of oxygen diminished by about the same amount. Furthermore, this expired air has become considerably warmer, and has acquired a large quantity of water vapor from the lungs and air passages. Carbonic acid gas is unsuitable for the support of healthy respiration. It will not support combustion, as is shown by plunging a lighted taper into it. Animal life is almost as suddenly extinguished when placed in an atmosphere of it. Mixtures of this gas, with the common air in different proportions, give rise to various symptoms that indicate incomplete oxidation of the blood, and in some cases cause slow death. However, the carbonic acid gas that occurs in the expired air from man or animals seems to be far different in its effects from the carbonic acid gas derived from purely chemical sources. Carbonic acid gas is in itself odorless, and yet when we enter a crowded and poorly ventilated schoolroom we can always detect a very disagreeable odor. This is caused by a volatile, organic matter, which comes off from the body in the process of respiration, and which is the most vicious constituent of expired air. It is invisible and is very difficult to measure or analyze even by the most delicate chemical methods. It is this which we notice when we enter a close room, and being organic matter, it is subject to putrefaction. While it takes a large quantity of carbonic acid gas to become injurious, a very small quantity of this organic poison may do much harm. It is possible, however, to measure the carbonic acid quite accurately. And as the organic matter increases in direct proportion with the carbonic acid, we can use the measure of the carbonic acid as the indicator of the amount of the poisonous material. In other words, we make our tests for this organic matter by measuring accurately the percentage of carbonic acid. It is an important fact for us to bear in mind that carbonic acid gas, as it comes from combustion or respiration, always appears in bad company. If, for example, it is the result of the combustion of coal, it is usually accompanied by sulphurous acid, a poisonous gas; and if it is the result of respiration, it is always accompanied by these minute quantities of volatile, organic poisons.

PLATE XII.—EIGHT-ROOM SCHOOL BUILDING, WITH ASSEMBLY HALL.

Vonnegut and Bohn, Architects,
Indianapolis.

PLATE XIII. — WHITINSVILLE HIGH SCHOOL BUILDING AND GROUNDS.

"Each the other adorning."

Hartwell, Richardson & Driver,
Architects, Boston.

As Dr. Ransome says: "The aqueous vapor arising from the breath and from the general surface of the body contains a minute proportion of the animal refuse matter which has been proved by actual experiment to be deadly poison. It is this substance which gives the peculiar, close, unpleasant smell which is perceived on leaving the fresh air and entering a confined space occupied by human beings and other animals, and air thus charged has been fully proved to be the great cause of scrofulous or tubercular diseases, and it is the home and nourisher of these subtile microscopic forms of life that have lately become so well known under the title of germs of disease or microzymes."

EFFECTS OF BAD AIR

There are several things about expired air that directly affect the human organism. Expired air has less oxygen, contains considerable carbonic acid gas, together with minute quantities of poisonous organic matter; it has a large amount of watery vapor and is warmer. That these factors have evil effects, especially when they are in a concentrated condition, has been unhappily proved in certain well-known instances. In the Black Hole at Calcutta, 146 persons were confined in a space 18 feet each way, with two small windows on one side. On the next morning 123 were found dead, and the remaining 23 were very ill.

It must not be supposed, however, that no ill results follow a comparatively small degree of pollution, because these results are not immediately apparent. A general lowering of strength and vigor is produced, and a greater proneness to fall victim to respiratory and other diseases. The drowsiness and languor so frequently noticeable in school children are to the intelligent teacher, not an indication of wilful inattention, but of the need of purer air. Yawning, again, is a cry of the nervous system for purer blood, *i.e.*, for blood containing more oxygen and less effete matter.

It is in the highest degree unfair to expect the brains of children to be active in the exercise of their functions, while they are provided with blood which is vitiated by respiratory impurities, and are thus kept in a species of mental fog.

TESTS FOR BAD AIR

It is not necessary to go through a careful chemical analysis to ascertain the amount of impurities in schoolroom air. It is accepted among sanitarians that the maximum amount of carbonic acid gas permissible is .07 per cent. This does not mean that the carbonic acid gas is the dangerous thing, but that amount of carbonic acid gas indicates the greatest amount of organic impurity consistent with the preservation of health. There is no simple test for the organic impurities in air, which are really more important, because more pernicious than the carbonic acid; but inasmuch as the carbonic acid is nearly always in exact proportion to the organic matter, the test for the former answers equally well for the latter.

This test, combined with the sense of smell on coming directly from the external air, gives most reliable indications which should never be neglected.

A simple and rapid method for estimating the amount of carbonic acid in the air is described as follows by Dr. J. B. Cohen:[1] —

(1) A standard solution of limewater. Pure water is left in contact with slacked lime until saturated. The clear decanted liquid is diluted with 99 times its own volume of distilled water. Make one quart or one liter.

(2) Phenolphthalein solution is made by dissolving one part of phenolphthalein in 500 times its weight of diluted alcohol (equal volumes of pure alcohol and water). Make three ounces or 100 cubic centimeters.

(3) A twenty-ounce stoppered bottle with (preferably) a hollow stopper marked to hold three drams or ten cubic centimeters.

A sample of air is taken by blowing air into the clean stoppered bottle with bellows. Six minims or one-third of a cubic centimeter of the phenolphthalein solution is then added, and the measured volume of limewater is run into the hollow stopper. The limewater is poured into the bottle, the stopper inserted, the time noted, and the contents vigorously shaken. If the red color of the liquid disappears in three minutes or less, the atmosphere is unfit for respiration.

The stock of limewater should be kept in a bottle furnished with a top and coated within with a film of paraffin, and in the neck an open tube should be inserted containing pieces of caustic soda or quicklime. The phenolphthalein solution is best measured by means of a narrow glass tube passing through the cork of the bottle upon which the measured volume is marked. If

[1] *Smithsonian Miscellaneous Collections,* Vol. XXXIX, Washington, 1896. Number 1073. Appendix.

the cork fits easily, the liquid may be forced up exactly to the mark by pushing in the cork.

The following are estimates made in this manner compared with the results obtained by Pettenkofer's method: —

Time. Minutes.	Per cent. Volume of Carbonic Acid.
$1\frac{1}{4}$	.1618
$1\frac{3}{8}$	.1379
$1\frac{1}{2}$	.1279
$3\frac{1}{4}$	.07716
$4\frac{1}{4}$	.05142
5	.0464
$7\frac{1}{2}$	.0351

This method may be used in the classroom at any time, but care should be taken to insure the cleanliness of the bottles and the purity of the standard solution. No bottles that have contained any acid or alkali should ever be used, unless the bottles have been thoroughly cleansed and rinsed.

In taking the sample of air with the bellows, it is well to have a rubber tube five or six feet long attached to the inlet opening on the bellows, thus guarding against vitiation of the air by the experimenter. The school children should not gather about the apparatus, as they might by their breathing interfere with the results. On the other hand, it is well to have them interested in the air test and as far as possible know what is being done; they should also be told the results.

VENTILATION REQUIREMENTS

It has been seen that for healthy respiration air should never contain more than .07 per cent carbonic acid. Some authorities, however, place this figure at .06 per cent. We will place our standard at the former figure. Ventilation, then, should have for its object the keeping of the amount of carbonic acid gas within this limit.

Each individual gives off in the process of respiration 316 cubic centimeters of carbonic acid gas per minute, so that it requires not less than 590 cubic meters of fresh air per hour to keep each individual supplied with air containing less than .07 per cent of carbonic acid gas. Parkes, an authority on hygiene, gives the following figures for the amount of fresh air that should be supplied to persons in health and repose: —

For adult males,	3500 cu. ft. per head per hour.
For adult females,	3000 cu. ft. per head per hour.
For children,	2000 cu. ft. per head per hour.
For mixed community,	3000 cu. ft. per head per hour.

In actual practice, in the ventilation of schools, 2000 cubic feet per hour is usually taken as the quantity of air that is practicable to furnish to pupils, and no plan or system of ventilation should aim at giving a smaller supply. No air should be considered too pure for school children. Each pupil should be provided with from 25 to 30 cubic feet of fresh air per minute, and this should be distributed without producing draughts, and having a temperature of not less than 60° nor more than 68° Fahr.

The following rules respecting ventilation are of importance: —

(1) The air should be drawn from a pure source.

(2) No draught or current should be perceptible. Often the remedy for a draught is not to close the opening, but to make others in order to increase the area through which the air enters.

(3) The entry of air should be constant, not at intervals.

(4) An abundant exit for impure air should be provided separate from the points of entrance of fresh air. In order to maintain a given standard of purity, it is necessary to provide for the removal of a volume of impure air equal to that of the pure air which is supplied. In order to satisfactorily fulfill all these requirements, it is necessary to understand fully the several systems of ventilation.

NATURAL VENTILATION

There are two natural agencies that are constantly assisting to bring about ventilation: the diffusion of gases, and the air currents formed by differences in temperature.

Diffusion, by which the purer outside gases tend to mix with the impure internal air, is constantly going on, though under ordinary circumstances the rate of diffusion is slow, and the amount of interchange thus effected is but small.

Differences in temperature cause much more active movements of air, warm air floating to the top of cold air, as oil floats to the top of water. The air in a room is warmed by the inmates and by the stove, gas, or other source of artificial heat. Cold air tends to rush in from every opening, and, being heavier than warm air, falls toward the floor, producing a draught. The great problem of ventilation is to secure a sufficient interchange of air without causing draughts. The entrance of air at any temperature below 50° into a room whose temperature is 65° or even 70° is almost certain to be accompanied by a draught; hence it is necessary to warm the entering air during the winter months.

If a free entrance for pure air is not provided, the influence of the higher temperature in the schoolroom may produce an aspiration of air from undesirable places. Thus it not uncommonly happens that air is drawn directly from underground cellars, defective drains, water-closet rooms, and so on.

For practical purposes there are two kinds of ventilation, natural and artificial. The former is produced by the ordinary interchange of air when doors and windows are allowed to remain open. The latter depends upon the assistance of the heating apparatus, or of some mechanical appliance for forcing the air into the rooms or of sucking it out from them. Natural ventilation is possible only during the warmer months. The colder the outside air, the more violent the draughts when it is admitted to the warm room. It is unsafe to rely on it for a supply of pure air when all doors, windows, and ventilators are closed. The diffusion of the outside air through the walls, cracks around doors and windows, etc., is insufficient to purify the air, and, if depended upon, will result in the foul atmosphere only too common to schoolrooms.

In order that natural ventilation may be more effectual, all corridors should be large and airy, and have windows opening direct to the outer air. No schoolroom plan which does not fulfill these conditions can be regarded as satisfactory.

In the methods of ventilation hitherto described, the air is admitted at the same temperature as the external air. Such methods have, however, but a limited application in the northern United States. During a large portion of the year, in order to prevent dangerous draughts, the incoming air requires warming.

When the external temperature reaches 60°, or better still 65°, the air may be freely admitted. Open windows are by far the best means of ventilation, and during the school recess all the windows should be thrown open, opposite windows if possible, or doors and windows, in order that the rooms may be thoroughly flushed with air. Ordinary ventilation commonly leaves a considerable proportion of organic volatile matter from respiration hanging about the room, while the rapid currents of air during the flushing of a room carry this away.

Natural ventilation, as a method of purifying schoolroom air, must be discarded entirely during the winter months.

ARTIFICIAL VENTILATION

Artificial or forced ventilation refers to those methods which employ some artificial means for moving air. Nearly all such systems depend upon one of two things: (1) the rarifying power of heat applied to air in flues, — the so-called gravity system, and (2) the mechanical power applied through the medium of fans. In the first method, the gravity system, the problem is to draw the cold bad air out of the rooms, and at the same time draw warm fresh air in. Warm air is lighter than cold and will always rise. Carbonic acid, at the temperature at which it is generated in the lungs, is considerably lighter than air, but as soon as it cools to the ordinary temperature, it becomes heavier and of course falls.

The object of this gravity system is to remove the cold bad air from the bottom of the room, leaving that which is fresh and warm. It is not a very difficult matter to create a strong current by heating air and allowing this heated air to pass up through a shaft or stack. If this stack is connected with the outlets for the bad air, the foul air will be withdrawn from the rooms by the force of the current, which tends to create a vacuum. The larger the number of outlets through which the air is being drawn out, the less chance there is for the creation of draughts along the floor of the room. Inlets for fresh air must be provided, and proper arrangements made for heating it, so that it will be circulated through all parts of the room at the proper temperature. It is readily seen that this fresh air does not have to be forced into the room through the inlets because the ventilating shaft tends to produce the vacuum in the room, and the fresh warm air will be sucked in to fill the vacuum. The action of the air currents in such a system is well shown in Fig. 3.

The warm air, if allowed to enter high in the wall of the room, makes a complete circuit of the room without creating much draught, and is sucked out through the outlet by means of the sucking action caused by the current of air in the ventilating shaft. While these currents may be slightly affected by natural ventilation through doors and windows, the variation will not interfere materially with the proper results being attained. The diagram provides, as can readily be seen, for both inlet and outlet on the same side of the room. Other locations for these openings have been advocated; for instance, the warm air inlet may be in the floor, and the

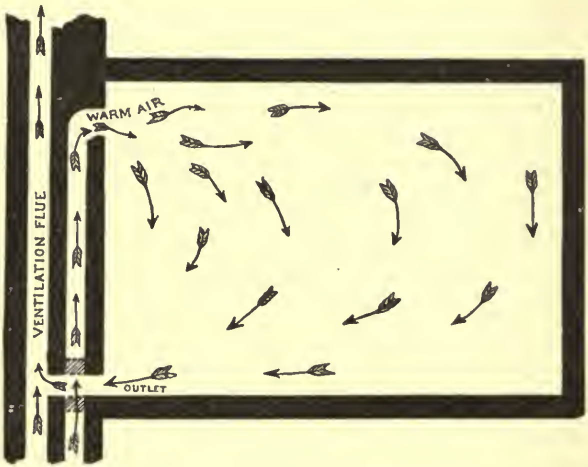


FIG. 3.—GRAVITY SYSTEM, WITH INLET AND OUTLET ON THE SAME SIDE OF THE ROOM.

vent on the opposite side of the room and near the floor. The result of such an arrangement is shown in Fig. 4 In this case the distribution of the warm air is not complete.

Still another arrangement is to have the warm air inlet on the floor at one side of the room, and the outlet high up on the other side. This gives still less distribution of the warm fresh air throughout the room, as is shown in Fig. 5.

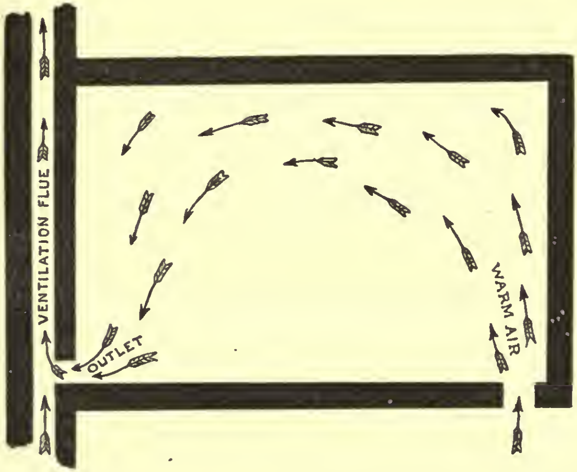


FIG. 4.—GRAVITY SYSTEM, WITH INLET AND OUTLET ON OPPOSITE SIDES AND NEAR THE FLOOR.

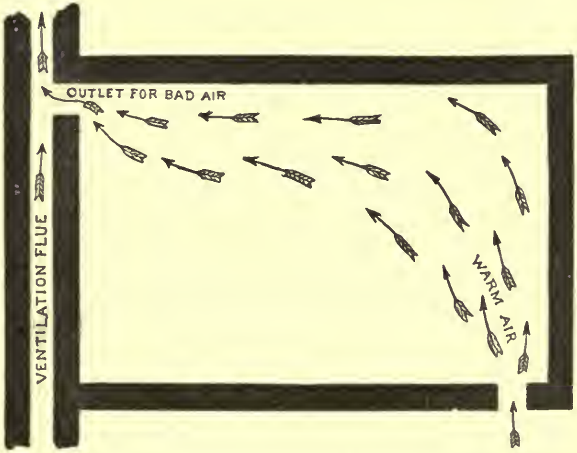


FIG. 5.—GRAVITY SYSTEM, WITH INLET NEAR THE FLOOR AND OUTLET NEAR THE CEILING ON THE OPPOSITE SIDE.

Methods have been tried introducing the warm air rather high up in the room, and withdrawing it from the opposite side near the floor. Figure 6 shows that the results are similar to the last arrangement. These last cases are bad enough, but there are others even worse. Figure 7 shows the inlet high and the outlet nearly opposite. Where this plan is adopted, any escape of

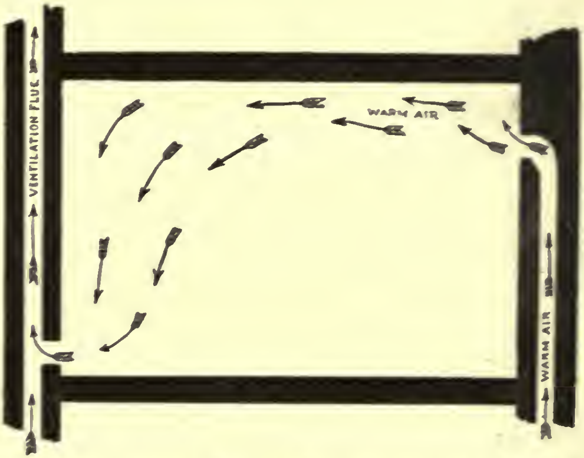


FIG. 6.—GRAVITY SYSTEM, WITH INLET HIGH AND OUTLET NEAR THE FLOOR ON THE OPPOSITE SIDE.

the vitiated cool air must be brought about through the natural ventilation of doors and windows, or by disturbance of the lower atmospheric stratum, by the occupants of the room. Careful experiments have been tried in glass rooms by ventilation experts, who have watched the course taken by the air currents under these different conditions, the currents being marked by smoke, and thus easily studied.

In practice, it is found advisable to have several outlets for the air rather than one, as is indicated in the diagrams. Thus there is less chance for the production of draughts, and a better circulation is afforded. These gravity systems usually arrange for a mixing valve, by means of which the temperature of the fresh air is regulated, it being possible by opening or closing the

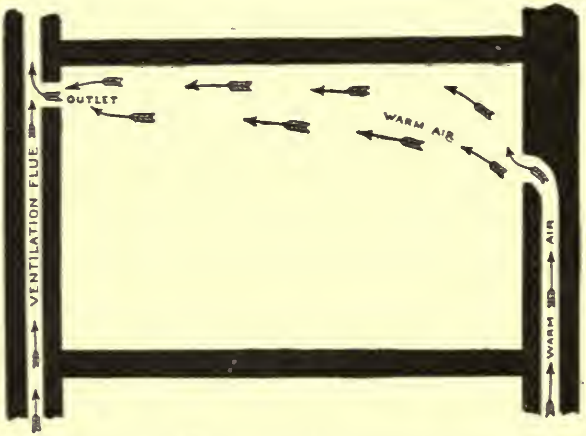


FIG. 7.—GRAVITY SYSTEM, WITH INLET HIGH AND OUTLET HIGH AND OPPOSITE.

valve to introduce more or less cold air directly from the outside as occasion demands. Automatic regulators (thermostats) have been devised and installed to open or close these valves, without requiring the attention of the teacher. In many instances these work admirably but often get out of adjustment, in which case there is no ventilation, and either too little or too much heat.

It is of the greatest importance in the introduction of this or any other recognized system of heating and ventilating that an expert engineer of wide experience should make the plans and complete the arrangements. Each school building requires a special study by itself. Two buildings constructed on exactly the same architectural plans might require entirely different heating and ventilating systems, because of slightly different orientation or exposure. It has been the tendency in the past to economize on systems of ventilation; but when the necessary expensiveness of good ventilation is fairly grasped by school managers, there will be an end of this attempt to save money, which is now so general. Such economizing is at the expense of the children's health and greatly tends to increase our mortality.

The other method of artificial ventilation, that requiring mechanical means to force fresh air into the rooms, operates in exactly the opposite way from the gravity system. That is, the fresh air is forced into the schoolroom by means of a fan, and the foul air is pushed out through any openings in the rooms, and passes away through a stack. The air in the rooms in such a system as this is under constant pressure. All spaces are filled with air, and all leakage is toward the outside. Thus the entrance of contaminated air from any outside source is absolutely prevented. Such a system as this, in distinction from the vacuum system, is called the plenum.

The diagrams shown in the discussion of the gravity system will answer as well for the fan system, if we imagine the warm air to be *forced* into the room, and the vitiated air to be *pushed* out through the vents.

The plenum has one great advantage over the vacuum system, in that the air in the rooms is under pressure, and there is no opportunity for bad air to leak into the rooms through floors or walls. Of course the air that is warmed and distributed must be taken from a pure source, and this leads to the discussion of an important point. This is the air supply.

The air must never be taken from the basement. It must be taken in from the outside ; and the condition of the ground over which it is drawn is of great importance. The best conditions are afforded by a grass plot that can always be kept mown and clean. If necessary, it should be fenced off, and all scraps from lunches, loose papers, apple cores, banana skins, etc., must be kept from it. It should be the cleanest and most beautiful spot about the school, and should be as far as possible from the part of the building in which the sanitaries are located. In this way a pure, fresh supply is assured, and one that is comparatively free from dust. In warming the air, it is often advisable to furnish it with some moisture. This should all be arranged in connection with the heater. A room that is overheated with dry air is very oppressive.

These systems, such as the gravity and the mechanical systems, require the expenditure of considerable coal or gas in order to heat the air and to run the necessary machinery. No system of warming and ventilating has as yet been devised which will work automatically. Any system, if it is good for anything, must be supervised by a competent man. Brains are required as well as coal for an apparatus designed for this great purpose. The man who is responsible for the running of the heating and ventilating apparatus not uncommonly regards good ventilation as inimical to his interests, and in case the heat is lowered, will sometimes stop the valve leading to the exit flues, thus penning up the hot impure air, rather than supply the extra fuel required. Of course it is for his interest to appear economical of coal. He is, therefore, under constant temptation to check the outflow of warm air from the rooms and to minimize the period of flushing them with the external air after school hours.

Various other methods of heating schoolrooms are in common use. One that deserves some attention is that which utilizes steam for heating, the radiators being placed in schoolrooms next to the outside walls. Openings are cut through the walls at the base of these radiators, permitting the outside air to enter the room and become heated by passing between and around the various pipes of the radiator. The outlets for bad air are usually placed on the opposite side of the room from the radiators, thus insuring a fairly good circulation of the air throughout the room.

The action of such a system on the air currents in the room may be seen in Fig. 8.

Steam-heating, if the radiators are in the schoolrooms, is not advisable unless there are openings provided for admitting fresh air. The temperature is regulated with great difficulty, even if the valves are in good condition. The average steam-heated schoolroom is overheated.

In smaller schools it has not been customary to introduce any of these more or less complicated systems because of the expense, and yet none of the other methods that have been devised for them are perfectly satisfactory. The unjacketed stove, when placed in the schoolroom itself, cannot be considered with favor. It is true that several forms of stove have been arranged with jackets, double floors, ventilating shafts, etc., but even then, unless conditions are remarkably in their favor, such heating and ventilating apparatus will not work with satisfaction. In cold weather, in particular, such stoves will not heat the room equally. Some children

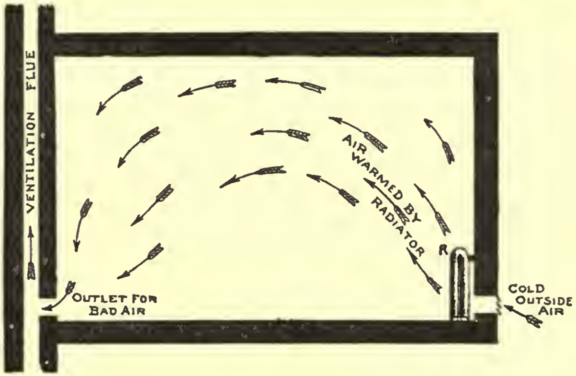


FIG. 8.—STEAM WITH DIRECT-INDIRECT RADIATION.

will be warm and some cold. Stoves without any system of jacketing should never be used. They make the air very dry, produce a close smell, and heat the room only on the side where the stove happens to be.

The distribution of the warm air in this case may be seen in Fig. 9. If this stove is jacketed, and proper means taken to heat and distribute outside air and to remove bad air, much objection is removed. It will be found, however, upon taking into account the expense of jacketing the stove, providing the necessary ventilation flues, etc., required to make it work satisfactorily, that the expenditure incurred will not be very far from that required for the construction of a cellar and furnace, and the latter system would give far greater satisfaction. One serious objection to having the heating apparatus in the schoolroom is, that any attention which it may require during school hours is a cause of distraction to the children.

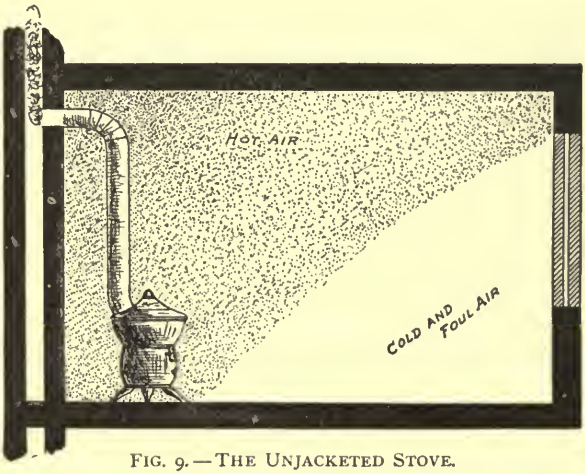


FIG. 9.—THE UNJACKETED STOVE.

Fireplaces are considered very good things to have in schoolrooms, but they must not be depended upon as the only means of heating and ventilating. A fireplace furnishes a cheerful warmth and is a great purifier of the air, but its heat is too unequally distributed. Even in smaller rooms it produces cold currents of air along the floor. Attempts have been made to utilize the heat usually passing up the chimney and wasted by the fireplace, by means of chambers behind the fireplace. In this way external air is warmed as it enters the room. A heater constructed on this plan is shown in Fig. 10. At the back of the heater is an air chamber communicating with the external air.

Air admitted through the opening (*a*, Fig. 10) is warmed by coming in contact with the fire-clay (*d*),

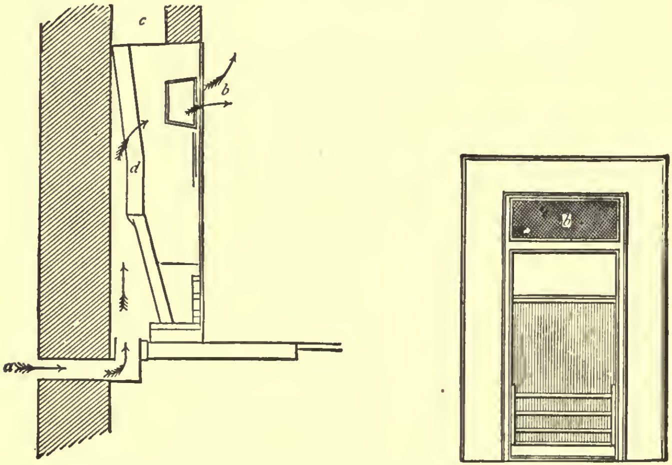


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FIG. 10. — SLOW-COMBUSTION VENTILATING STOVE.

1. Section of stove, showing — *a*, entrance of cold air; *b*, entrance of warmed air into room; *c*, smoke flue; *d*, fire-clay back of stove.
2. Front elevation of same stove.

which separates the air channel from the smoke flue (*c*). The warmed air leaves the air channel by the grating (*b*) over the fireplace, and then travels along the upper part of the room, falling to the floor as it cools, and finally escaping up the chimney.

The distribution of air currents in a room with this arrangement would be similar to that shown in Fig. 3. A specially arranged fireplace of the kind just described might be found very useful in a very small room, but in the larger rooms it could hardly be satisfactory by itself.

LIGHTING OF SCHOOLROOMS

The proper lighting of schoolrooms is one of the most important problems of school hygiene, and yet we find very few schoolhouses that are really well lighted. The eyes are in such constant use in school that the conditions under which they work should be the most favorable. Direct sunshine in the schoolroom is always cheerful, and yet the eye is dazzled, irritated, and often permanently injured by working on objects that are directly illuminated by the sun. One of the most important rules in the lighting of a schoolroom is to exclude the direct rays of the sun during school hours. It does not necessarily mean that the schoolrooms are best arranged on the side of the building which is not reached by the sun, because it is essential to utilize the sun's rays to purify the air of the room. The mental effect of deficient light is accompanied by an actual physical effect, so that we should guard against having too little light, just as much as against having too much light. The proverb well says, that "Where the light cannot come, the doctor must." It has been observed, in practice, that the attendance in a poorly lighted schoolhouse is always less regular than in a cheerful and well-lighted school.

The question in regard to direct sunlight entering the schoolroom has been a much debated one. In our climate there are many days in which clouds are rapidly passing over the sun, giving quite rapid alternations of light and shadow. The eye cannot accommodate itself to these rapid changes in the intensity of light without undergoing considerable fatigue. Professor Forster, of Breslau, says in regard to this matter: "Many of the advocates of the southern exposure of schoolrooms pass over this point lightly with the remark that protection from the direct rays of the sun may easily be had by the use of curtains. But this 'easily' I must dispute. The curtains are not yet invented that will keep back the direct rays of the sun and at the same time let the diffuse light of the clear sky pass through. The inventor of such a curtain would be regarded as a benefactor of the human race. As such a protection some have recommended thick, white linen. But this is too dazzling. Then ground glass has been recommended, but this is also too blinding in direct sunshine, and in cloudy days intercepts the light too much. Again, all green, gray, or blue curtains, if thick, absorb too much light, and make the desks most distant from the window too dark. While, if thin, they let through too many of the heat rays. Venetian and other blinds darken the room altogether too much. If the curtains are brought across the upper part of the window, they obscure just that part of the window opening that is the most valuable for lighting the schoolroom."

But Dr. Cohn, also of Breslau, the great authority on the hygiene of the eyes of school children, says that there never can be too much light in the schoolroom. His idea is, not that too much light will not injure the eyes, but that it is an easy matter to shut out the excess of light, while it is not easy to cut openings for windows after the window space has already been made. That is, if the available light by the window is insufficient, it is difficult to supply light in other ways. No definite statement can be made in regard to the extent of window surface in proportion to floor space that will fit every room, because there are such varying conditions, particularly in cities. The light of the room is affected, for example, by the height of the houses across the street, the width of the street, and the frontage of the windows. All tend to modify any definite rule that may be laid down.

The most radical authorities claim that one-fourth should be the proportion of window space to floor space, and the authority on the other extreme claims one-tenth as the proportion. This latter figure is out of the question except in very rare cases. One-fifth and one-sixth should be the minimum figures for window space. Under the ordinary conditions, many styles of curtains and shades have been devised and tried, but very few have seemed to answer the purpose satisfactorily. In regard to the location of the windows, authorities generally seem to agree that they should be on the left of the pupils as they sit in the room. It is not advisable under any conditions to have cross lights — lights that will make shadows on the books or papers that the pupils may be using. It is not impossible to arrange a room with the main lights coming from the back and left, if the light which comes from the rear is high enough to prevent its making shadows. As a matter of fact, if a rear light could be arranged, that is, a light coming from the back of the room and striking over the shoulders of the pupils, the results would really be better than the light coming simply from the left. For example, it is not uncommon to see in a schoolroom, in which the light comes from the left, that the children tend to twist slightly, with their backs toward the windows, rather than to sit perfectly erect and receive only the side light on their pages. As has been said before, no light must be permitted which will create distinct shadows on the books. For writing purposes, undoubtedly the left-hand light is the correct one, but reading and studying figures occupy a far larger portion of the time of the pupils during the school day, and we should perhaps consider this as much if not more than the time for writing. Under most conditions, however, if the windows are large, high, and extend along the whole left side of the room, the light that is supplied cannot be far from satisfactory. The space between the windows in every case should be as narrow as will conform with good construction. In Holland, the minimum space between windows is stated at one and one-half feet. The window panes should be large and the glass of good quality. The light from the upper part of the window is the most valuable. All authorities agree that the tops of all school windows should be square, not rounding, thus permitting no waste of space which would permit the entrance of this high light.

It is demanded, in some countries, that the windows should be so placed that from the last seat in the room the child can see some sky. It has been said that no cross lights should be permitted. It is often advisable, however, to have windows, particularly in small schoolhouses, on both sides of the room for the purposes of ventilation. If this is done, by far the greater amount of light should come from the left side, enough to overcome any shadows that might be caused by the windows on the right side. The latter should be high and small and looked upon more as ventilators than as windows.

During the winter months it not infrequently happens in some of the darker rooms that it becomes necessary to use artificial light for a portion of the afternoon session. As a practice this should be condemned, because even if artificial light is used only for a short time, the eyes of many of the children are likely to be strained; furthermore, under such conditions, the ventilation of the room is greatly impaired. On such days it would be preferable to dismiss school rather than to subject children to such disadvantages. The effects of bad light and the care of the eye will be treated in another chapter.

A few words as to the lighting requirements in foreign countries. In London, it is required that the windows should be so arranged that each part shall receive abundant daylight, and that the interval between the windows shall be as small as possible. The total superficies of the windows must be at least from one-seventh to one-sixth of that of the floor. They must be rectangular or slightly curved; the bottom must be four feet above the floor, and reach to six inches from the ceiling; they must as a rule only be placed on one of the long sides of the room. The upper squares must open inwards. The ceiling must be even and white. In Germany, the regulations are as follows: daylight may be admitted from the left or from behind, but not from both sides. The windows must have a surface

equal to one-fifth of that of the floor. In Vienna, it is required that great care must be taken that the windows are always quite clean. In Sweden, the surface of the windows must be equal to one-sixth of that of the floors.

While so much attention is being given to the schoolrooms themselves, the corridors and stairways must not be overlooked. It is important that these should be light and airy, and, if possible, should receive direct sunlight. It should never be necessary to have to light the corridors by artificial means.

CHAPTER IV

SANITARY PROBLEMS OF THE SCHOOLHOUSE

Along with the consideration of the heating and ventilating of schools are other sanitary problems, among the most important of which is that concerning the disposal of refuse. One of the first principles of sanitary science requires the quick disappearance from the buildings of the materials with which we are done. To comply with this law is one of the most difficult and, at the same time, one of the most necessary things to do. The more distant the building from the civilizing influence of the city, the more serious and difficult becomes the problem. Where it is possible, as it usually is in the cities, to have sewer and water connections with the building, the problem is greatly simplified. The architect has no difficulty in specifying that some form of water-closets must be used. It is imperative that these should be of the simplest kind, and that there should be no mechanical parts of the apparatus liable to get out of order. They should work powerfully and automatically, and all of the plumbing should be of the best. This last is very important, because the building and its occupants must be free from the dangers of sewer gas. If there is no sewerage system, and the question of a cesspool arises, it is well to know that the cesspool is one of the greatest sanitary evils. It has been styled "the king of nuisances." No system of closets must be considered for a moment that cannot be connected with a city sewerage system. The cesspool forms a manufactory for poisonous gases and is more dangerous in this respect than the badly constructed sewer. The soil around the cesspool tends to become saturated with filth, and the children using the school yard for a playground would be in constant danger from the effluvia arising from it.

If the school is located where there is no sewerage system, the problem is by no means so easily settled. In the rural section it is utterly impossible to utilize the water system, and therefore the country school has to be given one of the so-called less civilized systems of sewerage disposal. It cannot have the water-closet without the cesspool, thus it is obliged to resort to some of the usual methods employed in rural dwellings, or else to use what is called the dry closet system, which is the most sanitary, although the more expensive way of getting rid of the wastes.

This dry closet method is so important, from the standpoint of sanitation, that it is well worth while to describe it fully. In the first place, it requires absolutely fire proof material; therefore the vault, floor, and seats are constructed of brick and iron. Everything must first fall upon a grating which extends the entire length of the vault. Beneath the grating is a series of corrugated spreading plates. Thus the whole mass is thoroughly exposed to the action of the heated air. By this evaporation and drying, the solid matter is reduced fully three-fourths, and when this has accumulated sufficiently, it may be entirely destroyed by burning. One end of the vault is connected with the ventilating shaft which extends far above the highest part of the roof. Through this all fumes and odors are carried out into the open air. This shaft must be high enough to create a very strong draught. The solid materials that are left in the vault are perfectly dry and rendered inoffensive. At the other end of the vault is the furnace whose function it is to heat the air to a high temperature, thus increasing its capacity for taking up moisture. Such a system should never be connected, even very remotely, with the regular heating and ventilating system of the building.

There are some objections to this system aside from expense. For instance, it requires a competent man on hand all the time, which is impossible in many small schools where the teacher usually has to do the janitor work. Another objection arises from the burning of the accumulated dried matter, which must be done from time to time. This is apt to cause complaints in the neighborhood, as would a garbage crematory. In many instances such complaints arise from prejudice against the system ; yet sometimes, though not often, there is really cause for complaint. Burning organic matter does cause a disagreeable odor, but as a rule it is not sufficiently offensive to become unhealthful.

If for any reason this dry closet system cannot be adopted, the country school is left almost nothing to choose from. The only outbuildings to be considered (these must be outbuildings in every sense of the word, that is, must not be a part of the school building itself) are the so-called "earth closets." These will not work with sanitary satisfaction unless watched very closely.

Moule, the originator of the system, well says that "earth closets will no more work without dry earth than water-closets without water." Sawdust answers very well in the place of dry earth, but pure sand and gravel, or chalk, are nearly useless.

While earth closets may be utilized in the case of a dwelling-house with safety, there are so many factors about the school which tend to make them impracticable that it is very doubtful if they can be recommended for schools.

Where it is necessary to devise some means that can be regarded as perfectly safe by sanitary authorities, it may be possible to adopt an arrangement such as has been successfully tried abroad. The plan is to have large wagons backed in under the outhouses, these to receive the wastes, and at night horses can be attached and the material carted away and disposed of.

To return to a further consideration of city schools: after having determined that the water-closet is for them the system to adopt, the problem arises as to how many closets must be provided for a school of a given number.

Newsholme states that there should be one closet for every fifteen girls, and one for every twenty-five boys. In schools of higher grade, in which the pupils have recitation periods, these being never longer than fifty-five minutes, this number might not be far out of the way; but in schools of lower grades, where large numbers are dismissed at once, a much greater number will be found advisable and necessary. The same problem arises as to the number of urinals for the boys. Newsholme gives five for every hundred, but here again this number is far too small for the lower grades. The larger boys are apt to take advantage of their size and make it very uncomfortable for the smaller ones.

Another serious question arises in this connection: Is it advisable to have each closet provided with a separate door, so that the pupil can shut himself in completely; or is it better to have a large screen in front of and protecting all the closets, thus permitting the teacher to keep an oversight over the boys. In the latter case, while the teacher could not actually be able to see the boys, it would give the youngsters a certain feeling of insecurity which would keep them from doing mischief that they might find an opportunity to do if they could lock themselves up. This screen method of concealment is not looked upon by some as quite modest enough for the best refinement, and yet when we consider the harm that boys can do to school property and to themselves, it must be regarded as an excellent safeguard. The good that might come from such an arrangement must be far in excess of any harm from the possible unrefining influence.

THE CARE OF THE SCHOOL BUILDING

The care of a public school building must be of the very best in order to keep it in a healthful condition. One of the greatest evils in connection with the care of schools is the lack of cleanliness; this is perhaps more prevalent in old school buildings than in new ones, because in the new buildings there is usually more or less pride on the part of the janitor in keeping the halls and rooms free from dirt, and on the part of the teacher in keeping her room tidy and neat. But, on the other hand, it is the old school, with its old roof and floors, its dingy and rattly windows, its scarred desk and woodwork, that really needs the most care. In the country schools, also, where the teacher himself usually acts as janitor, it cannot be expected that the school and its surroundings can be kept in a very sanitary condition. It is an astounding fact to learn how many school buildings never get thoroughly cleaned. For example, during a careful study of the sanitary condition of the schools in the city of Boston a few years ago, it was found that the floors of seventy-seven of the buildings, or 41 per cent of the whole number of schools, had never been washed since laid. It is true that in an old city like Boston there are many old-fashioned and some dilapidated schools, but that is no reason why an attempt should not be made to give them at least an annual dose of soap and water. We excuse a man who has a ragged coat if he keeps himself and his coat clean. A rickety or dilapidated schoolhouse is permissible in so far as it does not endanger the safety of the pupils. But in order to be permissible it must be kept strictly clean. Every school building should undergo a thorough cleaning from top to bottom every year, preferably in the fall, a few days before the opening of the school. This cleaning should not take place on the day before the school opens, because, if done then, the floors and walls would hardly be dry, and there would be a damp atmosphere about the whole building, which would be disagreeable if not unhealthful. The floors should all be thoroughly scrubbed, the woodwork washed and wiped, and every trace of the dust of the long summer vacation removed.

It is a well-known fact that immediately after the opening of the public schools in the fall there is a marked increase in the diseases of children. It is not a very difficult matter to explain this. In the first place, the children are placed in rooms which are not always clean and perhaps not well ventilated. This change in itself, from the outdoor vacation life which they have been leading during the summer, would explain in part the increase in disease. Then again, in the country schools, particularly where the water is supplied from wells, and the school pump has been idle all summer, the water has become stale and stagnant, and the children are obliged to drink it. The fall term usually comes in warm weather; the children crave large quantities of water at such a time, and if obliged to take this foul, stagnant water, it is not strange that some of them are made sick. These two factors at the opening of the school year, namely, the unhealthful school building and the bad water, account in part for the production of disease. This being the case, it is not difficult to see that if the buildings are placed in a sanitary condition before the opening of the school by being thoroughly aired and cleaned, one of these factors in the production of disease will be removed.

A few words about the dust and the dirt in the schoolroom are of interest here. Of what does this schoolroom dust consist? Much of it is brought in upon the clothes and shoes of the pupils, and much is blown in as dust from the street. There are also small organic particles that are given off by the bodies of the children. Dust is known to be the carrier of disease germs. Consumption and many other infectious diseases are spread through its agency. Then again dust in itself is an irritant to the eyes and the air passages. It is, therefore, important that all possible means should be taken to keep the amount of dust in the schoolroom down to a minimum. It is the common practice in public buildings to sweep and dust an hour or so before the people are gathered together. This is the practice not only in theatres and churches, but also in many school buildings. If sweeping and dusting is done at such a time, the dust simply circulates about in the air, so that when adults or children come together, it is in the best possible position to cause them trouble. They cannot avoid breathing it. All cleaning of the school floors and furniture should be done daily at the close of the afternoon session, after all the pupils have left the buildings. The windows should be wide open during the process, and all dust that settles on the desks and furniture should be carefully removed with a damp cloth. In order to prevent so much dust from flying about in the air during the process of sweeping, it is advisable to throw damp sawdust over the floor. If the school has hard wood floors properly laid and oiled, they may be kept clean by wiping with a damp cloth. All the floors and the walls should be washed carefully at much more frequent intervals than is usual, if any regard is to be shown for cleanliness. The moral effect of a clean school building must be recognized.

Consider the unclean and untidy condition of the homes of many children, and the effect upon them of entering and becoming a part of such schools. A well-kept school cannot but have its good influence, if the child is made to feel that the school building and one of the rooms and one of the desks belong to him for the time being; and if everything around the building, the room, and the desk is clean and neat, the tendency will be for him to keep the desk and himself in the same condition. On the other hand, we can readily imagine the results if the school building and its various parts are uncleanly.

One of the most important duties of the school janitor is the care of the sanitaries. The perfection and care of the sanitary arrangements of a school building, or of any building, are the measure of the civilization of the community in which the building exists. The more perfect the arrangement and care, the higher the civilization. There are around the toilet rooms so many chances for the boys to do all kinds of mischief, that it undoubtedly takes a good-natured and hard-working janitor to keep things as they should be. Nevertheless every effort should be made on the part of the school management to have this properly done.

In the care of the sanitaries it has been thought advisable sometimes to use some form of disinfectant or deodorant. In many cases where this has been done, the supposed remedy has been worse than the evil itself. That is, many so-called deodorants simply remove the foul odor of the sanitaries by giving forth a much stronger one themselves. It often happens that the odor of the disinfectant can be detected throughout the hallways of the schoolhouse, and sometimes even in the schoolrooms themselves. This is an exceedingly unpleasant feature, because it is constantly reminding one of the presence of the sanitaries in the building. Absolute cleanliness, brought about by the plentiful use of water, is far preferable to the use of chemicals. This cleanliness, combined with good ventilation, will prove the best remedy for bad odors.

Another matter that deserves attention is the water supply. In many large cities the public supply is polluted and dangerous to drink without being treated in some way. It is perhaps necessary to introduce some form of filter which will insure a safe drinking water. The ordinary water tap filters do not do very much good, and it is advisable to use some such form of filter as that devised by Pasteur, or some sort of scientific mechanical filtration.

The distribution of pencils has in late years been a subject of considerable discussion, because of the danger of infection. We know that the children suck the pencils more or less, and scratch their heads with them, and so on, and that many contagious diseases are spread in this way; this is really a very serious matter. It seems advisable, therefore, that except in the lowest grades, children should have their own pencils and pens, and either keep them in their own desks, where they will always be sure to use the same ones, or else to have them collected in regular cases with numbers, so that they can be distributed again to the same children. As to the disinfection of the pencils and pens, it does not seem necessary, except in the time of serious epidemics when contagious disease is known to have been in the school. In the same way the books that are furnished to the children by the public authorities should be carefully distributed to the same pupils each time, and in case any pupil is out on account of sickness, it is advisable not to permit that pupil's book to be used by any other child. If the sickness proves to be a contagious disease, the book should be burned.

Another subject that has received considerable attention is the matter of oiling the floors with some form of patent "germicidal" or "dustless" oil. To this objection has been made by the teachers and the girls, on account of the tendency to soil the dress. If the oil is put down in the proper way, so that there is not a sufficient amount to become gummy on the surface, the tendency to give off dirt is slight. The principal trouble with such floors is that the janitor does not take the pains to clean them as carefully or as often as he does the ordinary dusty floors. Consequently, the oily or gummy surface becomes laden with dust, and when swept by the girls' and teachers' dresses naturally gives up some of the dirt. If these floors are very gummy, it shows that they have not been properly oiled, and it is necessary to give them a scrubbing with gasolene in order to remove the gummy surface. From the sanitary standpoint, too much cannot be said in favor of floors treated with some such oil. In many examinations of the bacteriological contents of the air of rooms that have these oiled floors, the results invariably show a smaller number of bacteria than do similar examinations made in rooms whose floors have not been so treated. The ease with which they are swept, and the absence of flying dust during the process of sweeping, are also important factors in their favor.

These points concerning the care of a school building show very clearly the need of some systematic sanitary inspection. In thus speaking of sanitary inspection, it is not intended to include in the term any portion of what is usually called medical inspection of schools. That will be treated in another chapter. Sanitary inspection, as the term is used here, applies simply to the building. Every town and city should have at least one sanitary inspector of schools, who should visit every school before the fall opening, and see that it is put in the proper condition for the assemblage of the pupils. If it is not in what he considers a proper condition at the appointed day, school should be dismissed until such time as he pronounces the school building fit for use. In many states there is a more or less systematic inspection of this kind, but usually the inspection of any school does not take place until it is rumored abroad that the school in question is in an unsanitary condition, and usually this rumor does not start until the unsanitary conditions are extreme. But a regular sanitary inspection of all schools should take place at stated intervals, not less frequently than once a month, and the sanitary inspector should either have the power himself to close the building, if he considers it unsanitary, or he should be responsible to some higher authority, such as the State Board of Health. His inspection should include the general cleanliness of the building and the school yard, the care of the basement and sanitaries, the operation of the heating and ventilating system, and he should watch very closely to see whether the janitor attends to all his duties. His visits to the school should not be made on any regular day or at any regular time. In this way he would see things as they actually exist, and not expressly polished in anticipation of his visit.

In view of the unsanitary condition of many of our schools, particularly of the older ones, such a system of sanitary inspection cannot be too strongly urged. In many cities there have been introduced systems of dairy inspection by which the cow barns and the cows themselves are carefully examined and strictly watched. Is it not peculiar that dairy barns and cows are of more sanitary importance to the public than our public schools and the pupils?

It is true that food comes from these dairies. But, on the other hand, we are sending our own children to be housed in buildings that often need inspection far more than many of these dairy barns.

CHAPTER V

SCHOOL FURNITURE

Desks and seats are the most important articles of school furniture, and it is unfortunate that authorities on this subject are not agreed as to their best form.

It is well to remember at the outset that no form of desk or seat will obviate the evils of long continuance in any one position. This leads to imperfect expansion of the lungs, relaxation of muscles, and a tendency to drooping shoulders, if not actually to a twist in the spinal column.

There are various bad forms of desks. The desk may be too high, in which case, during writing, one shoulder is unduly raised in order to rest the arm on the desk, and a lateral twist of the spine results, which in time tends to become persistent. If the desk is too low, the scholar has to bend too far over his work. A forward stoop and round shoulders are produced, the head becomes congested from being held so low, and there is a strong tendency toward the development of near-sightedness.

A flat desk is particularly bad, necessitating a cramped position and interference with free respiration. If the desk is too far from the seat, a forward stoop, with round shoulders, flat chest, and injury to the eyes are produced.

Seats, again, may be badly placed. If the seat is too high, the feet swing, the blood vessels and nerves at the back of the legs are compressed, and the sensation of "pins and needles" is produced. This is also apt to occur if, as is commonly the case, the seat is too narrow to support the whole length of the thigh. If too low, the thighs are bent up toward the body, and a cramped position is produced. If without a back-rest, or with an improperly adapted back-rest, the pupil tends to lean forward on the desk and thus to prevent free expansion of the lungs.

According to Eulenberg, a distinguished German orthopædic surgeon, 90 per cent of curvatures of spine not caused by actual bone disease are developed during school life. Bad postures during school work, and especially the twisted position, with the left arm resting on the desk during writing lessons, contribute considerably to the production of such curvatures. The effects are much more likely to be produced if the desk and seat are not properly adapted to each other and to the size of the pupil. An upright position in writing is indispensable, and the left elbow should not be allowed to rest high up on the desk. Writing should be continued for only a few minutes in primary and intermediate classes, and in higher classes not longer than half an hour without intermission.

The cramped positions induced by defective desks and seats not only favor the production of a twisted spine, but also round shoulders and flat chest, thus impeding the functions of heart and lungs. The habit of leaning forward, close over the copy-book, may produce short-sightedness; and this in its turn increases the necessity for the improper postures. Thus a vicious circle is entered, each evil mutually intensifying the other.

Proper desks and seats should be accurately adapted to each other. The most important points to ascertain are: (1) the "distance," *i.e.*, the distance between the edge of the seat and a perpendicular line dropped from the edge of the desk; (2) the "difference," *i.e.*, the difference between the height of the seat and desk; and (3) the slope of the desk.

The distance should, for writing purposes, equal zero, —the plumb line from the desk grazing the edge of the seat,—or it should be a negative quantity. For other purposes the distance should equal zero or a small positive quantity. This involves having a movable seat, unless chairs are used, which is inadvisable in boys' schools. Or, the same end may be attained by using a desk so constructed that it can be drawn horizontally backward, so as to enable the scholar to write while sitting erect, or resting his back against the back of the seat. When the scholar is too far away from the desk, he either bends forward into an unnatural position, or glides too far forward on his seat, and occupies an unsteady position.

The difference between height of seat and desk should not be such that the shoulders are painfully screwed up in writing, nor, on the other hand, should the pupil be obliged to lean forward in order to write or read. It is recommended that it should equal the length of the forearm, or about one-sixth the height of the scholar (Robson).

The slope of the desk should be capable of change, the proper angle being about 30° for writing and 40° to 45° for reading.

The height of the seat should correspond to the length of the scholar's leg from the sole of the foot to the knee, in order that there may be no stretching of muscles. Its width should not be less than eight inches.

There should be a back to the seat, which need not be more than a piece of wood three inches broad, slightly tilted back, and so placed as to support the back just below the shoulder blades. In this way the movements are not interfered with, while the spine receives steady support. Liebreich gives the rule that the top of the seat should be an inch lower than the edge of the desk for boys, and an inch higher than the same point for girls. Long desks are, as a rule, objectionable ; children tend to sit with the left arm high up on the desk, in order to prevent copying by their neighbors, and thus produce twisting of the spine. The same objection holds to a less extent against dual desks, but they possess the advantage of not spreading out the children so much as single desks, and thus economize the teacher's voice. They also suffice for three, when listening to a lesson.

It is a common fault to furnish a room with desks of only one size. There should be three sizes of desks in each large classroom, as there may be great diversity of height among children differing only two or three years in age. A foot-rest should always be provided for children varying considerably from the usual stature.

Adjustable desks are among the important improvements of school furniture. There are several forms on the market, and the main objection to all of them is the price, making it almost an impossibility to supply whole schoolrooms with them. From the hygienic standpoint, each child should have his desk adjusted to himself; but where this is impossible, it has been found of advantage to have two rows of desks and seats, usually the outer ones, adjustable. Extreme cases can thus be accommodated.

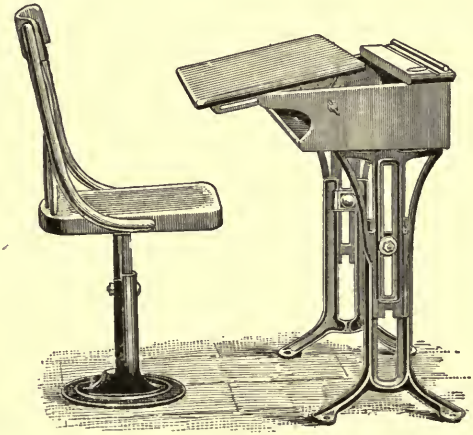


FIG. 11.—ADJUSTABLE DESK.

Several different forms of adjustable desks are made. The best form provides not only for an adjustment of the height of seat and desk, but also for a change in the slope of the top of desk, to adapt to the different positions required in reading, in writing, and in the new system of vertical writing (Fig. 11). The sitting position in this last seems to have much to recommend it from the standpoint of hygiene, and if the good reports continue in regard to the results obtained from it, the favor of medical men and sanitarians is assured.

The blackboard should be large. It should be so placed as to receive a good light, and its surface should be dull. The windows of the schoolroom should not be on the same wall as the blackboard, for in that case the children's eyes are dazzled in looking at the board.

Natural slate is acknowledged to be the best material for school blackboards ; next in desirability are some of the artificial slatings or liquid blackboard preparations. A serious fault with some of these preparations is that they are injured by the application of wet erasers.

The school floor, while it may not be usually classed as a part of the school furniture, is of importance with reference to the healthfulness of the room. Floors that are full of cracks and otherwise rough are hard to keep clean. Rooms with such floors cannot be kept free from dust. These cracks, moreover, may become the breeding places of bacteria and disease germs, should the floors ever become damp.

Cheaply constructed school floors are cold and cause the children much suffering during the winter months. Catarrhal troubles and other affections are among the results of permitting children to sit with cold feet. Wood floors at best tend to be noisy, and in several foreign countries methods have been devised to prevent this. The best floors for this purpose are those used in London, consisting of blocks of wood, with asphalted joints, placed on a bed of cement. In France and Germany a similar method is used, parquet sections or narrow boards of some hard wood are imbedded in a layer of asphalt. Such floors remain firm and free from cracks, are warm, and easily kept clean. They are also comparatively noiseless. It is claimed that they are not expensive, when the life of the floor is taken into account.

In schools of considerable size, there should always be a hospital room, a place where sick pupils and teachers can find seclusion and some of the necessary comforts. This is best situated directly adjoining the principal's office. It should be provided with lounge or cot, lavatories and water-closet, a few common medicines necessary for emergencies, in fact, a regular emergency kit with absorbent cotton, bandages, lint, salves, and dressings, hamamelis, and anything that might come in use in case of accident or sudden sickness.

This convenience is too often lacking in our large schools, and provision should be made by the architect for such a room. It might not be used often, but when the need comes, it is imperative to have something of this sort.

The provision of baths in the public schools is a matter of great importance, not only in the city schools, but in the country schools as well. In the large cities many are the children that come to school in a condition unfit to associate with the other pupils; and in the majority of such cases there is no opportunity in their homes for taking a good bath. Therefore there would be little good accomplished by sending these children home and not allowing them to return until they were in a fit condition. They should be provided with the opportunity to have baths, and, if necessary, at certain times there should be attendants to look after children that need the baths, particularly for the younger ones. The importance of a clean skin should be always emphasized before school children, and there is no better way to do this than to give them the best facilities to practice what is preached.

Some parents are apt to look upon this innovation as to some extent interfering with their business, but in such instances the objection is usually due to ignorance, and a little firmness and tact will overcome it.

There are questions that arise as to the best outfit to provide for this purpose, whether the shower bath, the bath-tub, or the swimming tank. Probably the latter would receive the most commendation from the boys. It would be more expensive, however, than either of the others, and for the average school the shower bath with the bath-tub, or even the shower bath by itself, would answer most purposes. Schools should always be provided with places where the children can wash their hands after visiting the sanitaries. Such an opportunity should not be simply provided, but rather forced upon the pupils. It should not be necessary for the pupil to run out to the school pump or up a flight of stairs in order to do this. So that wash-stands and towels in the neighborhood of the sanitaries should be among the essential furnishings of the school.

It is often the custom in school to supply the drinking water to the children in buckets. A bucket of water is placed in each room or hallway, and each bucket is provided with one or two drinking cups. Such a system is deplorable, and is undoubtedly the cause of spreading much disease. Any system that compels the pupil to dip the common cup or his individual cup into a bucket containing a general supply should never be permitted. A reservoir or tank with a faucet should be supplied wherever it is impossible to have running water, and in any case each child should have his individual cup. The expense of this reservoir should not be considered. Where there is no public water supply such a tank is the only method of dis-

FIG. 12. — SANITARY DRINKING FOUNTAIN.

tributing the drinking water throughout the school building that has the sanction of sanitarians.

Even where running water is provided, individual drinking cups must be supplied, if not by the school authorities by the children themselves. If for any reason the individual cup system is not feasible, the cups that are provided must stand under running water, that is, they must receive a continuous washing. The faucet should be open and running all the time during school hours.

The best improvement that has developed along this line is the so-called "Sanitary Drinking Fountain," and by this arrangement all danger of spreading disease by the cup is removed. Such a fountain is shown in Fig. 12. As can be seen, there is a continuous stream or jet of water rising three or four inches, and the child simply stoops over and allows this jet to enter the mouth, as shown in the illustration. With this arrangement there is no chance for the water to be used over again, and thus no opportunity is afforded for the spread of contagious diseases. These fountains are in use in several schools and public places, and receive almost universal approval.

PLATE XIV.—CORNER OF A KINDERGARTEN ROOM, INDIANAPOLIS, INDIANA.

Decorations temperate, appropriate, effective. An artistic informality in the grouping of decorative elements.

PLATE XV.—WINDOW GARDEN IN A SECOND GRADE ROOM, GARFIELD SCHOOL, PASADENA, CALIFORNIA.

A decorative hit. Notice the effects of dark against light in the window, and of light against dark upon the blinds.

CHAPTER VI

THE SCHOOLROOM

ITS CHARACTER

THE modern schoolroom is a workshop, consequently its appointment should be convenient. It is a study, hence it should be pleasant and stocked with reference material. But it is also a living room for children extremely sensitive to impression, therefore it should be as beautiful as a favored home. Of course a Wilton velvet carpet would be out of place beneath the restless feet of sixty children; upholstered furniture would be absurd in a room hourly powdered with chalk-dust; and lace curtains would be ridiculous with window gardens and a man janitor! But beauty is not dependent upon these things, it depends solely upon harmonious relations of parts to each other and to the whole, and of the whole to its conditions and functions. Floors made of hard wood, that they may be cleanly and durable; finish honest and substantial, to withstand the wear and tear of daily use; furnishings simple and appropriate — these may be combined to produce a whole which looks inviting, neat and businesslike, yet refined and rich, a place of stimulating ideals.

Such schoolrooms do not come by accident — they are carefully planned, and every effect is calculated. The work of the decorator begins as soon as the walls are rough plastered. He must consider the wood suitable for finishing, the tints for walls and ceiling, the furniture, curtains, and all other accessories. Such matters should be intrusted to an architect, decorator, or other competent person — seldom a member of the school committee or of the building committee.

FINISH

Undoubtedly the best wood to be used for finish is quartered oak. It is durable, tough, and compact in texture, with a surface broken by the grain into pleasing varieties of color, yet of sufficient uniformity in hue to give a warm and rich general tone to the finish as a whole. Moreover, its color becomes deeper and more mellow with age.

Ash is less expensive and almost as durable. The grain of the wood is coarser and its color contrasts are more marked, but the color is on the whole somewhat lighter than that of oak. On this account ash is a desirable wood for rooms where the illumination is not so strong as it should be, and for hallways, stair-cases, and coat rooms.

North Carolina pine is perhaps the most satisfactory among the cheaper woods. When well seasoned the surface becomes extremely hard. Its color is especially cheerful and interesting. For portions of the building inadequately lighted this wood is even better than ash, but the grain is so prominent, with its erratic lines and strong contrasts of color, that it is likely to be obtrusive in a well-lighted room, unless the other furnishings are keyed up to the same pitch of brilliancy.

White wood varies so much in color, and changes so diversely when exposed to light, that were its texture sufficiently close and hard to withstand the exigencies of daily use, it would be a difficult wood to manage in any decorative scheme. When fresh the wood has a warm creamy tone, often tinged with green ; under strong light it may become in the course of a year or two almost as dark as antique oak or black walnut, with here and there a streak practically unchanged. It is evident that such changes in the wood might demand changes in the color of walls and furnishings, if close harmony is to be maintained. It is possible, of course, by carefully selecting the stock, to avoid sappy wood and thus reduce the developing of color contrasts to the minimum ; and if this is done, the ripened hues of curly whitewood finish rival those of quartered oak. Whitewood has been much used because of its readiness to absorb and hold various kinds of prepared stains, which give pleasing effects of color without obliterating the varieties of the grain of the wood, but for schoolrooms the natural wood colors are usually preferable.

Whatever the wood selected, the finish must be simple. Deep channels in the moldings, or members in high relief, are to be avoided. The simpler and more refined the form, the better. The surface may be treated with a preparation of wax, or any other good filling, and shellacked, varnished, or oiled, according to circumstances ; but whatever the process, the result should be a smooth, hard, "dead finish," as the painters say, not a highly polished surface, reflecting the light like a glass bottle, but a surface rubbed down to a soft luster.

Painted finish is to be recommended chiefly in the restoration of old schoolrooms. Paint will cover a multitude of scars. Moreover, it may be of any color, and on that account is more tractable than natural wood. A painted surface should have the dead finish already mentioned, obtainable by the use of certain mediums well known to house painters, and should be free from brush marks or roughnesses of any sort. The best ground for a painted surface is undoubtedly extra quality soft pine, the cost of which plus the cost of painting is about equal to the cost of hard wood finish. Owing to the softness of pine, and the readiness of paint to show dents or scratches, the hard wood finish is preferable.

WALLS AND CEILING

The mason should leave a hard, smooth-finished surface for the decorator to enrich. Rough plaster is not best in a room so often filled with dust, and the final or skim-coat should be white. Tinted plaster or skim-coating has not proved itself altogether successful. Given, then, the smooth, white walls and ceiling, their proper tinting is the next problem.

First, one must consider the sort of light that the room receives. If the windows look toward the south, there will be direct sunlight during school hours; if toward the north, the room will have little or no sunshine; if the outlook is eastward or westward, the sun will shine into the room morning or afternoon only. The room must be cheerful, but not too brilliant in color. A room into which only the cold north light comes needs to be colored in delicate tints of yellow and orange-yellow to give an impression of warmth and light, while rooms having direct sunlight need the cooler and deeper tints of green, blue-green, and gray. As a rule, all the stronger tones of blue, and the intermediate hues to violet, are to be avoided; they are either unpleasantly cold or aggressive and insistent. Red and all its immediate relatives should be excluded, because such colors are trying to the eye. Knowing, then, whether the scheme of the room should be warm or cool, as the artists say, that is, whether the yellows or the greens are to furnish the prevailing colors, the precise hue and value of color for walls and for ceiling must be next determined.

The key to this problem is to be found in the woodwork, the finish of the room. All harmonies of color are, according to Ruskin's classification, harmonies of analogy or harmonies of contrast, or, to state it another way, harmonies of colors which vary but slightly in hue, like yellow and orange, or of colors which differ widely in hue, as do yellow and blue, or red and green.

The color of the walls should therefore harmonize with the woodwork either by analogy or by contrast. Suppose the finish to be of oak. An examination of the polished wood will show that the general color of the surface is made up of irregular spots and lines of various colors, dull yellow, dull orange and brown, with many varieties of these.[1] The colors which harmonize with these by analogy are tints of yellow and orange, in popular phrase,—"cream," "buff," "the wood

[1] With our present uncertain color nomenclature it is impossible to describe colors accurately in popular terms. To one familiar with the Bradley system, the following would be more definite: oak colors are broken shades of OY, YO, O, RO; their contrasts are in the BG, GB, and B scales.

colors," "tan," and "light brown." Those which harmonize by contrast are the hues between blue and green, — the "green grays," "light olive," "tea," "light robin's egg," and similar colors.[1] If the room is a comparatively dark room, finished in oak, the lighter colors of the grain will give the hue to the walls, and the lightest colors the hue for the ceiling, both of course lightened somewhat by the addition of white. If the room has a south exposure, the contrasting colors will be used, or if the analogous colors are preferred, they will be dulled and darkened to counteract the effect of the excessive light. The conditions vary slightly if ash or North Carolina pine is used. The pine is in effect slightly warmer or redder than the oak, or yellower, according to the predominance of light or dark streaks in the grain. Ash is usually yellower than oak, hence its contrasting colors average a little bluer. Perhaps a diagram will make this matter clearer. The letters, following the Bradley system, are the initials of the prismatic colors, — red, orange, yellow, green, blue, and violet. Their combination, as YO, means a yellow-orange, an orange

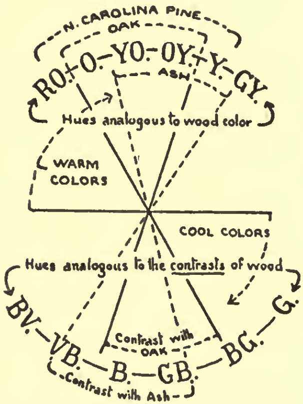


FIG. 13. — COLOR DIAGRAM.

[1] With our present uncertain color nomenclature it is impossible to describe colors accurately in popular terms. To one familar with the Bradley system, the following would be more definite; oak colors are broken shades of OY, YO, O, RO ; their contrasts are in the BG, GB, and B scales.

tinged with yellow; OY a yellow tinged with orange; etc. Of course the colors of the woods are merely tints or shades of these colors, never the pure colors themselves. Brilliant colors should be used sparingly, as, for example, in a narrow stripe along the edge of the ceiling or wall, or in a bit of still life upon the bookcase or elsewhere. The tone of the walls in hallways may be rather strong and rich, but in schoolrooms it should not be so dark as to appear heavy, or so delicate as to soil easily. It should not be so gray as to appear colorless, or so brilliant as to attract more attention than the pictures and casts for which it is to serve as a background. To give explicit directions for properly toning any room is impossible, but the following will not lead one far astray: —

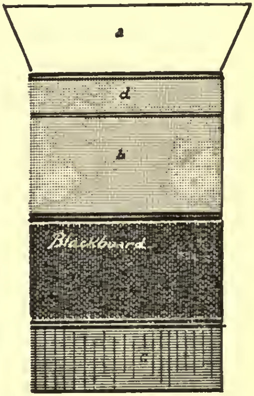


FIG. 14. — TONE DIAGRAM.

1. Determine the scheme of the room, — warm or cool in tone. 2. Select a tint for the ceiling (*a*). Let it be a very light tint of some color found in the finish, or of a contrasting color. 3. Make the wall (*b*) a middle value between the ceiling color (*a*) and the general tone of the finish (*c*). 4. If stripes are to be added for a frieze or border (*d*), they may repeat the color of the ceiling or of the woodwork or both, or may have a more brilliant color in harmony with the finish.[1] Strong con-

[1] Figured borders applied with stencils, if very simple and quiet in color, may be a pleasing feature, but, as a rule, it is safer to be content with the stripes.

trasts are to be avoided. The blackboards and the ventilators are the unmanageable elements. The blackboard is a necessary part of the equipment in a public school, and the sensitive decorator can do no better than to ignore it. Fortunately, if slate is used, the general tone soon becomes softened to a neutral gray. The ventilators should not be left black in color unless they come in a blackboard. If they come in the wall space above the blackboard, they should be toned by means of paint or bronzes to some harmonizing color. If painted the color of the wall, they soon become discolored by dust. Ventilators are of iron, and therefore some metallic finish is best, frankly different from the finish of both plaster and wood, and yet of a tone to harmonize with the color scheme of the room.

Having determined the color for the walls, the medium and its application are important. The various water-color preparations are cheaper than oil color, but less durable. An oil paint properly applied will not peel off, or be discolored by water leaking through from the outside. If soiled, it can be washed; and if occasion requires, the color can be matched perfectly. The walls and ceiling should have two or three coats, the last one to be stippled with a coarse brush to remove all gloss or shine and produce a dead finish.

An ideal wall surface is such as that produced by cartridge paper. A close examination of that paper will reveal the fact that its peculiar hue is produced by the mingling of light reflected from minute particles of different colors. The effect is that of a granulated surface, without a hint of shine or glitter, having a soft rich bloom of color. Cartridge paper, however, or any

PLATE XVI.—BY THE RIVERSIDE.
(*From a painting by Le Rolle.*)

other paper, is not sufficiently durable for use upon schoolroom walls. Paper is justifiable only in repairing or rejuvenating an old room merely for temporary use.

WINDOW SHADES

Inside blinds have many elements in their favor, though they often shut out too much light. They are clean, durable, of good color, or may be easily modified to harmonize with the room. They may be closed at the top to shut out a high sun and left open below, or closed below and opened above to give a good light upon objects used in drawing.

Venetian blinds, so-called, have the advantage of being adjustable to screen out direct sunlight while admitting a large amount of light, but, though requiring less room for operating than the ordinary blind, they necessitate coils of cord, which are often disorderly and unsightly in arrangement.

The ordinary shades upon rollers are comparatively inexpensive, and if of the right color and thickness, are quite satisfactory, especially if hung within the window-jamb, and in pairs, that is, one at the top to draw downward, and one below to draw upward as occasion may require. These are the most easily managed and, all things considered, the most satisfactory if the window-sills are to support window gardens. The material for such shades should be tested in the schoolroom with and without direct sunlight. A curtain which is quiet in color and in harmony with the decorative scheme of the room under ordinary light, may under full sunlight transmit such an intensity of color as to be unpleasant if not fatiguing or even injurious to the eye.

OTHER PERMANENT FURNISHINGS

Theoretically, the furniture of a schoolroom should correspond with the finish. If the room is finished in oak, the desks and chairs should be of oak. If the finish is ash, the furniture may be of birch or any light-colored wood. The "cherry" furniture, sometimes offered for sale, is usually too highly colored to look well except in a room finished in highly colored wood and having walls of a contrasting color.

Bookcases fall in best with the decorative scheme of the room when built in place against the wall as a part of the finish, but the wall space in a schoolroom is so valuable for other purposes that a revolving bookcase may be a necessity. There may be opportunity for a book shelf somewhere, perhaps in a corner, and any good architect will be able to design an inexpensive one which will be an attractive feature of the room.

Cabinets for reference material of various sorts are necessary, but may be consigned to the closet if room is limited. The ideal cabinet for photographs, mounted prints, and other pictures is that commonly known as a filing cabinet with drop suspension drawers. An illustrated catalogue of "labor-saving office devices" will suggest several space-economizing combinations for prints, specimens, and books well worth the attention of school architects and builders.

The bulletin should be a prominent feature. It may be made of soft pine wood and covered with burlap or denim of a color to harmonize with the room. It may be placed between two doors or in a corner or wher-

PLATE XVII.—THE LION OF LUCERNE.

(*Thorwaldsen.*)

Not suitable for wall decoration in any grade. Subject not pleasing for contemplation. Lines of composition in photograph inartistic, effect of dark and light uninteresting. Historical value great; therefore the print should be in the school museum for reference.

PLATE XVIII.—READING HOMER.

(*From the painting by Alma-Tadema.*)

Suitable for wide wall space in upper grade room. Figures large and graceful, composition pleasing and effective when-seen at a distance, subject appropriate, detail beautiful, technique artistic.

ever seems best. Unless it fits some space bounded by moldings, it should be framed, simply, to correspond with the woodwork of the room, and fastened securely flat against the wall. Upon this bulletin shall be posted all notices, clippings, sample sheets of writing, drawing, or painting. Rows of papers tacked to the upper molding of the blackboard, or hung upon wires or strings stretched across the walls, or pinned at haphazard upon the door, are unsightly. The bulletin is the place for the display of school work.

CHAPTER VII

SCHOOLROOM DECORATION

Many people have yet to learn that beauty does not depend upon complexity and prodigality, and that it has nothing whatever to do with the fashions. A popular journal published not long ago "The Interior of One Hundred Homes," the editor might have added "with furnishings enough for one thousand!" Almost without exception the walls were mottled with pictures and cards and the floors cluttered with things. Savages and half-civilized people delight in multiplicity; the more tattooing, the more earrings and nose rings, the greater the beauty; South Sea paddle blades are incised all over with with monotonous ornament; Indian pagodas are heaps of heterogeneous forms. Perhaps one ought not to say that American parlors are barbaric; they are at least composite, they contain collections, they are museums, — or would be if properly arranged and catalogued, — in many cases museums of moderate size simply because the purse is limited.

Our schoolrooms are in danger of becoming "so full of a number of things" that there will be no room for beauty. Plate XIX shows a schoolroom which recently received first honors in a prize competition organized by one of our enterprising monthlies. It contains pictures galore, pictures of all kinds and sizes, pictures

PLATE XIX.—AN OVERDECORATED SCHOOLROOM.

PLATE XX.—A WELL DECORATED SCHOOLROOM.

in frames and on easels, pictures singly and in borders, it contains casts and flowers, vases and dried grasses, flags and bric-à-brac. The room is burdened with a melange of decorative material, it is a new curiosity shop! A drawing teacher, more nice than wise, used to say "bric-à-*bree*." "She means bric-à-*de*bris," remarked an artist who happened to hear; "bric-à-debris fills a long-felt want in one's vocabulary." The word comes unbidden to the lips when such an interior as this presents itself for judgment. Contrast with it the interior from a primary school in Springfield, Mass. (Plate XX.) Here are a few of the best photographs obtainable, photographs of recognized masterpieces. They are large, appropriately framed, and hung with reference to the wall spaces. There is no crowding, no confusion, no clutter anywhere; the blackboards are utilized with some thought of orderly spacing, the vases of flowers are tastefully arranged, and the effect of the room as a whole is clean, temperate, restful, wholesome. One cannot imagine haphazard, slovenly results coming from children accustomed to such an atmosphere of order and peace and beauty.

Such schoolrooms are none too good for the most out-of-the-way corner in these United States. To produce them requires something besides a wish and a bag of gold; it requires good taste and forethought. Given the finished room, the problem is what kind of decorative material shall be used and how much.

It is well to plan the decorations ideally, at first, without regard to expense. With unlimited means, what ought to be done to perfect the room? The light comes from the left side only: then upon the wall in front of the pupils and upon the rear wall we may have casts, and upon either of these walls, or upon the right side opposite the windows, we may hang pictures. We will put our very best things in front, where they will be seen by the pupils whenever their eyes are raised from the books. But we must consider the wall spaces. Here is a wide space — that means one large thing, or two or three small ones. Which is better? Without doubt the one large picture or cast. Here is a narrow space between the door-frame and the corner — that is the place for a narrow picture or possibly a cast. Casts sometimes fit excellently well in very narrow spaces. Shall we place anything high over the door? Probably not; no artist likes to see his pictures "skyed." On that bookcase is a good place for a pretty vase or two. The room *ought* to have, let us suppose, five large pictures (one very wide), one large cast, and two smaller ones, and three vases — two for ornament only and one for holding flowers upon the teacher's desk.

What sort of pictures and casts and vases? Ah, there's the rub! Shall we just please the children in the selection? Shall we decide to have a "Greek room" or a "Roman room" or a "Venetian room," or shall we insist on using the flag in interior decoration and have an "American room"?

Firstly, the flag belongs on a flag staff outside the school building. The American flag, the most beautiful banner in the world though it be, has no place as a permanent wall decoration. It will spoil the decorative scheme of any schoolroom. Moreover, if we use the flag constantly, what shall we have in reserve for special occasions? And if it is always before us, how shall we bring it forth with rejoicing and with special honors upon the red-letter days of the Nation's life? Then, too, how incongruous to find Venus draped with the stars and stripes, or the flag above the Madonna! It is well for our children to know that but one flag in the world ever floats above Old Glory; it is well for them to remember that on Sunday mornings the flag of America takes second place and floats upon the still air beneath the flag of the Cross at the masthead of our battle ships, but it is not well for them to see in their schoolrooms the Mystery of the Ages draped with the flag of the United States.

Secondly, we will not have "classified" rooms for the little children. Classification is nothing to them; Greek and Roman and Renaissance are meaningless words. Children dwell in the realm of "unreflective immediacy"; they enjoy a picture for its own sake, not because it is Spanish and forms a part of a system. They like a Bambino because it is "a cunning little baby in a funny dress," not because of its plastic qualities, or because the great Lucca della Robbia made it. In the upper grades we may begin some sort of classification if we wish, and in the high school we will insist upon it. There the English literature room shall be appropriately decorated, the Greek room shall be Greek, and the Latin room Roman, and the great assembly hall shall be American. Some day those halls will be frescoed with the memorable scenes in our national history, drawn and painted by the boys and girls now being trained to patriotism as well as to power in our public schools.

Thirdly, we will hold to our ideal plan, though we have not the means to realize it all at once. We will buy the picture we want and hang it where it ought to hang; and when we can buy another, we will buy that and put it in its right place, and so on until the room is completed.

"Oh, but we want to change the pictures about," somebody says; "it is so monotonous to have always the same thing in the same place!" But the children change from year to year, the room need not. If the room is once really beautiful, it ought not to be changed: "A thing of *beauty* is a joy *forever!*" People change their parlor furnishings simply because the decorative effect is never quite right. Nobody wants to change the interior of the Spanish Chapel or of Cologne Cathedral.

Knowing, then, in a general way what a given room requires, the attention may be given to individual objects. Each picture, cast and object appears at its best under certain conditions; each may become insignificant under adverse conditions, therefore each may well be considered somewhat in detail.

PICTURES

Walls are decorated for the sole purpose of enhancing their beauty. It would seem unnecessary to add that whatever is placed upon them should be beautiful.

The subject of a picture may be unimpeachable, but unless the picture is in itself a thing of beauty, it has no claim to a permanent place upon the schoolroom wall. Shall we eliminate historical pictures? Yes, unless they are beautiful, like Turner's "Old Téméraire."

And how about portraits of authors and statesmen? Those too must go, unless they are, like Stuart's "Washington," masterpieces of art. All material useful to illustrate history, literature, nature study, and geography, or any other subject, shall be kept in portfolios or cabinets and used when required. We may have maps, charts, and decorations for special occasions hung upon the walls for a day or two. We will have permanently upon the walls only such things as are perfectly adapted to the decorative scheme of the schoolroom.

Kinds of Pictures. — Original masterpieces in color are too expensive for schoolroom walls. Originals which are less than masterpieces are not desirable. In Paris, a few schools possess original drawings or sketches by modern French masters. Possibly drawings by our American artists might be obtained for our schools if artists and teachers could work together sympathetically. But for the present we must depend chiefly upon reproductions.

Lithographs in black and white are usually undesirable because untruthful and inartistic. Chromolithographs are to be avoided, for the same reason. There are a few notable exceptions, such as the "Caravels of Columbus" by Prang, and occasional "masterpieces" by other high grade lithographers; but as a rule the chromo is not for permanent display on the schoolroom wall. Fine engravings and etchings of sufficient size are generally too expensive for schools to secure except through the generosity of some wealthy patron. Photogravures of such quality as Elson's are excellent, but almost all the "process" reproductions are too cheap; they look cheap and lack the artistic qualities of a good photograph.

Solar prints are satisfactory only when details are unimportant, as in the "Grand Hall of Karnak," or the "Mount Vernon," or the "Moses" (see frontispiece). But a fine photograph retains to an astonishing degree the qualities of the original, indeed, in some places the photograph is the more pleasing. Del Sarto's "Saint John," "Beatrice Cenci," and Richter's "Queen Louise" are examples of pictures which gain by photographic reproduction — the print preserves their fine values without calling attention to their unfortunate color. On the other hand, where the coloring is of prime importance, of course photographic reproduction is inadequate. One who knows Paul Veronese and Titian and Turner only through black and white prints can have but the very faintest conception of their power. This emphasis of the photograph in wall decoration tends to make the room colorless; but the lack of color upon the walls may be counterbalanced by color in bric-à-brac and in flowers. Besides, there are a few colored reproductions, in addition to the two or three good lithographs, not too expensive nor too crude for general use, namely, the higher grades of Japanese prints and colored photographs. Colored photographs are often too highly colored, but occasionally one will be found quite delightful in tone and very effective when properly framed; such, for example, as the large plate of the "Entrance to the Ducal Palace," imported from Italy, and the "Fusiyama" and the "Grand Avenue of Trees," imported from Japan.

Subjects. — Pictures should be selected with reference to the grade of the room in which they are to be placed. Little children care nothing for Roman ruins and Greek fragments; the pictures they love are those which tell the story of happy animal and child life, of vigorous action, and of mother love. Classic landscapes and temples and statues of the gods belong in the ninth grade, if anywhere below the high school.

The subjects selected in any grade should be such as one may contemplate with pleasure. Life is painful enough at first hand without reflecting its sorrows and sufferings from schoolroom walls. Thorwaldsen's "Lion of Lucerne" (Plate XVII, page 92) is admirable when seen by the traveler who visits the "Glacier Garden" once or twice in a lifetime; but the dying agonies of even the king of beasts are not for children to gaze upon continually, nor are such subjects as the "Dying Gaul" or a "Saint Sebastian" or an "Ecce Homo." We do not wish our children to live with one of Barye's masterpieces of animal fury and agony, or with a bloody horror by Verestchagin, or with a "Last Judgment," even Michael Angelo's. We want them to live just as long as possible with the sunshine and the flowers, with the birds and the cherubs, with the saints and the Madonnas.

The pictures selected should "carry," that is, they should be of such a character as to be effective and beautiful when seen at some distance. The photograph of the ceiling of the Sistine Chapel (which by the way should never be hung upon a wall), although fascinating when studied at short range, becomes, when seen from a distance, a patchwork of confused grays. But a good photograph of the wondrous equestrian statue of Bartolommeo Colleoni retains its majesty and challenges the admiration of the observer at almost any distance.

One should select, therefore, only artistic pictures, of appropriate subject and effective composition.

The following is a suggestive list of pictures, classified according to grade:[1] —

Kindergarten and Primary Grades

Madonna of the Chair	Raphael.
Holy Night	Correggio.
Rest in Flight	Knaus.
Children of the Shell	Murillo.
Mother and Child	Brush.
Baby Stuart	Van Dyck.
Age of Innocence	Reynolds.
Feeding her Birds	Millet.
By the Riverside	Lerolle.
Little Rose	Whistler.
Shepherdess Knitting	Millet.
Caritas	Thayer.
Member of the Humane Society	Landseer.
The Connoisseurs	Landseer.
The Blacksmith	Frère.
Escaped Cow	Dupré.
Milan Cathedral.	
Leaning Tower, Pisa.	

Intermediate Grades

Sistine Madonna, Detail	Raphael.
Madonna and Child	Dagnan-Bouveret.
Virgin, Infant Jesus, and St. John	Bourguereau.
Children of Charles I	Van Dyck.
Penelope Boothby	Reynolds.
Shepherdess	Lerolle.
Christmas Chimes	Blashfield.
Brother and Sister	Thayer.
The Gleaners	Millet.

[1] For more extended list of selected works see an appendix.

At the Watering Trough . . .	Dagnan-Bouveret.
Automedon	Regnault.
Horse Fair	Bonheur.
Aurora	Guido Reni.
Kabyl	Shreyer.
Pilgrims going to Church . . .	Boughton.
Paysage	Corot.
St. Mark's.	
Notre Dame.	

Grammar Grades

Virgin, Infant Jesus, and St. John .	Botticelli.
Madonna of the Shop	Dagnan-Bouveret.
Joan of Arc	Bastien Lepage.
Queen Louise	Richter.
Sir Galahad	Watts.
The Haymaker	Adan.
The Sower	Millet.
The Watercarrier	Millet.
Dance of the Nymphs	Corot.
Golden Stair	Burne-Jones.
Reading Homer	Alma-Tadema.
Portrait of Rubens	Rubens.
Washington	Stuart.
Capitol at Washington.	
Doges' Palace.	
Amiens Cathredral.	
Westminster Abbey.	

High School Grades

Sistine Madonna	Raphael.
Virgin Enthroned	Thayer.
Angels	Forli.
St. Catherine	Raphael.
St. Michel and Satan	Guido Reni.
St. Michel and Satan	Raphael.
Frieze of the Prophets . . .	Sargent.
Sibyls	Michael Angelo.

Circe	Burne-Jones.
Portrait of his Mother . . .	Whistler.
Elizabeth Bas	Rembrandt.
Diana's Bath	Corot.
Approach to Venice	Turner.
Ulysses deriding Polyphemus . .	Turner.
Vintage Festival	Alma-Tadema.
Appian Way	Boulanger.
Castle of St. Angelo.	
Acropolis, Pyramid and Sphinx.	
Arch of Titus, Cologne Cathedral.	
Moses	Michael Angelo.

Framing. — Just now fashion would have us believe that photographs, like oil paintings, should be framed without mats. But why? There is no more reason for discarding mats than for using them. The fact is that some pictures require a mat and some do not. Hoffmann's "Christ in the Temple" looks pinched and crowded by the frame without a mat, so also does Alma-Tadema's "Reading Homer" (Plate XVIII, page 93), but such a picture as Rembrandt's "Portrait of Himself" or Murillo's "Children of the Shell" need no mat, they have room enough between figure and frame.

The mat may either enhance or detract from the effectiveness of a picture. A dark picture with a light mat framed in dark wood is thrown into the shade by the mat. The mat gets the first word with every observer. A mat or a frame should surround the picture with "a space of silence," to use Ruskin's phrase. When the mat attracts attention first, when the frame leads people to exclaim "What an elegant frame!" that which should be first has become last and the last first.

A gloomy picture may be made less gloomy by framing with a mat which by contrast heightens the effect of the little light in the picture, or a very light picture may be made richer in tone by contrast with a pale mat; but as a rule the mat should be of a color analogous to the general hue of the picture and of a tone darker than the lights of the picture and lighter than the darks; for if the mat be too light the high lights of the picture seem to lose their brilliancy, and if too dark the deep shades by contrast appear to have lost their depth. Upon a mat of middle tone both the strong lights and the darks hold their own in the scale of values. Sometimes a single line, of the value of the darks of the picture, drawn upon the mat from a quarter to a half inch from the picture, so as to form a circumscribing rectangle, heightens the effect by softening the contrast between picture and mat.

The width of the mat depends upon the character of the picture. The mat isolates the picture by "stopping out" its immediate environment. When viewing a picture from a distance, one is conscious of a wide area of surrounding objects; a wide "space of silence," a wide mat, is required in such cases to focus the attention upon the picture. But a picture crowded with detail, a picture to be explored, to be studied at short range, requires less neutral ground around it. A narrower mat will be of sufficient width.

The picture should be placed slightly above the center of the mat, that the margin above may be less than the margin below. One may reason as to why this should be without arriving at a satisfactory conclusion. We know that to satisfy the eye the upper part of an S and of a B must be slightly smaller than the lower part, and that the tongue of the E and the bar of the H must be above the center; and the fact is that a picture mounted with equal margins above and below appears to have dropped or sagged for some reason, and to be in danger of falling out of the frame.

The frame proper is merely a continuation of the mat, and should, therefore, be unobtrusive. Its color should be analogous to that of the mat, but may be much darker in tone. Ordinarily all glittering surfaces and intricate or obtrusive ornament should be avoided. Flat moldings, which cast little or no shadow upon the picture, finished to show the natural grain of the wood, toned to the right hue and value to harmonize with the picture, and with a single line of delicate beading to give a ripple of light and dark for accent and to show that the picture is worthy of something more than a window sash for protection — such elements combine to produce a frame at once appropriate and durable, in good taste from either the æsthetic or utilitarian point of view. Plate XXI shows a half-tone of a well-framed picture. Notice the relative values of the picture proper, the mat, and the frame, and the relative widths of molding and mat. The molding may be wider than the mat or narrower, usually the latter, for equal widths of dissimilar surfaces are not pleasing. When no mat is used, the frame should be governed by the same considerations. Its functions are similar to those of the mat. A pleasing effect is sometimes obtained by mounting and framing in delicate hues which harmonize by contrast with the hues of the picture, but the practice is not to be strongly recommended.

PLATE XXI.—A WELL FRAMED PICTURE, CARITAS.
(*From the painting by Abbott Thayer.*)

Hanging. — Most pictures are at their best under a side or top light, but in a schoolroom they must often be hung directly opposite the light, or, worse, between two windows. A picture full of detail, or a picture with subtle gradations and delicate tones of light and shade, requires more light than one having large simple masses and strong contrasts; hence, as a rule, such pictures as Corot's "Rainbow" should be placed in a well-lighted place, and "The Sower" of Millet, and other vigorous compositions, reserved for less favored spaces. Sometimes, however, a picture full of light will illume a dark corner so happily that one is inclined to doubt the wisdom of attempting to formulate rules. A picture with a marked effect of light from one side is often most effective when hung so that the actual illumination corresponds with the apparent illumination; that is, if the light in the picture is represented as falling from the left of the observer, the picture may well be hung upon a wall lighted from the left side.

Whether pictures should be suspended from a single hook or from two hooks depends partly upon the evident weight of the picture, and partly upon one's taste in such matters. If it be assumed that the picture should rightly be flat against the wall, and supported without visible means, then the nearer those conditions can be approximated the better. It is safe to say that the picture should be hung in the simplest and most unobtrusive manner possible, and that it should not rest for support upon a shelf or molding beneath, except in extreme cases, where lack of space, or extraordinary weight, make proper spacing impossible.

CASTS

Casts are reproductions of sculpture: (1) "*in the round*," that is, of the entire figure, human or animal, or some detail of it, as a bust; and (2) *in relief*, of which there are three varieties, — very low relief, called *bas-relief*, very high relief, called *alto relief*, and medium or *mezzo relief*. The tendency in America is to discard this classification and these terms, and to make but two classes, designating them in plain English as low relief and high relief. The intaglio is a low relief reversed, that is, the depressions of the one answer to the elevations of surface in the other. Intaglios are seldom of large size, and therefore not to be considered here.

Qualities. — Casts are commonly made from "piece molds" — molds made in sections; hence upon a good fresh cast delicate lines are visible which mark the subdivisions of the mold. These are sometimes carefully removed before the cast is considered perfect. In cheap casts they are always removed. If the sections of the mold are not perfectly adjusted before being filled with plaster, these lines reveal the fact; hence in such cases they are immediately removed because of their tell-tale character, and the cast scoured down to a smooth surface. A moment's reflection will convince one that the subtle qualities of the original, the refined lines and delicate modeling, may be entirely lost during such a process of sandpapering. It is therefore the habit of connoisseurs to select the cast before the mold lines are removed. The safe course for a non-professional who wishes casts of good quality is to secure them through reputable dealers only.

PLATE XXII. — MADONNA AND CHILD. (DONATELLO.) A LOW RELIEF UNDER A FULL FRONT LIGHT. DETAIL LOST, CAST FLAT AND INEFFECTIVE.

PLATE XXIII.—THE SAME RELIEF UNDER A SIDE LIGHT. DETAIL MORE EVIDENT, BUT DARKS ACCENT TOO SHARPLY UNIMPORTANT PARTS.

Fresh casts are bright white in color, a most trying tone for the eye, and awkward to manage in most decorative schemes. They should be toned to "ivory," or cream white, which approximates the mellow tone of old marble, but should not be stained yellow, as cheap casts often are. A good cast, properly toned and appropriately placed, is so effective a piece of decoration that in a room with framed pictures it may easily become the chief ornamental feature. Nothing is more charming in a kindergarten or primary room than a Bambino upon the wall above the teacher's desk, with his hands spread out invitingly to the children.

Casts in the Round. — The beauty of a cast depends so largely upon position and illumination that the beauty of even the best cast may be practically destroyed by carelessness in these matters.

When "Rogers' groups" were in vogue they were usually placed upon a table or pedestal in a bay window, the worst imaginable place for a cast, so far as displaying its beauty is concerned, but the best possible place for it to advertise the fact of its possession and display one's vanity to the public. The best place for a cast in the round is probably a niche in the wall, where the cast may be seen at the most effective angle, under the best light, and against a softly modulated background. The next best is against a well-toned wall, where the light falls from one side only, or near a corner where the light reflected from a wall relieves the intensity of shade upon the dark side of the cast. A cast should never be placed against a blackboard. If the cast is a statuette or a bust, it may stand upon a table, a bookcase, or upon a bracket of unobtrusive design; but if of larger size, three feet high or more, it should be placed upon a pedestal of good proportions, refined line, and quiet color. A plaster pedestal with ornaments, plus a placard giving data, monopolize too much attention. A good pedestal may be made by any skilled carpenter from such a drawing as is shown in Fig. 15. The height of the pedestal, and therefore its proportions throughout, must be determined by the size of the cast and the position it should occupy. The "Ludovisi Mars" or the "Apollo Belvidere," for example, should be seen at about the level of the eye, the winged "Victory of Samothrace" is best slightly above, and the "Victory of Painios" very much above the level of the eye. The unobtrusive label, a gray card with lettering in black, may be added at *a*, or perhaps flat upon the top of the pedestal, where it attracts no attention whatever, but is always at hand to serve those who wish to be instructed.

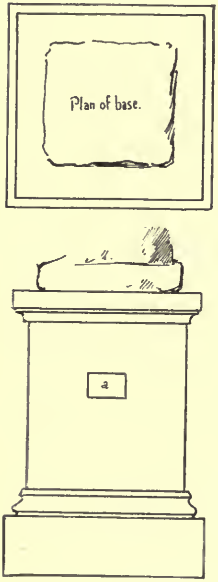


FIG. 15. — PEDESTAL.

In Relief. — Under certain conditions a cast in the round or a very high relief may be hung opposite the light in a schoolroom, but a low relief should never be so hung. Plates XXII, XXIII, and XXIV show the same relief under three different illuminations: first, full front light; second, a side light at random; third, a selected side light. There can be no question as to which is preferable.

PLATE XXIV.—THE SAME RELIEF UNDER A SELECTED SIDE LIGHT. DETAIL CLEAR, LIGHT MASSED UPON THE IMPORTANT OBJECTS.

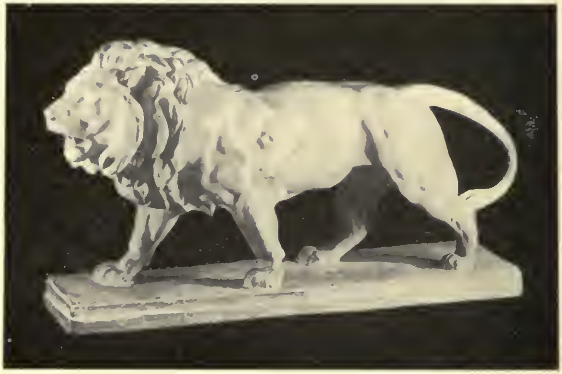


PLATE XXV.—CASTS: LION, BY BARYE. INFANT ST. JOHN, BY DONATELLO. BAMBINO, BY DELLA ROBBIA.

A relief of small size may be stood upon a bookcase and tilted against the wall like an ornamental tile if the conditions of light and height allow it, but a larger cast should be hung, not by cords like a picture, but flat against the wall by means of hooks at the back. A cast has the appearance of weight, and, if hung like a picture, gives the impression of being about to pitch for-

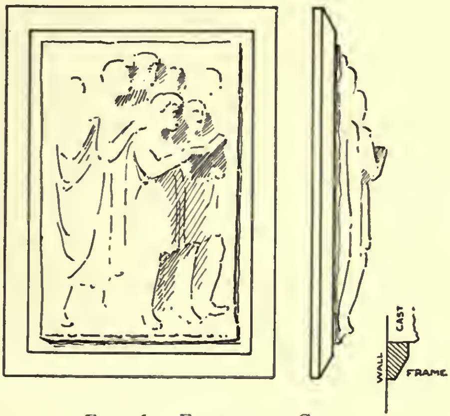


FIG. 16. — FRAME FOR CAST.

ward into the room. Very heavy casts require the additional support of a projecting molding or bracket.

A cast of decorative outline, like a Bambino, looks well upon the wall without accessories of any sort (see Plate XXV), but certain other casts of more or less irregular outline seem to require something to relieve the apparently unfinished, unrelated aspect which they present from some points of view. Architects have used casts with most charming effect above a fireplace or mantle, by imbedding them in the wall so deeply that the surrounding surface, plain or molded, forms a frame. It is usually impracticable to use casts that way in the schoolroom, although there is no good reason why they should not be set into the walls when the building is in process; but it is possible to hang a cast within a frame in such a manner that this impression of unrelatedness may be greatly reduced (Fig. 16). The frame should be perfectly plain, made of some wood to harmonize with the finish, or painted the proper color to mediate between the wall and the cast, or it may be made of rough plank, as indicated in the sketch, and covered with burlap of appropriate color, perhaps with the ordinary burlap. Some casts, however, would better not be framed singly. The Frieze of the Parthenon, for example, was originally intended to be lighted from below and seen from below, the separate sections forming a continuous band of enriched surface high above the eye. A single fragment of this noble frieze is never quite satisfactory; several sections side by side are needed to give the spirit of the original, and these should be placed as high as possible above the eye. A portion of the frieze is used effectually in the Medford High School Hall, Plate XXVI. On the other hand, each Metope of the Parthenon has a unity of its own, and was originally framed in marble, so to speak, and hence is perfectly adapted to the requirements of schoolroom wall decoration.

Subjects. — Little children like casts of animals like Barye's "Walking Lion," and of children like Donatello's "St. John" (see Plate XXV), but often a relief strikes them as a curiosity, and all perception of its beauty is swallowed up of wonder. In the upper grades the fine qualities of reliefs are more likely to be appreciated.

PLATE XXVI.—A WELL DECORATED INTERIOR. HALL OF THE HIGH SCHOOL, MEDFORD, MASS.

Notice relations between pictures, casts, and wall spaces. Effect temperate, but rich.

Hartwell, Richardson & Driver,
Architects, Boston.

PLATE XXVII.—THE HIGH SCHOOL LIBRARY, SPRINGFIELD, MASS.

Hartwell, Richardson & Driver,
Architects, Boston.

Moreover, in casts for public mixed schools the treatment of the subject should be considered with some regard to American ideals. We are not Greeks or Frenchmen. Artists make a nice distinction between the nude and the naked, a distinction all ought to make who have the selection of casts or pictures for schools.

The following is a classified list of the best casts: —

Kindergarten and Primary Grades

In the Round

Infant St. John	Donatello.
Singing Cherubs.	
Elephant Running	Barye.
Rabbit Reclining	Barye.

In Relief

Bambino	Della Robbia.
Madonna and Child	Donatello.

Intermediate Grades

In the Round

St. George	Donatello.
Youthful St. John	Donatello.
Lion Walking	Barye.
Panther Reclining	Barye.

In Relief

Madonna and Child	Michael Angelo
Choir Boys — with Book . . .	Della Robbia.
Flight of Time	Hunt.

Grammar Grades

In the Round

Young Augustus.
Sphinx, British Museum.
Victory of Samothrace.

David	Mercie.
Washington	Houdon.

In Relief

Chariot Race (starting).	
Triumph of Alexander.	
Choir Boys with Scroll	Della Robbia.
Angels bearing Wreaths	Ghilberti.
Victory untying Sandals.	

High School Grades

In the Round

Hermes of Olympia.	
Apollo Belvidere.	
Venus Milo.	
Sophocles.	
Narcissus.	
Homer, of Naples.	
Zeus Atricoli.	
Lorenzo de' Medici	Michael Angelo.
David	Michael Angelo.

In Relief

Victory dedicating a Trophy.	
Bacchante (with arm above head).	
Apollo and the Muses.	
Angels with Musical Instruments . .	Donatello.
Sections of the Parthenon Frieze.	

OTHER BEAUTIFUL OBJECTS

VASES

Vases are of two sorts: those which are for use, and those which exist for their own sake only, like beauty. Vases of the first sort must be appropriate to their uses. Vases of the second sort have no excuse for being if they are not beautiful in form, or beautiful in




PLATE XXVIII.—THE FIGHTING TÉMÉRAIRE, BY TURNER. THE MADONNA OF THE CHAIR, BY RAPHAEL. FEEDING HER BIRDS, BY MILLET. NOTRE DAME, PARIS.

PLATE XXIX.—(1) TWO FLOWER VASES AND AN ORNAMENTAL JAR. (2) TWO FLOWER VASES AND A JAPANESE FIGURE.

All inexpensive objects, each excellent in its place.

color, or both. These are the vases *par excellence.* For a choice vase of this sort a Greek would give a score of slaves, a Roman barter an estate, and an English nobleman pay five thousand pounds. To produce such a vase a Chinese potter would give his life.

This is not the place to treat even suggestively what constitutes beauty in vase forms, but after observing for several years the character of the bric-à-brac often collected by well-meaning persons, one is tempted to define negatively the more obvious features of a beautiful vase.

1. A vase with excrescences upon the surface, clay roses and the like, *which break up the contour lines,* is not good.

2. A vase with naturalistic flowers painted upon the surface in brilliant colors and gold is to be avoided.

3. A vase with a scalloped or waved lip is bad.

4. A vase with a rough granulated surface which catches the dust, and reduces the surface to a dull lustreless finish is not desirable.

5. A vase with ugly proportions and loose unrefined curves is bad. What constitutes good proportion and refined curvature may not be stated off hand, but one might say that equality in the measures of dissimilar parts is unpleasing (for example, length of neck and length of body, width of lip and width of body, width of body and width of base), and that as a rule circular and irregular or broken curves in the contour are not beautiful. For illustrations of beautiful vase forms, see Plates XXIX, XXX, and XXXI. Notice the subtle proportions, the temperate and refined curves, the exquisite play of light over the glowing surfaces.

When purchasing vases for decorative purposes remember that one beautiful thing is worth more than any number of commonplace things. It is the habit of some to buy one little bit of pottery because it is pretty and cheap, and another for the same reason, and another, because they cannot afford to purchase more expensive things. Presently the room becomes cluttered, and the price paid for the bewildering collection is greater than the cost of some really beautiful treasure — some exquisite vase which is in itself almost enough to furnish an apartment with beauty.

Professor Morse of Salem has said that a Japanese nobleman would never think of crowding his walls with pictures or his stands with vases; that is pure ostentation, as inartistic as it is vulgar. He has his collection of treasures from which he selects a picture or a vase, according to his mood, and places it in the best possible light where his friends and himself can enjoy its beauty to the full. When another is to be enjoyed, the first is returned to its place in the cabinet. We have much to learn from the Japanese: not quantity, but quality should be the standard; not how much clay and pigment for the money, but how much loveliness.

If the first vase selected is tall and stately, let the next be of a different form and of some harmonizing color. If the vases are to be placed side by side, each should enhance by contrast the beauty of its companion, like a handsome and noble man by the side of a queenly woman — "each the other adorning." Plates XXIX, XXX, and XXXI show several simple groups of vases arranged by Mr. Bunkio Matsuki of Tokio and Boston, who has done so much for art instruction in

PLATE XXX.—THE SACRED LILY FITLY SET.

The vase an object of use, primarily, but a thing of beauty because in perfect harmony with other objects in the group.

PLATE XXXI.—AN OBJECT OF BEAUTY.

One such object is more desirable as a piece of decorative furnishing than a dozen cheap, inartistic things.

America through his active interest in our public schools. These groups will richly repay careful study: they are not the work of an amateur. The Japanese have practiced the grouping of objects until they are as sensitive to balance of mass, contrast of hue, and harmony of color as we are to heat and cold.

TILES

Colored tiles are suitable for schoolroom decoration because of their beauty and durability, and especially because by means of them the color of the room may be enriched.

An ancient Persian tile is quite as marvellously colored, in its way, as a rare Persian rug; some of the tiles of the Moors are wonders of design and color, to say nothing of their purely technical qualities; and an old Dutch tile is as quaint as the peasants of Maarken and as lovely as the sky over the North Sea.

In recent years the art of tile-making has been revived in America with conspicuous success. Tiles of pretty pattern and of exquisite color may be had at reasonable prices from the stores of any first-class manufactory. Tiles group well with vases because while harmonizing in kind they vary in pattern and qualities of surface and contrast sharply in line.

Plate XXXII shows half-tone reproductions of water-color drawings of groups, showing the effective use of tiles as decorative material.

To describe a beautiful tile, that a novice may be guided in selecting, is even more difficult than to describe a beautiful vase. About all that can be said is: —

(1) Avoid, as a rule, all tiles with figures in high relief.

(2) Reject those which attempt the naturalistic representation of flowers, butterflies, etc.

(3) Do not purchase, even "at a bargain," tiles which are ugly in pattern or inharmonious in color. Such things cost too much even when acquired as gifts.[1]

(4) Do not purchase a number of small tiles; put the money into one or two large beauties, which have sufficient dignity to stand alone, so to speak, without giving the impression of being pieces of something.

VASES FOR FLOWERS

Vases which are to serve as receptacles for flowers are primarily objects of use; their office is subordinate, they no longer hold first place, hence they should have certain well-defined characteristics.

1. A vase for flowers should be stable, able to stand securely upon its feet, and that without being ballasted with sand as in the days of our great-grandmothers.

2. It should have a form which does not interfere with its use. Here are illustrations of forms adapted to various kinds and groups of flowers. (See Fig. 17.)

3. It should have a color which will harmonize with the colors of flowers either by analogy or contrast. A clear glass or a delicately tinted glass is always safe, for

[1] A word might be added as to the acceptance of gifts for the schoolroom. The subject is a delicate one. Gifts of money are preferable, that with it persons of good taste in art matters may purchase right things. To forestall the necessity of accepting and hanging anything and everything, the school committee might make a rule that no work of art is to be accepted for schoolroom decoration without the approval of a committee of three competent persons, one a teacher.

PLATE XXXII.—ILLUSTRATIONS OF THE EFFECTIVE USE OF A FIGURED TILE IN A DECORATIVE GROUP.

its color is modified by whatever is placed within it. As a rule, the brilliantly colored vases are to be avoided, for their colors vie with those of the flowers themselves.

4. It ought not to be necessary to add that a flower vase should not itself be obtrusively decorated with flowers. It is not the province of art to rival nature. No flowers modeled in clay, no painted representation of a flower, though outlined with gold and set with jewels, can for a moment compete successfully with any flower of the fields.

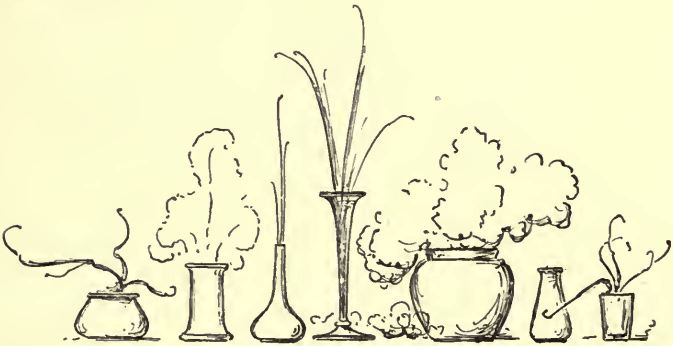


FIG. 17.— VASES FOR FLOWERS.

FLOWERS

Nothing, except a charming teacher, adds so much to the cheerfulness and beauty of a schoolroom as a few fresh flowers at the window or in a vase upon the teacher's desk.

A window garden may be simply a tray to fit the window stool and containing a group of potted plants, or it may be a water tight box filled with earth, — a veritable garden in miniature. In either case it will require constant care, of the sort which few if any janitors will or can bestow. "How *do* you manage to have such beautiful plants always in blossom?" once asked a teacher of another; "my plants won't bloom." "I love mine so," was the reply, "that they can't help blooming for me." Love, no doubt, would be found to be in the final analysis the secret of the success of the window garden.

An aquarium is not to be despised as a piece of decoration, especially for the lower grades. Its color is fresh and its life makes a living picture ever full of interest.[1]

Bouquets of flowers for the teacher's desk need not be the round-headed, Joseph's-coat-like clumps so popular in the extremely rural districts. If masses of flowers are desired, let the flowers be of one kind, or at most of two contrasting kinds, arranged not in a compact head, but loosely, to show the characteristic lines of growth which are often quite as charming as the flowers themselves. The rough sketches on page 119 will be suggestive. The vase as well as the flowers should be considered in any arrangement — the lines of one will supplement or complement the lines of the other, that both together may compose a mass, in which line, texture, and color will combine to produce a beautiful whole.

Plates XXXIII to XXXVI inclusive are from photographs taken by Professor Clarence Moores Weed of the New Hampshire College of Agriculture at Durham from flower arrangements of his own, will help establish ideals of good form. Such a book as "Japanese Flower

[1] For suggestions for making an aquarium see Teachers' Leaflets No. 11, by Mary F. Rogers. Published April, 1898. College of Agriculture, Cornell University, Ithaca, N. Y.

By permission of Clarence Moores Weed, Durham, N. H.

PLATE XXXIII.—THE EFFECTIVE USE OF THE JARDINIÈRE.

By permission of Clarence Moores Weed, Durham, N. H.

PLATE XXXIV.—AN APPROPRIATE VASE FOR A SINGLE PLANT, TO DISPLAY BEAUTY OF FORM IN LEAF STEM, AND BLOSSOM.

Arrangement," by Josiah Conder, will show to what extent the science of arrangement may be carried, and will yield the thoughtful reader rich returns.

But after all has been said, the fact remains that beauty will not come by prescriptions. A person of artistic temperament and training will produce an artistic room. Happy is that school board which has in its employ a teacher whose presence creates beauty. She is more precious than rubies. Her ways are ways of pleasantness, and all her paths are peace. She is a tree of life to them that are under her instruction, and happy are they that retain her.

CHAPTER VIII

THE OLD COUNTRY SCHOOLROOM

In out-of-the-way corners of the country and elsewhere are still to be found the little old-fashioned schoolhouses of uncertain age, where the fathers and their fathers for many generations have fought the good fight and laid hold on education. Many of these weather-beaten structures are rather picturesque, with their much-climbed trees and worn-out yards.[1] But within, they are often forlorn and ugly. The young woman fresh from the Normal School, with her high ideals gathered from the model schoolrooms of her *Alma Mater*, looks at the begrimed and falling ceiling, at the dingy walls with their unsightly cracks, at the dusty rough blackboards, at the unwashed windows, the weather-stained and tattered curtains, at the battered and incised desks, the coarse floor with knots and nail-heads in high relief — what wonder that she longs to be promoted to a village school with modern furnishings!

But some of these ills can be cured, and therefore need not be long endured. Indeed, it is just possible that the room contains unsightly elements in the form

[1] For improving the yard, see suggestions in Bulletin No. 160, by L. H. Bailey. Published January, 1899. Cornell University Agricultural Experiment Station, Ithaca, N. Y.

By permission of Clarence Moores Weed, Durham, N. H.

PLATE XXXV. — VASES APPROPRIATE TO THE FLOWERS THEY HOLD, BOTH IN FORM AND COLOR.

By permission of Clarence Moores Weed, Durham, N. H.

PLATE XXXVI.—A WELL PLACED FLOWER.

The vase echoes, reversed, the form of flower and seed pod, and contrasts strongly with the leaves, both in form and texture.

of decorations, which may be eliminated at once. Are there advertising cards and cheap chromos pasted or tacked upon the wall, or bouquets of dried grasses and tissue paper flowers? Are there old discolored maps, faded prints of educators and authors, examples of pupils' work, wilted and dust-covered?

The maps and the notables should be put into the closet for possible future reference, and all the rubbish should be burned.

A scrubbing party may now be organized and the room cleaned thoroughly from ceiling to floor, then, if nothing more satisfactory can be done, any mason can be hired to whitewash the walls. But before resorting to so extreme a measure as pure whitewash, one may think a bit. A tinted kalsomine will cost but little if any more than whitewash. Consider the color of the woodwork. It may not be so bad, now that it has been cleansed, and if it is rather too bad after all, possibly the school committee man, now that he has discovered a teacher who means business, would be willing to have the woodwork painted a single coat, not much different in color from the old, perhaps, but sufficient to give the room a fresher look. A tint may be selected for the walls, similar to the color of the woodwork, but lighter, and by adding white to the wall tint, a more delicate tint for the ceiling may be produced. The old blackboards shall be kept as tidy as possible — surface clean, chalk trays swept — and the whole room shall be swept and dusted every day.

The windows may be furnished as follows: procure for each window cambric of the right size and color to make a curtain three inches wider and three inches longer than the opening, a thin flat strip of wood equal to the width of the curtain, a round stick of the same length, and a cord twice as long as the curtain. Find the middle of this cord and fasten it by a single tack to the middle of the lower edge of the window cap. Now tack one end of the curtain to the thin flat strip and the other end to the round rod; and, folding the curtain over the flat stick to cover it, fasten the stick to the window cap, taking care to have one part of the cord fall behind the curtain and one part in front of it. The curtain may now be rolled up upon the round rod, and fastened at any desired height by tying the cords. One or two flowering plants, — geraniums are hardy and cheerful, — placed upon the window stool, and grouped prettily, will complete the transformation.

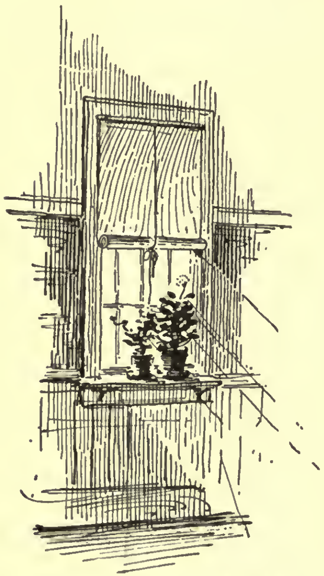


FIG. 18. — AN ATTRACTIVE WINDOW.

Upon the teacher's desk shall stand a clear glass tumbler or a simple vase of some sort, filled daily with fresh water. There shall be kept the daily offering of cut flowers. Not a collection of them, not a confused bunch of all colors, but a few of one kind only at a time, arranged to show their graceful forms and pure colors to the best advantage. The children will be glad to help furnish them, and at the close of the session to take them to their little friends who happen to be ill at home.

A piece of denim, green gray, or some other soft color, stretched over a tablet of thin boards, may be fitted into some narrow space between the window and a door, or elsewhere, to serve as a bulletin board for the display of excellent work or reference material. Hereafter such things shall not be tacked along the top of the blackboard, nor hung upon lines like washing.

For wall pictures, one must have the best or none. The teacher may have a beautiful picture of her own, a photograph from some famous old master, that might be loaned to the school for a few days. Movements might be started to secure by subscription or otherwise one or two beautiful things. During the five years prior to 1897 works of art were procured for schools in more than seventy cities and towns in Massachusetts at a total cost of nearly twenty thousand dollars, and yet none of this money came from the public funds; it was raised through the activity of teachers and others interested in more beautiful schoolrooms, raised by subscription, by contributions, by means of entertainments given by school children. Where there's a will there's a way. It may be that in the town lives some rich person who will gladly give a fine photograph or a cast, and who needs but an invitation.

But suppose such things cannot be had. An old picture frame may be found, scraped, rubbed down with oil or shellac, a glass fitted into it, and a back made, which may be removed easily. A full-page engraving from a magazine, a half-tone reproduction, a Japanese print, an unmounted photograph, — such pictures anybody can procure in these days, — these may be mounted on gray cards of uniform size to fit the frame, and each displayed for a day or two, or a week or more.

In any event the teacher should decree that nothing but beautiful things shall be hung upon the walls. Better bare walls than debased and debasing art; better nothing in the way of decoration than decoration which is worse than nothing. The following list may prove useful to the country teacher who wishes to be able to name *one* desirable work of art, and then another and another, as interest increases: —

Caritas	Abbott Thayer.
Feeding Her Birds	Millet.
Madonna of the Chair	Raphael.
Lion (cast)	Barye.
A Cathedral, Notre Dame, Canterbury, or Amiens.	
The Aurora	Guido Reni.
Paysage	Carot.
Automedon	Regnault.
A Bambino (cast)	Della Robbia.
Sir Galahad	Watts.
Old Téméraire	Turner.
Infant St. John (cast)	Donatello.

Make a bold beginning and believe in your ultimate success in securing what you want for the children.

"As garment draws the garment's hem,
Men their fortunes bring with them.
By right or wrong
Lands and goods go to the strong —
Property will brutely draw
Still to the proprietor;
Silver to silver creep and wind,
And kind to kind."

CHAPTER IX

SCHOOL CHILDREN

It cannot be too clearly understood that the function of education is to prepare the child for his life-work, and the true test of the value of an educational course lies in whether it fulfills this end. In order that this preparation may be complete, the physical side of the child's nature must be embraced within its scope, as well as the mental and moral sides. By the physical side is not meant necessarily physical culture alone, but the general hygiene of the child, including the care of the body and the protection against various diseases common to school children. From the time that a child enters the schoolhouse he is subject to its influence. If the school seats and desks are not right, he is likely to be afflicted with spinal curvature or some other deformity. If the lighting is defective, his eyes are almost sure to suffer. If the building is in a noisy neighborhood, the result will be evident on his nerves. If the sanitary condition of the school is not good, he is subject to the dangers of some of the infectious diseases that come from unsanitary conditions. Furthermore, if a proper supervision is not kept of the children themselves as to their cleanliness and freedom from disease, he is again subjected to the dangers common to school life. So that from the moment of the opening of the school, the greatest care should be taken to have all of these factors which tend to exert an unhealthful influence upon the child reduced to a minimum.

At conventions and teachers' meetings much time is spent discussing the sequence of studies, the proper age or grade in which arithmetic, or geography, or grammar, may be taught the child with best results; and yet until within the last few years almost no attention has been given to the physical and sanitary side of school life. In regard to physical culture itself, in many towns gymnastics has been too much the fad, and much more attention has been given to physical culture than to all other departments of the school together. In a few instances, however, teachers have become interested in the sanitary welfare of the school, and have attempted to carry out much-needed reforms; but as far as concerted thought and action are concerned, little time has been devoted to the sanitary conditions of schools. The teachers have been allowed to shift about for themselves. Bad effects are the results of this, as are seen throughout the United States, in the proportion of bad eyes, curved spines, and otherwise crippled bodies which too often mark the public school pupil. However, there have been waves of reform spreading throughout the teaching fraternity, and it is only hoped that these waves will become tidal.

To return to the child himself. It has been found in many instances that teachers have been misunderstanding some of their pupils, as they have perhaps thought a boy to be dull and stupid, while in reality he could not hear distinctly the questions put to him; or perhaps he could not see the blackboard or the page of the book, on account of some trouble with his eyes. If such defects can be discovered and made known to the teacher, such pupils could be favored. For example, one that is slightly hard of hearing could be given a front seat, or one with defective eyes could be provided with glasses, or placed in a better light, or given a seat enabling him to see the blackboard. Thus it may be seen that the arrangement of the children in the room is a matter of vital importance, especially to those children who are suffering from defects of one or more of the senses. By favoring individual cases it is possible for the teacher to bring out pupils who up to that time had passed as stupid, and had been subject to ridicule by their classmates. Laughter from other pupils at supposed mistakes, which were mistakes only because of the inability of the child to understand the question, naturally would tend to make such a one withdraw within himself and become habitually silent. A little attention on the part of the teacher to such cases will often develop a remarkably bright pupil who otherwise would be allowed to remain in the same grade for several terms as incapable of advancement.

It is not the intention to give the idea that all cases of stupidity or dullness are due to these causes, for it is only too well known that there are many *bona-fide* instances of weak minds among the pupils in our public schools.

In regard to regulation of the school work, the teachers have their work usually planned for them. They are given a certain amount of ground to cover. They must use individual discretion, however, in working their pupils, taking care not to force the whole class in order to make them keep up with one or two exceptionally bright children. It is far better to hold the quickest ones back, or perhaps put them in a higher grade, than to attempt to push beyond their capacity a whole class of average ability. Much injury can be done by this process of forcing, and care should be exercised on the part of the teacher to accommodate the work to the capabilities of the age, sex, and individual weaknesses of her flock.

Most school children are quite incapable of looking after their own health. As a rule, they do not understand the importance of good ventilation, hygienic furniture, and cleanly habits; so that everything must be done to save them from physical harm while in school. And yet, as seen in Chapter V, there are many diseases brought about in pupils owing to defective furniture. The seats and desks, if not the proper height from the floor and distance from each other, tend to bring about bodily deformities that cling throughout life.

Physicians have made a special study of these school deformities, among the most common of which is curvature of the spine.

SPINAL CURVATURE

The fact appears to be clearly established that nearly all cases of spinal curvature can be directly traced to school life. It is almost never an inherited trouble. Of the 23,293 children born in a Paris maternity hospital, only one was affected with this deformity. Eulenberg cites some very interesting statistics as to the age at which lateral curvature of the spine originates, his researches covering a thousand cases.

	Cases.	Per cent
Before the second year	5	.50
Between second and third years . . .	21	2.10
Between third and fourth years . . .	9	.90
Between fourth and fifth years . . .	10	1.00
Between fifth and sixth years	33	3.30
Between sixth and seventh years . . .	216	21.60
Between seventh and tenth years . . .	564	56.40
Between tenth and fourteenth years . .	107	10.70
Between fourteenth and twentieth years . .	28	2.80
Between twentieth and thirtieth years . .	7	.70

This table shows that 95.8 per cent of this one thousand cases originated between the ages of four and twenty, and 92 per cent between the ages of five and fourteen. The sex of the child seems to have some influence upon predisposing to this lateral curvature, for there are about four times as many cases occurring in females as in males.

Posterior curvature or "round shoulders" is a spinal deformity brought about by the children remaining in faulty positions, such as stooping forward over a desk, or bending over their books, or by the use of an improper seat which causes the spinal column to sag between the two points of support. Aside from detracting much from the personal appearance, such deformity is unfortunate because it impedes respiration and other functions. To prevent these deformities so common in school, the following points may be noted: —

First, the pupil should be furnished with a desk of proper height, but not so high that the right arm and shoulder must be raised in writing. Place the desk close enough to the pupil that he may not be compelled to lean forward in using it. The seat must be of the proper height and shape, and the back rest must support the spine where this support is needed.

Second, if the child is subjected to any duty for a prolonged period, even if properly seated, there is danger of physical injury, therefore the teacher should allow frequent pauses to rest the eyes and the brain, and if possible by active play enable the muscular system to rectify any tendency to deformity.

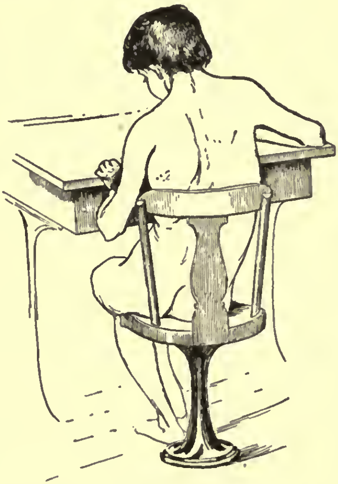


FIG. 19.—DISTORTED POSITION CAUSED BY A HIGH DESK.

Third, the faulty slope of the characters in the child's copy-book, the faulty positions of the book itself, often lead the pupil to twist himself into vicious postures. In nearly all instances in which it has been possible to compare the positions of those pupils using the vertical system of writing and those using the sloping system, the best position is assumed by the vertical writer.

Fourth, the child should never be kept standing long at a time. For when tired, he will assume a faulty position which may finally produce curvature of the spine.

Chorea, or St. Vitus' dance, is a disease common to school children. Every teacher should be able to recognize the jerky twitchings, the shuffling of feet, the contortions and twitching of eyelids, which characterize the disease. Children suffering from it require a prolonged rest from school work, and the welfare of the school demands that severe cases shall be excluded.

Hysteria assumes various forms and may occasionally simulate a simple faint or an epileptic fit. It is distinguished from the former by the absence of the extreme pallor of the face and lips which characterize fainting; and from the latter by the fact that the hysterical patient is usually not completely unconscious, as is shown by the attempts to attract sympathy and attention and by the flinching which occurs when the white of the eye is touched with the point of the finger. The patient should be treated firmly, though kindly, and not allowed to attract too much attention.

Defects of hearing are more or less common among school children, and often exist to a degree that interferes with the progress of the pupil, and yet this defect may not be suspected by parents, teachers, or by the pupils themselves. The cause of deafness in children in many cases may be traced back to a previous case of scarlet fever or measles, and a few cases are found where the ear had been severely boxed or pulled, thus causing the drum-head to be ruptured or strained, with consequent deafness. Some cases have been caused by cold water passing from the mouth up into the drum through the Eustachian tube, while the child was bathing. Diphtheria, whooping cough, and mumps also sometimes affect the hearing of the child. An examination of 5902 school children by a celebrated Berlin aurist showed that 1392, or 23.6 per cent., had defective or diseased ears. While all of the deformities and diseases just mentioned are of the greatest importance, because of their universal prevalence, there is no group of disorders so vitally important as those diseases classed as contagious and infectious.

CONTAGIOUS DISEASES

Undoubtedly the public schools often serve as a medium for spreading communicable diseases. Without a medical inspection of the school children, it is next to impossible to rid the public schools from very serious dangers. These diseases may arise in connection with school life, through children suffering from the early symptoms of a disease, convalescing from a disease, or perhaps, healthy themselves, coming from homes in which there is a contagious disease. In the early stages measles, whooping cough, mumps, scarlet fever, and diphtheria often creep into the schoolroom, and, unless medical inspection is in vogue, it is essential in order to eliminate these cases that teachers and parents should be familiar with the early symptoms, indicating these various diseases, and know the length of time during which these diseases are communicable.

Diphtheria is perhaps the most serious of the various school diseases. But modern bacteriology enables the physician to diagnose cases of this disease very accurately a very few hours after the patient is suspected.

Furthermore, by means of the same bacteriological methods it is possible to determine when it is safe to return the child to school without danger to the other children. The presence of sore throat and feverishness in any pupil would always justify the teacher in sending the case home with a note.

Small-pox is comparatively rare among school children. Chicken-pox, on the other hand, is quite common and is apt to appear without any warning other than slight feverishness. The rash comes out in twenty-four hours, and while at first nothing but pimples, they speedily become clear vesicles. In many ways chicken-pox is difficult for one not an expert to diagnose from modified small-pox. But the rash in small-pox seldom, if ever, appears on the scalp as it does in chicken-pox.

Scarlet fever is a very important school disease. It is serious because of the after effects with which it is likely to leave the child. Any child at school who is sick and has a hot, dry skin, should be sent home immediately. If it is scarlet fever, within twenty-four hours a form of red rash appears on the chest, soon becoming a scarlet blush and spreading to the other parts. It often happens that the disease is so slight that the pupils may come to school throughout, and finally be discovered only by the occurrence of the characteristic peeling, or dropsy due to chill affecting the kidneys, which may occur after the mildest cases.

Measles comes on with all the symptoms of a severe cold in the head with an unusual amount of fever. At the end of seventy-two hours, red blotchy spots appear on the face, hands, and other parts. The rapid spreading of this disease in schools is greatly aided by the fact that it is infectious three or four days before the eruption appears.

Whooping cough, although oftentimes regarded as an insignificant disease, is not at all such. Every teacher should be familiar with the whoop and send home immediately any child who has it, or even if the child has a cough severe enough to produce nausea.

Mumps is a disease serious enough to be excluded from the schools. It comes on with feverishness and pain near the ear, followed by an enlargement of the parotid salivary glands. Any child with a suspicion of it should be sent home.

Tuberculosis has not usually been given much attention in our public schools, and yet undoubtedly it is at this period of a person's life that the seed of the disease is sown. It has been quite satisfactorily shown that tubercular infection is caused in the majority of cases by breathing the tuberculous germs that come from the dried sputum that is being blown about in the air as dust. In schools of higher grades, consumptive pupils sit at their desks among other pupils, entirely unconscious of danger or wrong to others, and yet themselves are a source of infection to their fellow-pupils. If the sputum be properly disposed of, the presence of a consumptive is not dangerous. Only tuberculosis of the lungs should make the exclusion from school imperative. In order to have thorough protection against this disease, there should be strict rules forbidding scholars and teachers spitting upon the floors and insisting upon great care against raising dust in the schoolroom. Scholars with lung diseases should stay away from school, both in order to avoid endangering their schoolmates, and to hasten their own recovery.

In all of these contagious diseases a period of time elapses between the reception of the infection in the system and the beginning of those symptoms which characterize the disease. This is called the period of incubation. The following table will give the incubation periods for the more common diseases, although the figures here given are subject to slight variations: —

Diphtheria from two to seven days.
Scarlet fever from two to five days.
Measles about eight days.
German measles from fourteen to twenty days.
Small-pox from ten to twelve days.
Chicken-pox from thirteen to fourteen days.
Whooping cough about six days.
Mumps from fourteen to twenty-one days.

Another period of great importance in these diseases is the period of infectiousness. This is the length of time during which the child who has or has had an infectious disease should be considered dangerous to other children, and therefore should be excluded from school. In diphtheria, the child should not be readmitted until the bacteriological cultures indicate the absence of the diphtheria bacilli from the throat of the patient. This time is usually not less than three or four weeks. For scarlet fever it is not less than six weeks, or longer than this if the desquamation is not complete; for measles from two to four weeks; for German measles not earlier than two weeks from the appearance of the rash. Small-pox is infectious until the last trace of crust has been cleared from the skin and hair. Chicken-pox is infectious until every scab has fallen off; mumps until four weeks from the beginning of the disease, if all swelling has disappeared; whooping cough usually not less than eight weeks.

Typhoid fever and malaria may arise from unsanitary conditions about the building, the water supply, or the drainage. While typhoid fever is not a contagious disease, it is caused by bacterial infection, and precaution should be taken to protect the water supply from pollution.

The matter of disinfection in schools is quite important, particularly if there has been a school epidemic. The old-fashioned method of burning sulphur cannot be wholly depended upon, nor can formaldehyde gas; these should be supplemented by scrubbing the infected room and furniture with some liquid disinfectant. As regards the disinfection of books, no reliable method has as yet been devised, and the safest way is undoubtedly to burn those books that have been used by the infected pupils.

No other precaution against the various school diseases, particularly the contagious diseases, is as effective as the medical inspection of teachers and pupils. Sanitary inspection has been mentioned in another chapter in connection with the school building and its surroundings, and that is very important. But its effects are not so quickly realized as in the case of the medical inspection. Many look upon these innovations as novel experiments, instituted by city boards of health for the purpose of giving physicians some pay and little work. They are not experiments, and no money expended by boards of health in their war against the spread of disease is used to better advantage than that spent on medical inspection. While from the point of view of boards of health the principal function of medical inspection is to discover cases of contagious disease and send them to their homes before they have done mischief, another important service is the discovery of defects of eyesight and hearing, deformed bodies that need attention, and other evils that are being started or exaggerated by the school life, which the physicians are able to detect and remedy.

Medical inspection of school children has been practiced in Boston since November 1, 1894, when it was inaugurated by the chairman of the Board of Health, Dr. S. H. Durgin. He describes the operation of the system in Boston as follows:—

"The board of health divided the city into fifty districts, giving an average of about four schoolhouses and fourteen hundred pupils to each district. No difficulty was experienced in finding well-qualified and discreet physicians who would undertake the duties prescribed; and the board selected and appointed one physician for each district, with a salary of $200 a year. His duty was to make a visit to each master's school daily, soon after the beginning of the morning session. The master receives from each of the teachers in his district early reports as to the appearance of illness in any pupil in his charge. These reports are given to the visiting physician, who at once examines the reported children, and makes a record of his diagnosis and action in books furnished by the board of health for this purpose, and kept in the custody of the master. If the visiting physician finds the child too ill, from any cause, to remain in school, he advises the teacher to send the child home for the observation and care of its parents and family physician. If the illness is from a contagious disease, the child is ordered home, and the case reported to the board of health. The disposition of the sick child while at home and the proper isolation in cases where contagious diseases develop in such children, as well as giving them a warrant for returning to the school, depend principally upon the report of the school inspector."[1]

[1] Paper read at annual meeting of the Massachusetts Medical Society, June 9, 1897, by Dr. Durgin.

According to this system inspectors are not allowed to give professional advice or treatment in any case, with one exception, and great care is necessary to avoid giving offense to the family physician. This one exception is in connection with pediculosis, which was found to be so prevalent throughout the schools, existing in one instance to the extent of nearly 80 per cent of scholars in one building. The board of health did recommend an economical wash or remedy for this trouble, but not without some friction on the part of families whose children had to be advised to use it. Obviously, medical inspection requires the thoughtful coöperation of the teachers, and a generous amount of tact on the part of the inspectors.

It cannot be expected that the teachers will be physicians. But they are not required to do much expert work. It is a comparatively simple matter for the teacher to recognize an "ailing" pupil, and it is not a matter of much time to report the same to the principal or to the inspector, as the rules may require.

That the system is very effective may be shown by the following figures: —

For the fourteen months from November 1, 1894, to December 31, 1895, in Boston, 16,790 children were reported by the teachers and examined by the medical inspectors. Of these, 6035, about 36 per cent, were found to be not sick; 10,737, the other 64 per cent, were ill. Of these, 2041, or 19 per cent, were sick enough to be sent home. About 22 per cent of these sick ones were sent home, or 2.7 per cent of the total number examined proved to be cases of infectious disease, specifically as follows: —

Diphtheria	77
Scarlet fever	28
Measles	116
Chicken-pox	28
Mumps	47
Whooping cough	33
Pediculosis	69
Scabies	47
Congenital syphilis	8
	453

In 1895, 8964 scholars were examined; 1156, over 12 per cent, were sent home; and 23 per cent of those sent home, or 2.9 per cent of those examined, were cases of infectious disease.

New York has also had successful experience with medical inspection. The board of health there started out with a few explanatory lectures to the inspectors, giving them an outline of the scope and purpose of the work.

As outlined, the duty of each school inspector is to visit his round of schools at nine o'clock every morning during the session. Upon assembling in the morning every child who appears to be ill, or who presents himself for the first time after being absent, is sent to a special room where he is inspected. If found attacked by an infectious or contagious disease, or not fully recovered from one, the inspector sends him home with a note to that effect, and at the same time he is obliged to inform the board of health of the fact. In addition to the school inspectors, New York has a number of physicians whose duty it is to examine all applicants for teachers in the public schools. New York City appropriates $47,500 for the establishment of a special corp of medical inspectors.

On June 7, 1898, the Philadelphia bureau of health passed the resolution that the medical inspector be directed to have the fifteen assistant medical inspectors visit one public school each day in their respective districts, and inspect each school according to the methods employed in Boston, New York, and Chicago.

St. Louis availed herself of an opportunity to study the system by having a volunteer inspection of ten of the public schools made under the auspices of the Medical Society of City Hospital Alumni, from October 10 to December 25, 1898. The inspections were made by members of this society. In that sixty days' trial nearly one-half of the dismissals were due to cases of acute infectious disease.

In Boston, fifty inspectors are employed at a salary of $200 each. In New York, one hundred and forty-nine at $300. In New York, however, the corporate, private, and parochial schools are included in the inspection, and should be in order to make it a thorough preventive measure.

In studying the reports on the result in various cities, — Boston, New York, Chicago, and St. Louis, — it is found that about one pupil in every ten has some ailment; and that one-tenth, sometimes as high as one-third of those sick, should be sent home, either because they were too ill to be in school themselves, or because they endanger the health of others. From .3 to .7 per cent of these sent home have been suffering from some form of contagious disease.

Out of the total morbidity in Boston schools, more than 4 per cent in 1895 were acute infectious diseases, nearly 3 per cent in 1896, and nearly 6 per cent in 1897. In New York, between March 29 and July 1, 1897, over 10 per cent of those sent home were in this class; that is, they were menacing other pupils.

The experience in Chicago would indicate that if the inspection service is limited, what there is should be applied to old buildings, for in them the larger number of ill pupils always have been found. Chicago adopted medical inspection about two years later than Boston, and the health commissioner says, in regard to its results there, that "he knows of no other single line of effort in which his scanty force of inspectors has engaged that has been of more obvious and direct benefit to the community in general, as well as to the school children themselves."

The examples here given are all taken from the large cities, and the question naturally arises: Is such a system feasible in the small cities and in the towns? There have been various expressions of opinion with regard to this. However, if we take one of the school districts in a large city like Boston, it may be compared with many smaller communities. One school district in Boston has four schools and fourteen hundred pupils. It should not be a matter of great difficulty to secure a competent physician in such a community who would be only too glad to have the salary of $200 or thereabouts. It has been claimed that in the country districts the people are too conservative, that they would not see the good of such a system to the community as a whole, that they would not see its value and necessity. But the general intelligence of the country people has grown and broadened in late years, to a great degree through the agency of the press and periodicals, and there should be few communities not ready to adopt a properly planned medical inspection.

The necessary requisites for the successful establishment of the system are a board of health vested with authority, a competent inspector endowed with tact to handle teachers, parents, and children; wide awake teachers who know enough of the principles of sanitary science to help and not hinder the work of the inspector; and an intelligent public opinion to back up the work of the board of health and its agents.

The medical inspection of school children, when properly conducted, does away with the closing of schools in times of epidemics, and must be regarded as *the most important* measure for preventing disease and deformity, and for checking the spread of contagious diseases throughout school children.

Medical inspection has also an educational side, for it serves as a lesson to the children and to their parents as regards what great care is necessary in handling contagious diseases. In a few instances parents have objected to the inspection of their children at the school, claiming that it was interfering with their parental duties. But as a rule parents, teachers, school boards, and city governments unite in praising the system itself, and expressing great gratification at the results obtained.

Boston, after two and a half years of experience with it, reports that the plan is constantly growing in favor with the medical profession, among the school teachers, and in the community at large.

In regard to the educational value of medical inspection, Superintendent of Schools, W. B. Powell of Washington, says:[1] —

"The most important argument in favor of medical inspection of schools and school children is the educational benefit it would be to the community at large. Its direct and naturally aggressive tendency would be to make knowledge of the common laws of health universal, and to create an interest in the study of social life.

"Intelligence respecting the effects of modes of living on length of life, on happiness of life, and on cost of living is very meager, especially among the lower classes of society. The school has reason to know and to understand the disadvantages of this condition, economically and morally. Knowledge of these subjects would grow rapidly if the school would take hold of the matter purpositively, and would cause people to begin knowledge-getting in experience. Medical inspection would result in giving knowledge of conditions and causes, and would suggest changes in modes of living with reasons for the same. These would cause thought and would give information to satisfy the same, which, with the purposive effect induced in the realization of suggestion, would educate in the most effectual way. This experience would create interest which in turn would insure further knowledge-seeking by means of reading, attending lectures, by inquiry, and in many cases by original investigation and experiment. Is it not the duty of the school to arouse society to intelligent thought on the importance of better modes of life? By no other means can this be done so effectively. Is it not the duty of the school to train people to live better? Is not this the true purpose of the school? The logical place to begin this is with the physical life of society, the one phase of life that has been the most ignored by our educational methods, because least thought about, and, until now, least understood."

[1] Proceedings National Educational Association, 1898, p. 459.

CHAPTER X[1]

INFLUENCE OF SCHOOL LIFE UPON THE EYE

In order to understand the influence of school life on eyesight, the following facts relating to the structure of the eye are important.

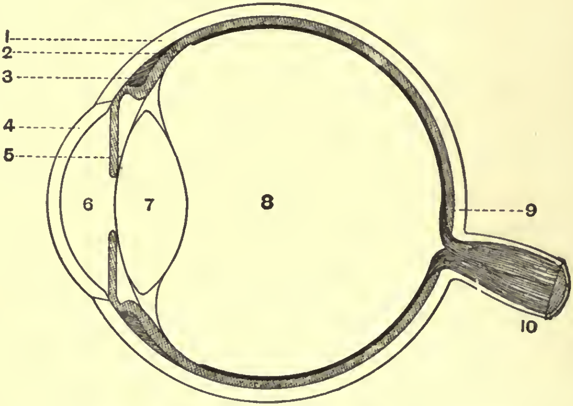


FIG. 20. — VERTICAL SECTION OF THE EYEBALL.

1, Sclerotic; 2, choroid; 3, ciliary muscle; 4, cornea; 5, iris; 6, aqueous humor; 7, lens; 8, vitreous humor; 9, retina; 10, optic nerve.

The eye is enveloped throughout the greater part of its circumference by a dense white coat (the sclerotic), the transparent and more convex cornea enveloping the smaller moiety in front. (Fig. 20.) Inside the sclerotic is a black vascular layer (the choroid), which serves to

[1] This chapter has been but slightly modified from Arthur Newsholme's "School Hygiene," published by D. C. Heath & Co.

absorb the excess of light, and within this is spread out the delicate mesh-work of the retina, which receives impressions of light and conveys them to the brain. The interior of the eyeball is occupied by a transparent gelatinous material in its posterior part, and a watery material in front, between which lies the delicate lens of the eye, which is capable of being altered in shape by the action of the minute ciliary muscle. (3, Fig. 20.)

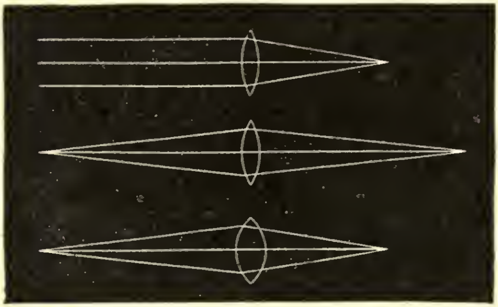


FIG. 21.—DIAGRAM SHOWING EFFECT OF A BICONVEX LENS ON RAYS OF LIGHT.

1, Focus of parallel rays; 2, focus of divergent rays; 3, focus of divergent rays brought nearer by more convex lens.

In the normal eye waves of light coming from a distance are refracted by the passive lens and media of the eye, and brought to a focus at the most sensitive part of the retina, without any muscular effort. Thus, vision of distant objects represents rest for the eyes, and exertion of its muscles comes into play only for near vision.

The divergent waves of light from a near object are brought to a focus on the retina by the action of the ciliary muscle, which renders the lens more convex, and thus capable of refracting the light more powerfully.

The effect of an increased convexity of lens in bringing divergent waves of light sooner to a focus is shown in Fig. 21. If for any distance under 20 feet the eye were not able thus to accommodate its condition, a blurred and incomplete image would be formed on the retina.

A child with normal eyes ought to be able to read this page, in a good light at the distance of 40 inches, and at all intervening distances down to 4 inches. Any child who cannot read it as far as 15 inches off should have his eyes examined by a competent oculist. A rough test may be also made by means of the following

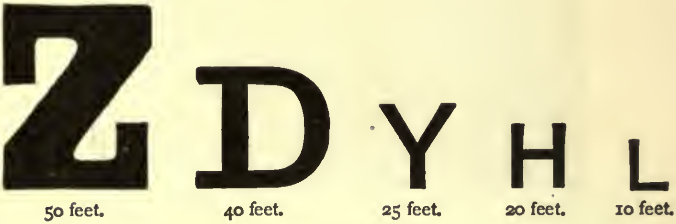


FIG. 22.—EYE TEST.

letters: the Z should be distinguishable at a distance of 50 feet, D at a distance of 40 feet, Y at 25 feet, H at 20 feet, and L at 10 feet.

Three chief defects of vision occur in children: in the first, the waves of light are brought to a focus behind the retina (hypermetropia); in the second, the waves of light are brought to a focus in front of the retina (myopia); and in the third, the different axes of the eyes do not bring waves of light to a focus at the same point (astigmatism).

Hypermetropia or *Long-sight*, in which the eye is shorter from back to front than usual, is really in a moderate degree a normal condition in childhood, but if present in a high degree represents an arrest of development. Parallel rays of light (*i.e.*, those from a distance) are brought to a focus behind the retina. (Fig. 23.) Thus, when the eye is at rest, there is not distinct vision even of distant objects for the long-sighted. The ciliary muscles must always act and accommodate the eye, and in moderate degrees they succeed in concealing the condition. It is evident, however, that this constant strain on the muscles, during the waking hours,

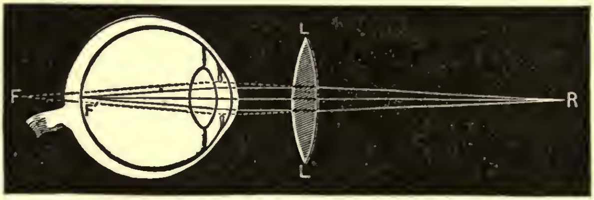


FIG. 23.—SECTION OF HYPERMETROPIC EYE.

R, the origin of divergent rays of light; F, the focus beyond the eyeball; LL, convex glass to be worn by hypermetrope; F', the focus of rays of light on retina, showing influence of L.

must be injurious; and during the use of the eye for near vision, as in reading or needlework, the strain on the ciliary muscle becomes still greater. Consequently, congestion and redness, with watering of the eyes, result.

The lids tend to stick together in the morning, owing to increased secretion. If close work is insisted on, in severe cases dizziness and total inability to distinguish letters are produced, and, in some cases, nausea, or even vomiting. The child is worse in the morning than in the evening, as his ciliary muscles have to adjust themselves to the strain imposed on them. Mistakes are frequently made, and the child is often thought to be idle. In this, as in other abnormal conditions of the eye, it is very common for the child to have been repeatedly punished by his teachers for supposed obstinacy or stupidity.

Long-sight is often confused with short-sight, because, in the former, as in the latter, the child gradually holds his book nearer and nearer to his eyes. This is because spasm of the ciliary muscle (causing accommodation beyond the necessities of the case) is produced by the effort to see small objects at moderate distances, and because the large size of the image of the print obtained by holding the book nearer partially compensates for its imperfect definition.

In the effort at accommodating long-sighted eyes for near and small objects, those external muscles of the eyeballs which turn them in towards the nose are brought into excessive action. A convergent squint may be thus produced, at first occasional, afterward becoming constant, and one eye being usually worse than the other. The squint is worse when the child is tired or ill, but any squint in a child four to seven years old should receive immediate attention.

Myopia or *Short-sight* is the exact opposite of the last condition, the eye from front to back being too long, so that waves of light from a distance are brought to a focus in front of the retina. In order that they may be focussed on the retina, the affected child finds it necessary to hold objects near his eye, thus making the waves of light more divergent.

Myopia is distinguished from hypermetropia by the fact that distant vision is improved by a concave lens, and by the fact that the smallest type can be read easily, provided it be held closely to the eyes. The fact of a person seeing equally as well, at a distance, through a convex lens, as without, certainly indicates hypermetropia.

Myopia is essentially due to the soft and yielding character of the tunic of some children's eyes, enabling the pressure of the muscles during accommodation to elongate the globe. The condition when started may remain stationary, but in some cases the continuance of

FIG. 24.—SECTION OF MYOPIC EYE.

R, the origin of divergent waves of light; F, the focus of these in front of retina; LL, concave lens to be worn by myope; F′, focus of waves of light on retina, showing influence of L.

the cause increases the elongation of the globe. This may be followed by stretching and atrophy of the choroid, or even detachment of the retina, and other evil consequences, resulting in partial or complete destruction of vision.

The tendency to short-sight is generally strongly hereditary, but it may be acquired, and it is chiefly during school life that this occurs. Jäger, in 1861, first called attention to the remarkable development of myopia during school life. Dr. Cohn, of Breslau, in 1865 took up the subject. Having examined the eyes of 10,060 children, he found 1072 myopic, 239 hypermetropic, 23 astigmatic, and 396 whose vision was impaired from the effects of previous disease. As his testing was by lenses only, he probably underrated the myopia. In elementary village schools he found 1.4 per cent of myopia; in town elementary schools, 6.7 per cent; in intermediate schools, 10.3 per cent; high schools, 19.7; and in gymnasia, 26.2 per cent. Among medical students he found the proportion in the first year of study 52 per cent, in the last year 64 per cent. At Tübingen, Gärtner found that of 600 theological students, 79 per cent were myopic.

Although Germany has until lately had the greatest prevalence of defects of vision, it has by no means a monopoly of them. In all the cases investigated, the fact comes out that the youngest classes have the fewest myopics, and the oldest most. Drs. E. G. Loring and R. H. Derby, of New York, found that in the lowest classes 3.5 and in the highest 26.78 per cent were myopic.

The statistics furnished by the Philadelphia Committee, of which Dr. Risley was chairman, are peculiarly valuable, as a complete examination of the eye (barring the use of Atropine) was made in each case. Twenty-four hundred and twenty-two eyes were examined by the committee, and 174 afterward by Dr. Jackson, of West Chester, on the same plan, each case requiring on an average twenty-eight minutes' examination.

The accompanying chart, from Mr. B. Carter's pamphlet on "Eyesight in Schools," shows the result. (Fig. 25.) The horizontal lines give the percentages, the vertical lines the different classes. The myopia was found to increase from 4.27 per cent in primary classes (average age, $8\frac{1}{2}$ years) to 19.33 per cent in normal classes, while the hypermetropia diminished from 88.11 per cent to 66.84 per cent, the proportion of normal

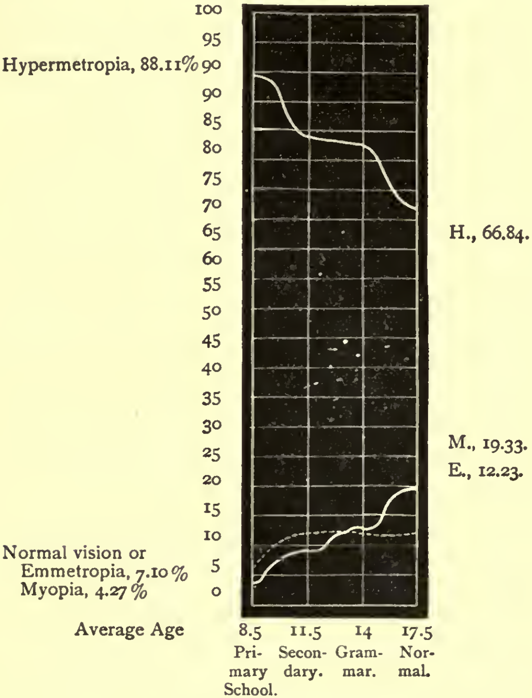


FIG. 25.—CHART SHOWING PREVALENCE OF NEAR-SIGHT, FAR-SIGHT, AND NORMAL VISION AT DIFFERENT AGES.

vision (emmetropia) remaining nearly stationary. It is evident, from the statistics just advanced, that school life has, under conditions which commonly prevail, a most deleterious influence on eyesight.

Astigmatism is a condition of the eyes in which the curvature of the cornea is not uniform, and consequently waves of light passing through it in different meridians have a different focus. The lines running in a given direction look blurred — as all the horizontal or all the upright, etc. Children suffering from this condition often appear stupid or inattentive, because there is in this defect what has been aptly called "slow sight"; a word is not recognized quickly on first sight, but "it seems to come to them afterward." The defect is commonly ascribed to near-sightedness, but ordinary convex lenses will not remedy it; lenses, the curve of which is specially adapted to each meridian of the eye, being required.

The causes at work during school life which tend to produce defects of vision may be classed under the five following heads: —

(1) The *prolonged exertion* of the eyes involved in seeing *near objects*. School work usually lasts from four to six hours, and the home lessons sometimes nearly as long. During a great part of this time, the accommodating apparatus of the child's eyes is being strained; the tissues of the eyes being soft and compressible, evil results are apt to occur, especially when there is a hereditary tendency to defects of vision. Three hours' good work is always better than five hours of indifferent work.

The posture of the scholar is very important. He should not be allowed to lean forward with a bent head. In writing we have a good instance of the principles involved and the practice to be followed. The movements required are of a complicated character, and, like the complicated movements concerned in speech and walking, should be automatically performed. In fact, the more automatic and the less conscious the movements become, the greater is the degree of precision attained. Hence, as in piano-playing, where the pupil is required to look at the music and not at the keys, the pupil who is writing should be required to sit erect, and directly facing the desk, and should fix his attention on the matter to be written, rather than on the movements of the fingers. The desk should be at a proper angle to the eyes, and the eyes should not be allowed to come nearer than 12 inches from the book or slate.

(2) An *inadequate amount of light*, or an ill-directed light, causes an undue strain on the eyes. The amount of window area required, and the direction of the light admitted, have been already discussed. It is probable that the preparation of home lessons in semi-darkness is responsible for much injury to the eyes.

Cohn, in his investigations, found that the narrower the street in which the school stood, the higher the opposite houses, and the lower the story in which lessons were given, the greater the number of cases of myopia among elementary scholars. He proposed that 30 square inches of glass (not including the window frames) should be allowed for every square foot of floor area.

(3) *Badly printed text and other books* produce the same result. The *type* should be clear and large, Roman being much better than Gothic type. The construction of such letters as *h* and *b*, *v* and *n* should be especially precise.

The following words represent well-known sizes of type: —

Double Pica.	*Great Primer.*	*Pica.*
No type	smaller than	Pica should

Small Pica.	*Bourgeois.*	*Minion.*	*Pearl.*	*Diamond.*
be used	while	teaching	children	to read.

Cohn proposes that the type of ordinary journals should be 4 millimeters or $\frac{1}{6}$ inch in height, though M. Javal thinks it may be allowed to be 2 millimeters. The thickness of down and up strokes, the spaces between letters and words and between lines, and the length of lines all require attention.

Letter-press derived from a *worn-out fount* gives an imperfect impression of the letters. The loops of *a* and *e*, of *b d p g* are apt to form a black spot; long letters become broken, and fine up strokes are imperceptible.

Books for children should not be too large and heavy, the spaces between the letters and between words and lines should be relatively wide, and the lines not too long. The reading or writing book should be placed at a distance of 12 to 15 inches from the eyes. The most agreeable tint of paper is a cream-color or a pale blue. It is inadvisable to gloss the sheets, as this produces a dazzling reflection.

It is important that too small a handwriting should not be allowed, and that neither writing nor reading should be permitted in the dim light of evening.

Pale ink and greasy slates are very trying to the eyes.

The letters on many maps in schools are most trying to the eyes, the lettering not only being fine, but the maps having often been printed from old and worn plates. Maps should contain as few data as possible, teaching by wall-maps and outline maps being preferable. Glazed maps are not advisable. In writing lessons the character of the writing material used is of some importance, especially on dull, winter days. Thus the furthest distance at which a specimen of slate pencil writing was recognizable, as compared with a specimen of lead pencil writing of the same size, was as 7 to 8, while the ratio of lead pencil to pen and ink legibility was 7 to 8, and of slate writing to pen and ink 3 to 4. The bearing of this on the hygiene of the eye is evident; pen and ink writing should be used where possible. Also pale ink, or ink which turns black only after a time, should be abolished from school.

(4) *Needlework* is a too frequent cause of defective vision in girls. Sewing is more trying to the eyes than any work that boys have to do. In ordinary coarse calico there are about 70 threads to an inch, and what is considered good work consists in taking up 4 threads, 2 in front and 2 behind the cotton; while in moderately fine linen, as a shirt-front, there are 120 threads to an inch, so that the seamstress has to work to $\frac{1}{60}$ inch, a much smaller distance than the finest print.

The sewing required of children should be neat and accurate, but not too fine, and sewing should not be prolonged, nor undertaken in a bad light. Where possible, the light should come from above for needlework, as for drawing lessons, and such lessons should be avoided by gaslight. Needlework and drawing and writing lessons should always, preferably, be given during the brightest hours of the day. Lace work taxes the eyes severely and may lead to absolute loss of vision. Working at night on black dresses is most injurious. Scarlet materials are somewhat trying to the eyes, and are not allowed under the London School Board ; blue is to be preferred.

(5) The condition of *the general health* produced by insufficient exercise or food, and the influence of a vitiated atmosphere, powerfully favor the production of defective vision. So, likewise, does the occurrence of catarrhal or other affections of the eye, as after measles, diphtheria, and scarlet fever. Home study for the children under the age of fourteen should be forbidden as far as possible.

It is not always the school that is responsible for defects in children's eyes. Much reading at home under unfavorable conditions is a factor that must be taken into account. The child may become buried in a book, as the expression is, and not think of light, position, or of anything but what he is reading. Many eyes are unnecessarily strained in this way, and a careful watch by the parents is essential to guard against the injury. Often a boy or girl will curl up in front of an open fire to keep warm and read by the firelight.

CHAPTER XI

SCHOOL AUTHORITIES AND PATRONS

It is the duty of all cities and towns to keep their schools in a sanitary condition. The schools are their property and are for the purpose of training the younger generations to become wise and efficient citizens. The governmental body should be so divided as to make it impossible for one department to shift the responsibility on to another. It should be so arranged that some one department be wholly responsible for the sanitary condition of the schools. At present it is impossible to obtain legal redress for injuries received during school life, or for deaths of school children caused by municipal or departmental neglect. If a city permits its streets to get out of repair sufficiently to endanger the lives of citizens using them, it makes itself liable for damages for injuries sustained. Not so with the schools. No matter how many epidemics start in or spread from them, nor how many children die from this great criminal negligence, there is no redress. But perhaps this is taking too dark a view of the whole matter, because there are many examples of cities that are making strenuous efforts to bring about a more healthful state of affairs in their public schools. They are attempting to renovate old buildings, putting in new systems of heating and ventilating. They are establishing systems of sanitary and medical inspection.

They are attempting to make all of their new buildings fulfill the requirements for the best sanitary conditions, and they take much pride in displaying these new buildings, and rightly so. For properly constructed schools are quite modern affairs. Any board of trustees, or any city government that has such, deserves to be highly praised. The age is passed, however, when fine schools may be looked upon as a luxury. They are a necessity. They cost money, but money put into good schools is well spent. It is false economy to withhold money needed to secure hygienic school buildings. The red tape and wrangle often necessary to obtain even small amounts of money for schools and school improvements is shameful. To show how difficult it is to get small appropriations for such purposes, it is well worth while to give attention to an extract from the proceedings of a school-board meeting in one of our large cities in 1898:—

Regarding improved heating, etc., in —— school district, the committee reported that the work, in view of the limited appropriations, should be deferred for the present.

Dr. —— hoped that this would not be voted. He stated that in —— Street Schoolhouse, in that district, the sanitary condition is deplorable. The plumbing of one of the sinks, he went on to say, was disconnected last winter, and the pipe has remained open up to the present time. The closets are directly under one of the schoolrooms, and the foul odors come into the rooms. A teacher has been advised by her physician not to go there this fall on the beginning of the school, unless something is done to remedy this evil. Dr. —— asked that at least $25 be appropriated to connect that plumbing. A peppermint test, he said, has been made showing that sewer gases have free access to the basement where the children play. This condition he characterized as an outrage.

Mr. —— stated that if the matter was left to the committee, it would do all possible to connect the plumbing. "We cannot do things without money," he said, "and we have to pick out those things that are absolutely necessary. We know that the plumbing in many of the schoolhouses is not what it should be. Bills left over from last year have to be paid, and we have only money enough to keep the schoolhouses wind and water tight."

The report was accepted, and the recommendation that the work be deferred was adopted.

This extract was used by Mrs. Ellen H. Richards in a paper before the American Public Health Association, in 1898, to illustrate this same point, viz., the deplorable fact that school boards are not allowed sufficient money properly to carry on school work. One of the greatest causes of this difficulty is the general lack of knowledge of the first principles of preventive medicine. One of the strongest proofs that we could wish to have of this was shown during the late war with Spain, where the soldiers, officers, and in many instances the medical men themselves, gave evidence of their great ignorance on such important matters. The result there we know was disastrous, if we measure it by the amount of sickness and death caused by preventable disease. As Mrs. Richards says, in the paper referred to above, "Why should the men on the transports have taken care to keep the decks clean when they have been accustomed all their lives to dirty schoolroom floors, dirty school yards, streets littered with rubbish," and "Why should our soldiers have believed that it made any difference what water they drank, when they had been accustomed to the conditions prevalent in nine-tenths of the school yards in this country."

It is evident that school boards and city governments hold exceedingly responsible positions relative to the schools, whether this responsibility be legal or not. The public schools are established by the various states in order to insure their own stability and prosperity, as President Garfield said in his inaugural address in March, 1881: "We have no standard by which to measure the disaster that may be brought upon us by ignorance and vice in the citizen, when joined to corruption and fault in the suffrage. The veterans of the Union who make and unmake constitutions, and upon whose will hangs the destinies of our government, can transmit their supreme authority to no successors save the coming generations of veterans, who are the sole heirs of sovereign power. If that generation comes to its inheritance blinded by ignorance and corrupted by vice, the fall of the republic is certain and remediless."

While the states insist on universal compulsory education, they should feel a certain responsibility about compelling any exposure of their protégés to unnecessary danger of physical injury. This responsibility of the public authorities should begin before the school has been constructed at all. It is their duty to consult competent experts in regard to the location of the school site, the construction of the building, its heating and ventilating, and any other features that would tend to influence the health of the teachers and children. It not uncommonly happens that these public authorities make mistakes, and then they call upon some one, perhaps the State Board of Health, to remedy them; whereas if this board had been consulted in the first place, it would have prevented such mistakes, and in the end would have saved the local authorities considerable expense. Their responsibility should also include the establishment of proper systems of sanitary and medical inspection; the former to insure the proper care and condition of the buildings, and the latter the better health of the teachers and scholars.

The discussion of the responsibility of the teachers from the sanitary standpoint is a very difficult matter. Most public school-teachers work very hard, many of them overwork, and when we come to consider their duties toward the sanitary conduct of their school buildings or schoolrooms, we may be expecting them to do things which, had they the inclination, they have neither time nor opportunity to carry out. It cannot be expected that school-teachers are expert sanitarians or physicians, but we can expect something in the matters of ordinary cleanliness and neatness. They should have pride in the appearance of their rooms, and most of them do. Further than that, it is possible for them to inspire this interest and pride in the pupils, making them vie with one another as to personal cleanliness and the tidiness of their desks. If the younger children cannot understand the hygienic importance of good air, much sunlight, and proper temperature, they can be interested in these matters to a large degree by enthusiastic teachers. For example, the teacher can have even the young pupils learn to read the thermometer, and make a record on the blackboard or on paper at stated periods — perhaps once every half-hour. They could also be taught to watch for the sunlight; counting the number of hours in the day or the week or the month in which the sun has shone during the school hours. Many other features of this kind can be arranged by the enthusiastic teachers, and without interfering materially with the regular class work. Little matters like these would in a short time spread their influence outside of the school and reach the homes of the pupils, which in many cases, particularly in the large cities, would be greatly benefited by even the smallest attention to proper ventilation and admission of sunlight and habits of cleanliness.

In regard to regular instruction in sanitary science, opinions differ as to the wisdom of introducing this — even when reduced to its lowest terms — into any but the higher grades of the public schools. Yet it would seem possible that by the proper arrangement, instigated by the State Board of Health or some other good authority, leaflets of instruction might be distributed to the teachers, differently arranged for different grades, in which some of the important facts regarding health and disease, the care of the body, its various organs, and so on, might be set forth. This would seem a very important matter, and one that deserves considerable attention in the near future, not only on the part of the teachers, but also of the school managers, because, as we have seen, so many of our public school pupils are launched into life without the simplest rudiments of the principles of preventive medicine. The example of our soldiers in the late war proves this only too plainly, and emphasizes the fact that there is a widespread need for instruction of some kind, wherever it may seem best to place it, in the school curriculum.

In Brussels, all teachers receive thorough instruction in hygiene. They are supposed to supervise its practice in the schools, the doctor only controlling and directing them. They are required to record on a chart the temperature of each room four times a day, — at 8.30 and 11 A.M., and 2 and 3.30 P.M. This chart is hung up beside the thermometer, and at each inspection the doctor is supposed to examine it.

In the United States, Michigan has taken perhaps the most radical steps toward educating her children in sanitary matters by passing the following law: —

ACT NO. 146. MICHIGAN, LAWS OF 1895.

An act to provide for teaching in the public schools the modes by which the dangerous communicable diseases are spread, and the best methods for the restriction and prevention of such diseases.

SECTION 1. The People of the State of Michigan enact, That there shall be taught in every year in every public school in Michigan the principal modes by which each of the dangerous communicable diseases is spread, and the best methods for the restriction and prevention of such disease. The State Board of Health shall annually send to the public school superintendents and teachers throughout this State, printed data and statements which shall enable them to comply with this act. School boards are hereby required to direct such superintendents and teachers to give oral and blackboard instruction, using the data and statements supplied by the State Board of Health.

SECTION 2. Neglect or refusal on the part of any superintendent or teacher to comply with this law, shall be considered a sufficient cause for dismissal from the school by the school board. Any school board wilfully neglecting or refusing to comply with any of the provisions of this act, shall be subject to fine or forfeiture, the same as for the neglect of any other duty pertaining to their office. This act shall apply to all schools in this State, including schools in cities or villages whether incorporated under special charter or under the general laws.

In compliance with this act, the State Board of Health has issued valuable printed matter from time to time, and during the last two years has been issuing Teacher's Sanitary Bulletins, and distributing them to every school-teacher in the state. Thus the teachers can inform themselves, in fact must inform themselves, as to how to instruct the children. The good effects of such careful dissemination of knowledge cannot but be felt throughout the state, in reduced death rates and the greater intelligence of the citizens.

The interest of parents in the schools, particularly in their sanitary affairs, is too often lacking. Few parents know personally the teachers of their own children, except in smaller towns where the teacher is one of the social community. Fewer parents probably know the superintendent of schools unless they happen to meet him socially. This is a very important matter, for parents should make an effort, unless sickness or some other circumstance prevents, to become personally acquainted with the teachers and superintendent. This does not mean that the parents should keep nagging the teachers about petty troubles, nor that they should carry imagined faults in the conduct of the school to the superintendent; but it does mean that they should confer with the teacher in regard to the strong or the weak points of their children. Thus, in many cases, they would help the teacher to understand the child. They should talk with the teacher regarding the health of the child, the strength or weakness of the eyes, the tendency to stand or sit in bad postures in the home, and ask the teacher to help to remedy these faults. Coöperation in these matters will be a great assistance to the teacher in conducting the school, and also bring about better results in the children.

It is well known that in many instances parents hold themselves aloof from teachers; but in these modern times this seems wholly unreasonable. Their work is a noble one, and in many instances they are sacrificing their health for the good of the community, and doing so on small pay. There should be no barrier between the home and the school. In taking into account the education of the child as a whole, we must regard the school as simply completing and enforcing the educational work of the home. That is, the school and the home are working together to educate the child. The parents of the better class of people can, through their children, lend a strong influence for the good of the schools, and also the well-conducted school can exert a powerful and good influence over the poorer class of parents by teaching the children cleanliness and making them neat in their habits.

Thus civilization will gradually reach a higher plane, and future generations will become the beneficiaries of this instruction and of these reforms which mark the dawn of the twentieth century.

CHAPTER XII

BEAUTY IN SCHOOL WORK

A HEALTHFUL and beautiful schoolroom should lead to more beautiful results in school work, but sometimes, alas, it does not. Occasionally when visiting a well-furnished room, where results are slovenly and poor, one is reminded of Emerson's experience when ascending Monadnock : —

"'Happy,' I said, 'whose home is here !
Fair fortunes to the mountaineer !
Boon Nature to his poorest shed
Has royal pleasure-grounds outspread!
Intent, I searched the region round
And in low hut the dweller found :
Woe is me for my hopes' downfall!
Is yonder squalid peasant all
This proud nursery can breed
In God's vicegerency and stead?'"

What boots our fine building and our rich furnishings if they make the children and children's work no better? If results do not improve under improved conditions, it is not the fault of the conditions ; some person is to be blamed, and usually that person is the teacher. A teacher who allows her children still to feed on husks, and to do the disgraceful work of the far country when they dwell in the midst of the house beautiful with

bread enough and to spare, should himself be given his portion of goods and told to depart, unless he plead the one valid excuse, ignorance. But that excuse should be considered valid for thirty days only. Thirty days from date of discovery the lack of commensurate results should begin to be less evident; sixty days from date results should be fair, and in ninety days good. All the ambitious teacher needs — the teacher ambitious to serve her pupils — is the suggestion that beauty is to count in school work, side by side with accuracy. "I try for correct spelling and accurate number work, for good position in writing and close observation in drawing. If I get accuracy," says the conscientious teacher, "that is all I ask." "If you get simple beauty and naught else," says Browning, "you get about the best thing God invents," and if that is true, — and who doubts it? — we must not be satisfied with mere formal accuracy: our work must conform to the æsthetic ideals of the architect and the artist of our schoolroom as well as to the mechanical ideals of the plumber and the carpenter.

The first lesson the beautified room should teach is

ADAPTATION,

the nice adjustment of a thing to its environment, or to its place or function.

A perception of that principle will lead to many reforms in schoolroom practice. Pen and ink will not be used upon rough paper, nor will the pencil be used upon glazed paper. Drawings a foot square will not be attempted in lead pencil, neither will charcoal be used on a sheet 6 x 9. When the nature lesson has been on leaf structure, the pupils will not attempt to express that with the brush and ink. When it has been upon the growth of the grapevine and its fruit, they will not be asked to draw it in lead pencil. If threads and dots of color, as in the sedge, are to be expressed, colored pencils will be used. If broad masses of color with subtle gradations, as in the morning glory, are to be expressed, water color will be the medium. For withered leaves and seed pods in mass, for broad silhouettes to reveal forms as wholes, the brush and ink is the best medium. In the careful, searching study of plant growth, in studies of structure and function, the medium of expression is the pencil or the pen. The ink drawing shall be upon gray paper; the delicate water-color, upon white; crayons, usually a little crude and harsh in color, shall be used upon cream-colored paper to soften them.

All arithmetic and language papers will not be the same size, regardless of the amount of work to be placed upon them, merely that they may be bound with a brass fastener and displayed as a class exercise. They will vary in size according to the lesson. The long column of primary number work shall have its long narrow paper, and the spelling lesson shall be written on a paper to fit (Plate XXXVII), just as the pictures upon the walls fit their frames. A large sheet and blackboard crayon are appropriate to the rendering of a pumpkin, but a small sheet and a camel's hair brush to the rendering of a downy butterfly. A winter landscape may be suggested in ink, but for autumn foliage there must be color. In geometric diagrams, where accuracy is important, the straight lines shall be ruled, and the compasses shall be used for circles. In the sketching of maps, where relative positions only are important, the lines shall be free hand. Drawing shall not be upon paper with ruled lines, even when it is to illustrate a written page, nor shall writing be upon unruled paper so long as the child needs the line.

"The classical form of art," says Hegel, "is the free and adequate embodiment of the Idea in the shape that is peculiarly appropriate to the Idea itself," a statement which is at once so comprehensive and so discriminating that by means of it we may test any work of art from a first-grade spelling paper to John Sargent's "Triumph of Religion" or the Parthenon Frieze.

The second lesson that the beautiful things in a schoolroom should teach is

ARRANGEMENT,

the disposition of parts in harmonious or suitable form.

A work of art is planned; it is never a "fortuitous combination of atoms." Throughout there is that nice adjustment of part to part which produces a beautiful whole. This should be emphasized by means of supplementary material, such as Japanese prints, pages from the best magazines, artistic circulars and posters, examples of pupils' work, which are illustrations of good arrangement. Under the inspiration of masterly examples, the thoughtful study of arrangement should begin in the primary grades and continue until the habit of planning any work with regard to its ultimate appearance is established.

There are three rules of arrangement which every pupil should know: —

1. *A Sheet should have a Proper Margin.* — Pictures look best when framed; the full-page frontispiece in the magazine has a broad margin, this printed page has a clear unoccupied space all around the text, space which might be used to the financial advantage of the publisher, if the great public with its ideals of convenience and beauty would not object. But the public would object. It would not buy a book it could not hold open to read without moving its thumbs about! It allows narrow margins in Bibles because a limp-covered Bible stays open of itself, but in other books a broad margin is a convenience, not only in holding the book, but for the making of marginal notes, and because it aids the eye by isolating the text. Moreover, it adds greatly to the beauty of the page. The same considerations should have weight in school work. No paper should be crowded from edge to edge with figures or text or sketches. It is customary in school exercises to write on all the ruled lines of a sheet; but why? Why so much margin at the top and none below or at the sides? Sometimes sheets have a strong red line an inch or two from the left edge; in such cases the text usually begins at that line and spills off the right-hand edge, or stops timidly short of it, or huddles together at the brink of it. The margin, at left and right should be alike, that at the top about the same, and the lower margin somewhat wider, as upon this page. In the case of a "chapter heading," with title or sketch or ornamental initial of especial weight, the upper margin may be the wider. If a map or a picture fills the entire sheet, the sheet should be mounted upon another of larger size, and, if possible, of a slightly different color,

so that the sheet may have its proper margin and be seen to good advantage.

2. *A Sheet should have an Orderly Plan.* — A good picture or cast yields its subject to the first glance of inquiry. It is a Madonna or a knight, a shepherdess or a gleaner; it is a landscape, or a sea piece, or a bit of still life; after even a hasty glance no one could have any doubt as to the broad intention of the artist.

The same should be true of school papers. One ought not to find "Sadie King" in bold chirography at the top of a language paper when the subject of the paper is "Sir Joshua Reynolds." Letters written by primary children ought not to begin: —

> Elizabeth Brown, aged 6.
> Hatherly School, Grade I.
> My Dear Papa: My teacher —

We do not start our private correspondence just that way, and a paper so started does not explain itself at sight.

A nature paper ought not to give the impression of being a drawing lesson, nor a drawing paper that of being the result of a lesson in language or paper cutting. A history lesson should not result in a paper doll in costume, nor a geography lesson in a chart covered with bottles, peanut shells, and scrap iron. The papers produced by children in schools may be classified for convenience as follows: —

1. Letters.	4. Diagrams.
2. Essays.	5. Drawings.
3. Charts.	6. Sheets of notes and sketches.

The correct form for the first, *a*, is well known. That for the second may be gathered from any magazine. There are but two right plans. In one the name and date are placed at the end of the text, *b*. In the other the name only, at the beginning after the title, *c*. The form of a chart depends somewhat upon the subject-matter, but in any case the topic should be the most prominent feature, and the sub-topics next.

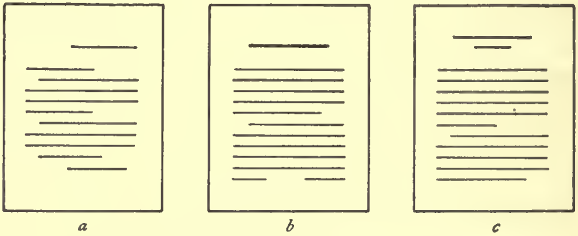


FIG. 26. — MODELS OF ARRANGEMENT.

Diagrams and drawings are less liable to become confused through lack of plan, but even here there is a tendency to add unnecessary and confusing details. A pupil's name in full, age, sex, and "previous condition of servitude," need not disfigure the face of the sheet. Such information for the benefit of people interested in biographic data might be written upon the back of the sheet. Notes and sketches should be classified in envelopes or portfolios and properly marked that their character may be identified instantly.

When papers are illustrated by means of clippings or sketches, or enriched with ornamental initials or end pieces, the plan of the paper as a whole should in no wise be obscured.

3. *A Sheet should have Balance.* — Every work of pictorial art has what may be called a "magnetic pole," or center of interest, and a "center of gravity." The two may or may not coincide. In Murillo's "Holy Family," they do, almost; in Alma Tadema's "Reading Homer" they do not. The "center of gravity" is at the center of the area covered by the picture, or upon a line passing through the center of the mass of a piece of sculpture. About this center the artist disposes his material — weight against weight, interest against interest, spot over against spot — until the eye is satisfied because the work has a stable equilibrium.

FIG. 27. — MODELS OF ARRANGEMENT.

Every sheet produced by pupils in school should be balanced in effect, and thus reflect some echo of the harmony of a work of art. It is possible. Let a child once grasp the principle of balance, and his every paper takes on a new and fascinating interest; he himself is no longer an artisan, he is exalted into the realm of the artist.

In these rough diagrams of sheets, Figs. 26, 27, 28, notice how this principle of balance has been observed. In *b*, *e*, *d*, *g*, and *m* the matter has been arranged bisymmetrically, so far as written text will allow, upon a central axis; in the others the matter has been distributed with no less care, but with less evident formality. In *e* the additional weight of the ornamental initial at the left is balanced by the weight of the name below at the right. In *f*, picture and text above are balanced by text and picture below. In *h*, the two initials at the left are

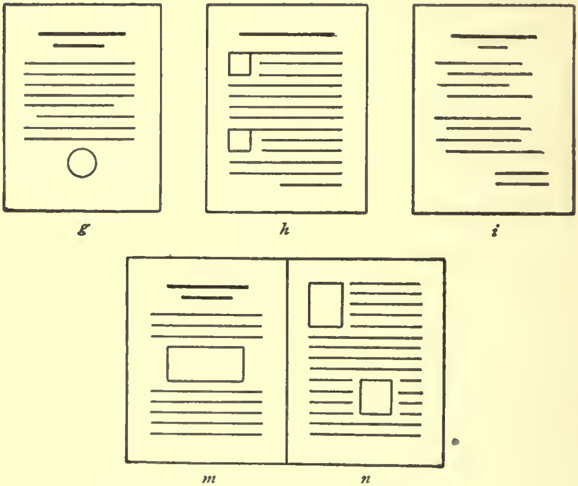


FIG. 28.— MODELS OF ARRANGEMENT.

offset by the additional amount of text at the right of the central axis and by the name at the lower right hand. In the double-paged sheet, *m* is bisymmetrical and *n* balanced like *f*, but the sheet as a whole is balanced — the title and the smaller amount of text over against the larger amount of text, and the two smaller pictures over against the one large one. A glance at the plates in this chapter and in the Appendix, made directly from pupils' work, will show that pupils of all ages can grasp this principle and apply it. Nothing should be placed upon any sheet at random. Illustration, text, pupil's name or initials, and even the teacher's mark of approval or criticism should be placed in relation to each other and to the sheet as a whole.

If the measure of a man's religion is his daily life, the measure of a pupil's culture is his daily work. Let us not deceive ourselves with the notion that a well-decorated schoolroom and an hour a week spent in drawing or picture study is exalting the æsthetic standards of the pupil, although the work of his hands is just as slovenly and bungling and inartistic as ever. When the beauty of the world has entered our souls, the beauty within will manifest itself in beautiful deeds.

The third lesson which should come from the masterpieces upon the schoolroom wall is —

ENRICHMENT.

A work of art has what John La Farge calls a "fullness of intention," quite inconceivable by one who has never attempted artistic expression.[1] Large areas of information, knowledge, and skill are drained to produce a work like Alma Tadema's "Vintage Festival," or William Hunt's "Flight of Time"; the quintessence of Myth and History, of Science and Poetry, of Nature and the artist's own soul are poured into that wonderful "Circe" by Edward Burne-Jones.

Every sheet produced by pupils should have this same fullness of intention. As the artist concentrates

[1] "Considerations on Painting," Macmillan, 1896.

himself upon his canvas, and puts into it all the appropriate knowledge he has, so the pupil should express himself. Each sheet should be an index of the sum total of his powers at the time. The clear penmanship of the writing lesson, the fine drawing of the drawing lesson, the good spacing and arrangement of the lesson in decorative design, the correct English of the language lesson, the right orthography of the spelling lesson, the free original expressions of the conversation lesson, the geographical data from the lesson in geography, and the historical facts gleaned from the study of history, — all should appear in that paper on "Egypt." Only when one gives his first best every time, is he sure of having something better to give next time — "Give and it shall be given you" is the law in the realm of spirit.

But it is the teacher's duty to see that the children have much to give. These beautiful things in the schoolroom should lead to an enrichment of the work of the school along the lines of language, history, literature, and art. Here are some of the language topics suggested by such a work of art as "The Holy Family" (Murillo): —

1. Murillo's "Holy Family" — a description of the masterpiece.

2. What does the "Holy Family" say to me?

3. Story of the Christ child.

4. History of the canvas — when painted, for whom, changes in ownership and home. Its present home.

5. The story of Murillo — his life and works.

6. The paintings of Murillo — their style, what they have in common.

7. The composition of the "Holy Family."

8. Murillo's place in Spanish art.
9. Murillo's place in the history of painting.

It will be seen that these topics cover a wide range. The first is not too difficult for even first year children. (They may as well write "I see a pretty little boy with a dove above his head," as "I see a cat; the cat can run; run, cat, run.") High school pupils will find such a topic none too easy; it will tax their powers to the utmost. The seventh topic may be treated in any grade above the fourth year. It will mean one thing to a boy of twelve, and something deeper and richer, let us hope, to a boy of seventeen, and the essays will differ as widely, perhaps, as Miss Hurll's sketch of Raphael's "Transfiguration"[1] and Dr. Harris's;[2] but both will be entirely legitimate and helpful. The upper grade pupil will not treat the eighth or ninth topic as would M. Henri Taine, but he will find either topic a richer vein to work than "The Value of a Good Education," or "The Improvement of Time."

Other masterpieces will suggest similar topics, any one of which will be a door into a new world. How well Emerson has described the ideal teacher, whose motive is love, and whose aim is culture and power for her every pupil: —

"Day by day for her darlings
To her much she added more.
In her hundred-gated Thebes
Every chamber was a door;
A door to something grander,
Loftier wall and wider floor."

[1] In *Riverside Art Series*, No. 1.
[2] In *Journal of Speculative Philosophy*, Vol. 1.

As a proof that beautiful school work may be done by pupils under the twofold influence of beautiful schoolrooms and artistic teachers, the following plates have been prepared by photographic reproduction from originals by pupils in the Massachusetts schools. It is hoped that the explanatory notes will be found suggestive to the enthusiastic and ambitious teachers throughout the country, who have done and are doing so great a work for the American people.

Let the last word be that of William Morris: —

"What I want to do is to put definitely before you a cause for which to strive. That cause is the Democracy of Art, the ennobling of daily and common work, which will one day put hope and pleasure in the place of fear and pain, as the forces which move men to labor and keep the world a-going."

EXAMPLES OF
ARTISTIC SCHOOL WORK

Plate XXXVII

(1) A number paper by a first grade primary pupil. The little seal is the "medal of honor" for a correct and well-arranged sheet.

(2) An artistic spelling paper. The pupils were asked to sketch at the head of the sheet something from the object, from memory, or from imagination. The name and date were added. Each pupil now wrote all the words suggested by his sketch. Each pupil thus chose his own subject, dictated his own words, and furnished the teacher with a list of words which he could not spell, that she might have material for the next spelling lesson. The teacher who invented that labor-saving, mind-probing device is a genius!

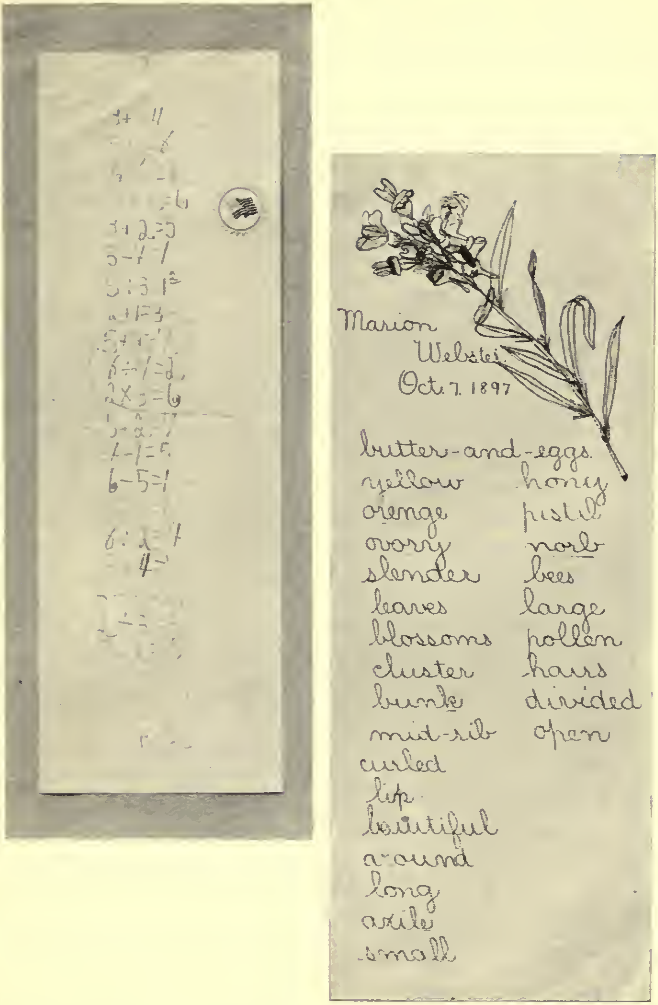
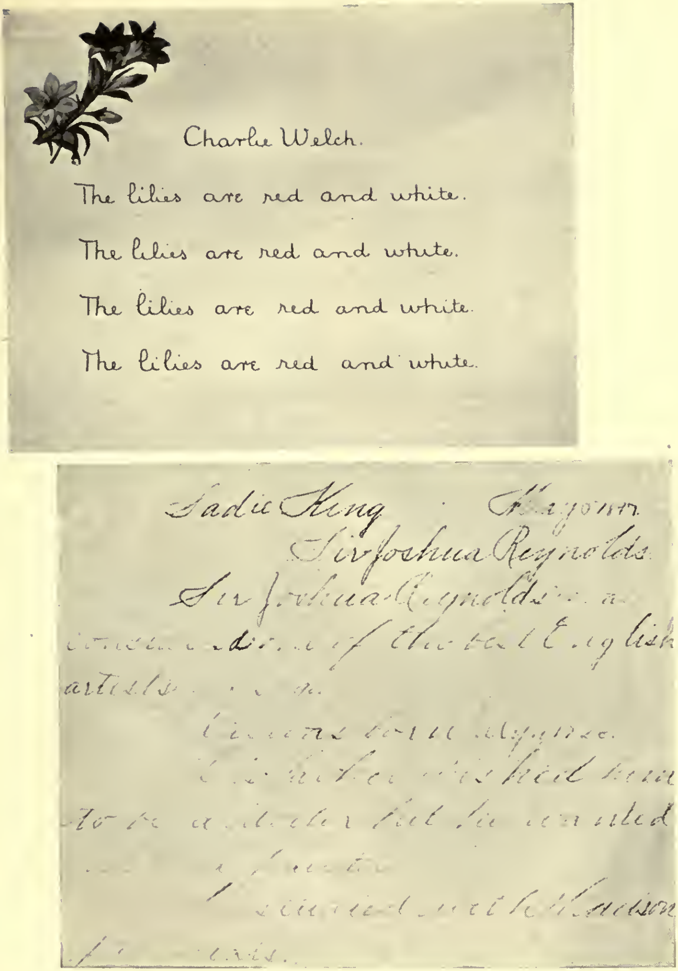


PLATE XXXVII.—A WELL ARRANGED NUMBER PAPER, BY A LOWEST GRADE PRIMARY PUPIL. AN ARTISTIC SPELLING PAPER, BY A SIXTH GRADE PUPIL.

PLATE XXXVIII

This plate shows at a glance the difference between a well-arranged paper and its opposite. The first is a language paper from a second grade. Each pupil was given a paper with a decalcomania-like flower in the corner, which served as the suggestion for one simple sentence, to be repeated for the sake of practice in writing. The second is without proper margins, without a rational plan, and is unbalanced and careless. The handwriting "combines the vices of both the vertical and the slant systems."



Charlie Welch.

The lilies are red and white.

The lilies are red and white.

The lilies are red and white.

The lilies are red and white.

Sadie King

Sir Joshua Reynolds.

of the best English

artists

PLATE XXXVIII.—A WELL SPACED LANGUAGE PAPER, SECOND GRADE. AN ILL ARRANGED AND POORLY WRITTEN LANGUAGE PAPER, SIXTH GRADE.

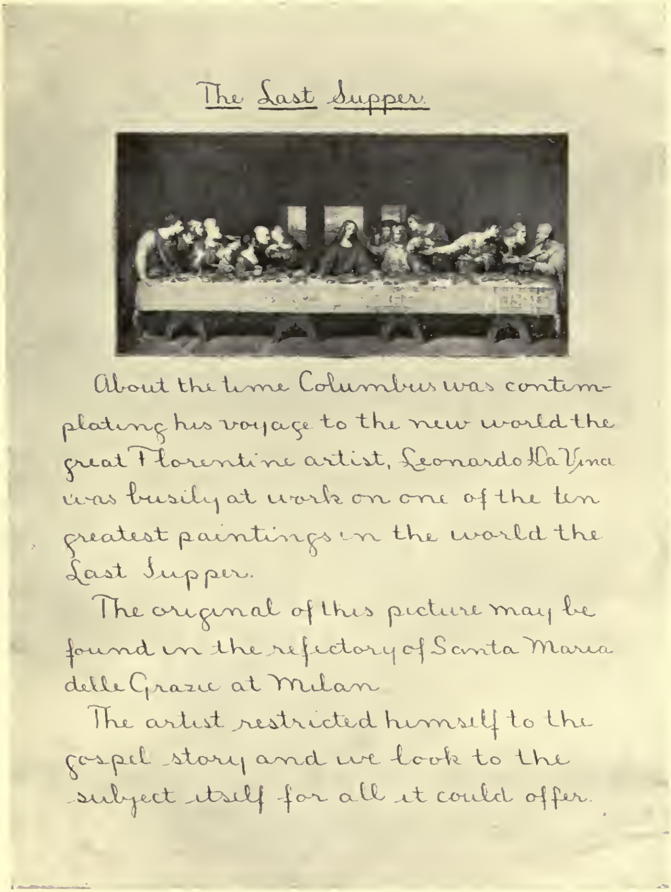
Plate XXXIX

Lessons in mounting. Pupils were asked to bring from home, or to cut from old magazines among the teacher's stores, a picture of any shape or subject they might fancy. They were then required to cut from gray paper of appropriate intensity a mount which should show the picture to the best advantage. The picture was then fastened to the mount in such a position that the four margins hold the right relations to each other. The illustrations are from work of fourth year pupils.

PLATE XXXIX.—STUDIES IN THE MOUNTING OF PICTURES, BY FOURTH GRADE PUPILS.

Plate XL

A language paper, by an eighth grade pupil. An example of a well-planned and balanced sheet. Subject evident, scrap picture properly placed, text rightly paragraphed, effect of the whole inviting.



The Last Supper.

About the time Columbus was contemplating his voyage to the new world the great Florentine artist, Leonardo Da Vinci was busily at work on one of the ten greatest paintings in the world the Last Supper.

The original of this picture may be found in the refectory of Santa Maria delle Grazie at Milan.

The artist restricted himself to the gospel story and we look to the subject itself for all it could offer.

PLATE XL.—A WELL ARRANGED LANGUAGE PAPER, BY AN EIGHTH GRADE PUPIL.

Plate XLI

A well-spaced, well-balanced history paper, but not quite orderly in its plan. The subject of the sheet should have been first, and the name of the school and pupil after it in less conspicuous handwriting. This page was the first of a series, illustrated by means of sketches and scrap pictures, which was designed to correlate closely geography, history, art, drawing, penmanship, and language. The pupils, though averaging but eleven or twelve years of age, found it fascinating to follow the course of civilization from its root in the Nile mud to its flower in Christian England and America.

Maplegrove.

Bertha Hunt. Grade Five.

Growth of Civilizing Arts.

Five thousand years ago a desert land named Egypt, a country in Africa, was the most powerful land in the world. It was noted for it's sphinxes, pyramids and temples.

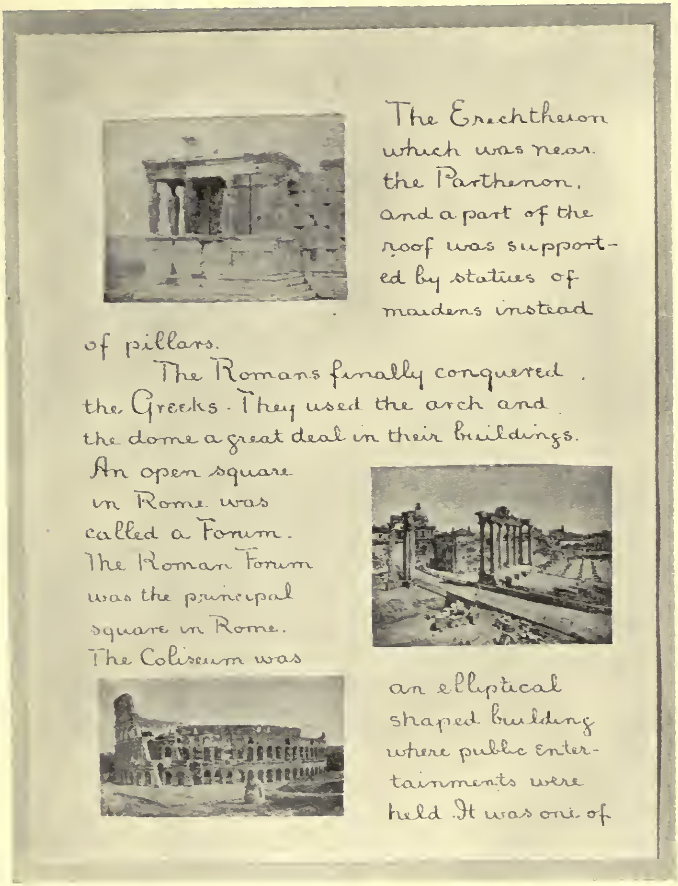
a. = Africa
b. = Asia
c. = Europe.
1. = Egypt.
2. = Greece
3. = Rome.
4. = Western Europe.
5. = British Isles

This sphinx had a head like a woman, and body and feet like a lion. They worshipped it

PLATE XLI.—A WELL SPACED HISTORY PAPER, BY A FIFTH GRADE PUPIL.

PLATE XLII

This is another page from one of the pamphlets on "The Growth of the Civilizing Arts," by a fifth grade pupil. It is well planned and well balanced. The spacing of the text might be improved, but it will do for a twelve year old!



The Erechtheion which was near the Parthenon, and a part of the roof was supported by statues of maidens instead of pillars.

The Romans finally conquered the Greeks. They used the arch and the dome a great deal in their buildings. An open square in Rome was called a Forum. The Roman Forum was the principal square in Rome. The Coliseum was an elliptical shaped building where public entertainments were held. It was one of

PLATE XLII.—A WELL ARRANGED HISTORY PAPER, BY A FIFTH GRADE PUPIL.

Plate XLIII

The first page of a folio sheet by an eighth grade pupil, showing the correlation of geography, history, drawing, and composition. The paper was illustrated by sketches in pen and ink, and contained a full-paged plate — a picture cut from a magazine. Notice the balance of parts and the interesting line leading the eye to the title. The title is a trifle small, but it would be insignificant were it not for the lines leading the eye to it. The sketches, the drawing, and the whole character of the page are suggestive of the Japanese spirit. It is a thoroughly good bit of applied design — design applied to school life, not to imaginary conditions.

PLATE XLIII.—ORIGINAL DESIGN FOR THE FIRST PAGE OF A GEOGRAPHY PAPER, BY AN EIGHTH GRADE PUPIL.

Plate XLIV

Original design for a cover for a series of language papers upon Egyptian art, by an eighth grade pupil. The papers were upon the following topics: —

1. "The Sphinx," a poem by John L. Stoddard.
2. The story of Joseph.
3. Egyptian history — its great period.
4. The tombs of Egypt.
5. The temples.
6. The religion of Egypt.

The papers were illustrated with scrap pictures. In the cover design notice how the form of upper and lower Egypt suggests the lotus, so typical of all the decorative art of the country. The arrangement is good, and the title anything but prosaic. The whole scheme was a delight to both pupils and teachers.

PLATE XLIV.—THE FIRST PAGE OF A SERIES OF PAPERS ON EGYPT. AN ORIGINAL DESIGN BY AN EIGHTH GRADE PUPIL.

Plate XLV

Sketches in common writing ink, diluted, upon gray paper. The first is an original composition by a sixth grade pupil, to illustrate Whittier's "Snowbound." The second is an original composition by an eighth grade pupil. Subject, "Evening." They were made to be used in the enrichment of literature papers.

PLATE XLV.—ORIGINAL COMPOSITIONS IN INK WASH, BY GRAMMAR PUPILS.

Plate XLVI

The design at the left is an ornamental panel, intended to decorate the cover of a series of autumn nature studies. It was drawn in ink by a ninth grade pupil. The others are original designs for ornamental initials to be used in nature-study papers by ninth grade children. The initials were drawn in black and one tone of gray upon a white ground in one case, and upon a gray ground in the other.

PLATE XLVI.—ORIGINAL DESIGNS IN INK WASH, BY NINTH GRADE PUPILS.

Plate XLVII

Object drawing. The problems involved are: 1, an interesting group; 2, good spacing; 3, a well-balanced sheet; 4, pleasing relations of dark and light. These drawings were made in two colors and black, by ninth year pupils. Notice the effective use of the monogram in the upper sheet.

PLATE XLVII.—DRAWINGS IN TWO COLORS AND BLACK, BY NINTH GRADE PUPILS.

Plate XLVIII

(1) Sheet by a high school pupil, illustrating the correlation of history, literature, drawing, and composition. The original was drawn in lead pencil.

(2) Sheet by a normal pupil, illustrating the correlation of nature study, drawing, literature, and decorative arrangement. In the original, the goldfinch was in water-color and the lettering drawn with a brush.

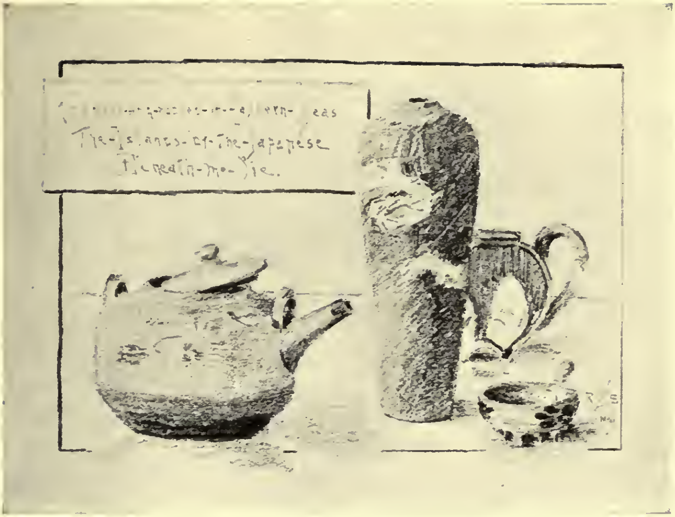


PLATE XLVIII. — A DRAWING IN PENCIL, BY A HIGH SCHOOL PUPIL. A DRAWING IN WATER COLOR, BY A NORMAL SCHOOL PUPIL. EXAMPLES OF GOOD ARRANGEMENT.

Plate XLIX

Drawing in connection with nature study. Studies of a sprouting bean, by a high school pupil. The original was in color. Notice the arrangement of the spots on the page, and how skillfully the initials are added to help carry the eye around the corner. They form an important but unobtrusive spot and assist greatly in the balance of the sheet.

PLATE XLIX.—STUDIES OF A SPROUTING BEAN, BY A HIGH SCHOOL PUPIL.

PLATE L

The cover for a set of papers on "Greek Architecture and Ornament." An original design by a normal school pupil. The papers were written upon unruled sheets and illustrated by means of scrap pictures, a map, and appropriate end-pieces. This cover was in water-color, three colors on a cream ground.

PLATE L.—ORIGINAL DESIGN FOR A COVER FOR A SET OF PAPERS ON GREEK ARCHITECTURE, BY A NORMAL PUPIL.

Plate LI

A cover for a set of Greek papers. An original design in two colors, white and black, by a high school pupil. The design is thoroughly Greek in effect, yet no single element is an exact copy of a Greek original.

PLATE LI.—A COVER FOR A SET OF GREEK PAPERS.
ORIGINAL DESIGN BY A HIGH SCHOOL PUPIL.

APPENDIX

A CLASSIFIED LIST OF WORKS OF ART SUITABLE FOR SCHOOLROOM DECORATION

PICTURES

Kindergarten and Primary Grades

A Distinguished Member of the Royal Humane Society	*Landseer*
Age of Innocence	*Reynolds*
An Old Monarch	*Rosa Bonheur*
Baby Stuart	*Van Dyck*
By the Riverside	*Le Rolle*
Can't You Talk?	*Holmes*
Caritas	*Thayer*
Cathedral of Pisa, with Leaning Tower, Western.	
Children of the Shell	*Murillo*
Christ Blessing Little Children	*Hoffman* or *Plockhorst*
Feeding the Birds	*Millet*
Holy Antonius of Padua	*Murillo*
Holy Night	*Corregio*
Little Rose	*Whistler*
Madonna of the Chair	*Raphael*
Milan Cathedral.	
Mother and Child	*Brush*
Norman Sire	*Rosa Bonheur*
Rest in Flight	*Knaus*
Shepherdess Knitting	*Millet*
The Blacksmith	*Frère*
The Connoisseurs	*Landseer*
The Escaped Cow	*Dupré*

Intermediate Grades

Angels' Heads	*Reynolds*
At the Watering Trough	*Dagnan-Bouveret*
Automedon	*Regnault*
Brother and Sister	*Abbott Thayer*
Children of Charles I.	*Van Dyck*
Christmas Bells	*Blashfield*
Cologne Cathedral, Germany.	
Dignity and Impudence	*Landseer*
Haymaker's Lunch	*Dupré*
Holy Night	*Le Rolle*
Horse Fair	*Rosa Bonheur*
Infante Don Balthasar	*Velasquez*
Kahyl	*Shreyer*
Madame Le Brun and Child (Morning)	*Mme. Le Brun*
Madonna and Child	*Dagnan-Bouveret*
Madonna, Child and St. John	*Bouguereau*
Madonna di San Sisto	*Raphael*
Odin (Dog)	*Landseer*
On the Coast near Scheveningen	*Mesdag*
Paysage	*Corot*
Penelope Boothby	*Reynolds*
Pharaoh's Horses	*Herring*
Pilgrims going to Church	*Boughton*
Ploughing	*Rosa Bonheur*
Return of the Fishing Boats	*Mesdag*
Return from the Farm	*Troyon*
St. Mark's Church, Venice.	
Shepherdess	*Le Rolle*
The Gleaners	*Millet*

Grammar Grades

Amiens Cathedral, France.	
A Morning Landscape	*Corot*
Aurora	*Guido Reni*
Capitol at Washington.	
Christ in the Temple	*Hoffman*

Church of Santa Maria della Salute.
Dance of the Nymphs . . . . . . *Corot*
Ducal Palace, Venice.
Equestrian Statue of General Colleoni . . *Verrocchio*
Fighting Téméraire . . . . . . *Turner*
Grand Canal and Rialto Bridge, Venice.
Harvest Moon . . . . *Mason*
Houses of Parliament, London, or New Palace
of Westminster.
In the Meadow . . . . *Le Rolle*
Madonna of the Shop . . . . . *Dagnan-Bouveret*
Madonna Gran Duca . . . . . . *Raphael*
Mount Vernon.
Notre Dame Cathedral, Paris.
Othello . . . . *Becher*
Porta Della Carta, Venice.
Portrait of Rubens . . . . . . *Rubens*
Queen Louise . . . . *Richter*
Reading from Homer . . . . . . *Alma-Tadema*
Shaw Memorial . . . . *St. Gaudens*
Sir Galahad . . . . *Watts*
St. Cecilia . . . . *Raphael*
Temperance . . . . *Burne-Jones*
The Alhambra, Granada, Court of Lions.
The Golden Stairs . . . . . . *Burne-Jones*
The Haymaker . . . . *Adan*
The King of Rome . . . . . . *Greuze*
The Quest of the Grail Series:
Oath of Knighthood . . . . . *Abbey*
Round Table of King Arthur . . . *Abbey*
The Shepherdess . . . . *Millet*
The Sower . . . . *Millet*
The Taj Mahal, India.
The Water Carrier . . . . . . *Millet*
Virgin Enthroned . . . . *Abbott Thayer*
Virgin, Infant Jesus, and St. John . . *Botticelli*
Washington . . . . *Stuart*
Westminster Abbey, London.

High School

A Doge of Venice	*Bellini*
Angels	*Farli*
Angel Trumpeters (colored)	*Fra Angelico*
Angelus	*Millet*
Appian Way, Rome.	
Approach to Venice	*Turner*
Arch of Titus.	
Breaking Home Ties	*Hovenden*
Canterbury Pilgrims	*Blake*
Castle of St. Angelo and the Tiber.	
Christ and the Rich Ruler	*Hoffman*
Circe	*Burne-Jones*
Diana's Bath	*Corot*
Duomo and Campanile, Florence.	
Elizabeth Bas	*Rembrandt*
Evolution of the Book (series of six)	*Alexander*
Frieze of the Prophets	*Sargent*
Government (series of five)	*Vedder*
Jeanne d'Arc	*Le Page*
Julian	*Michael Angelo*
Lady Hamilton	*Romney*
Last Supper	*Da Vinci*
Moses	*Michael Angelo*
Mosque of Omar, Jerusalem.	
Napoleon at Waterloo.	
Portrait of his Mother	*Whistler*
Primavera	*Botticelli*
Princes in the Tower	*Millais*
Roman Forum. View from Colosseum.	
St. Michel and Satan	*Guido Reni*
St. Michel and Satan	*Raphael*
Soul's Awakening	*Sant*
Sybils.	*Michael Angelo*
The Days of Creation	*Burne-Jones*
The Vintage Festival	*Alma-Tadema*
Ulysses deriding Polyphemus	*Turner*

View of Acropolis and Parthenon.
View of Arch of Constantine.
View of Erechtheum and Caryatid Porch, Ionic Order.
View of Isle of Philæ and Pharaoh's Bed.
View of Pantheon.
View of Sphinx and Pyramids.

CASTS

Kindergarten and Primary Grades

Bambino — From Children's Hospital, Florence.
Bambino — From Children's Hospital, Florence.
Cat . . . . *Fremiet*
Cherub — From Tomb of Henry IV.
Cherub — From Tomb of Henry IV.
Cock . . . . *Fremiet*
Elephant . . . . *Barye*
Lion . . . . *Barye*
Madonna and Child.
Madonna and Child.
Madonna and Child . . . . . *Andrea della Robbia*
Rabbit . . . . *Fremiet*
Seraph.
Singing Cherubs.
St. John . . . . *Bargello*
St. John, in Boyhood.

Intermediate Grades

Choir Boys, or (Seven Boys singing from One Book.) *Luca della Robbia*
Columbus . . . . *Canova*
Elephant (running) . . . . . *Barye*
Faun . . . . *Praxiteles*
Flight of Time . . . . . . *William Hunt*
Lion . . . . *Barye*
Madonna and Child . . . . . *Bargello*, Florence
Maiden of Lille . . . . Attributed to *Raphael*

Morning . . . . *Thorwaldsen*
Night . . . . *Thorwaldsen*
Nun Seated.
St. George . . . . *Donatello*, Florence
St. John — From the Pinacoteca, Florence.
Triumph of Alexander . . . . . *Thorwaldsen*
Venus of Melos — From the Louvre.

GRAMMAR GRADES

Angels.
Angels.
Angels Bearing Wreaths — From San Zanobia's Monument in the Duomo, Florence.
Angels with Musical Instruments — From the Front of an Altar in the Church of San Trovasso, Venice (fifteenth century).
Apollo in a Chariot.
Apollo Belvedere — At Rome, or the Vatican.
Bear (dancing) . . . . *Barye*
Chariot Race (Quadriges).
Chariot Race (Quadriges).
Choir Boys, or (Five Boys singing from One Scroll.) *Luca della Robbia*
David . . . . *A. Mercie*
Diana of Versailles — From the Louvre.
Hypnos — Original in British Museum.
Moorish Panel — From the Alhambra.
Moorish Panel — From the Alhambra.
Niké, or Victory, untying Sandals . . . *Praxiteles*
Niké, or Victory of Samothrace — From the Louvre.
Nubian Girl.
Panther . . . . *Barye*
Portrait . . . . *Antonio Pollajolo*
Scroll, with Griffins.
Slave . . . . *Michael Angelo*
Sphinx — From British Museum.
Victory, or Niké — From National Museum, Naples.

High School

Apollo and the Muses.
Bacchante — From Capitoline Museum, Rome.
Capital — From the Alhambra.
Choir Boys, or (Six Boys playing on Trumpets; Four Children dancing.) . . . . *Luca della Robbia*
Menos Procession, the Nine Muses.
Moorish Panel — From the Alhambra.
Moorish Panel — From the Alhambra.
Niké decorating a Trophy — From the Balustrade of the Temple of Niké Apteros, Athens.
Parthenon Frieze, Slabs from Western Frieze.
St. Cecilia.
Savonarola.
Six Children playing on Cymbals . . . *Luca della Robbia*
Augustus (young).
Dante . . . . (*Naples*)
Hermes, Olympian . . . . *Praxiteles*
Homer . . . . (*Naples*)
Jupiter, or Zeus of Atricoli — From the Vatican.
Minerva Giustiniani — In the Braccio Nuovo of the Vatican.
Narcissus — From National Museum, Naples.
Sophocles — From Lateran Museum.
Unknown Woman — From the Louvre.

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