

T H E S I S

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A N D  
G R O U N D S

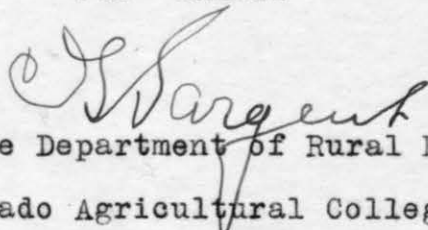
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Submitted by  
Josephine Stokes  
for the Degree of Master of Arts  
Colorado Agricultural College  
August 12, 1924.

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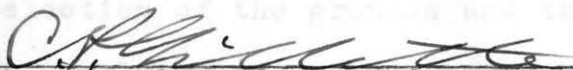
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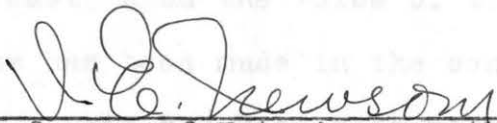
Head of the Department of Rural Education  
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THIS THESIS HAS BEEN APPROVED AND RECOMMENDED FOR  
THE DEGREE OF MASTER OF ARTS

  
Chairman and Professor of Zoology

  
Professor of Horticulture

  
Professor of Veterinary Pathology

Committee on Advanced Degrees  
Colorado Agricultural College  
Fort Collins, Colorado

## Foreword.

The selection of the grounds and the decision upon the type of building to be erected must, in every instance, be determined by local conditions, such as population, valuation of property, available funds and, last but not least, upon the voice of those to be served. Great progress has been made in the construction of rural schools. This has been made possible, to a great degree, by the union of isolated districts, and the erection of a modern consolidated school building, designed to meet the needs of the community. The subject matter of this thesis is treated from a general standpoint, rather than technical.



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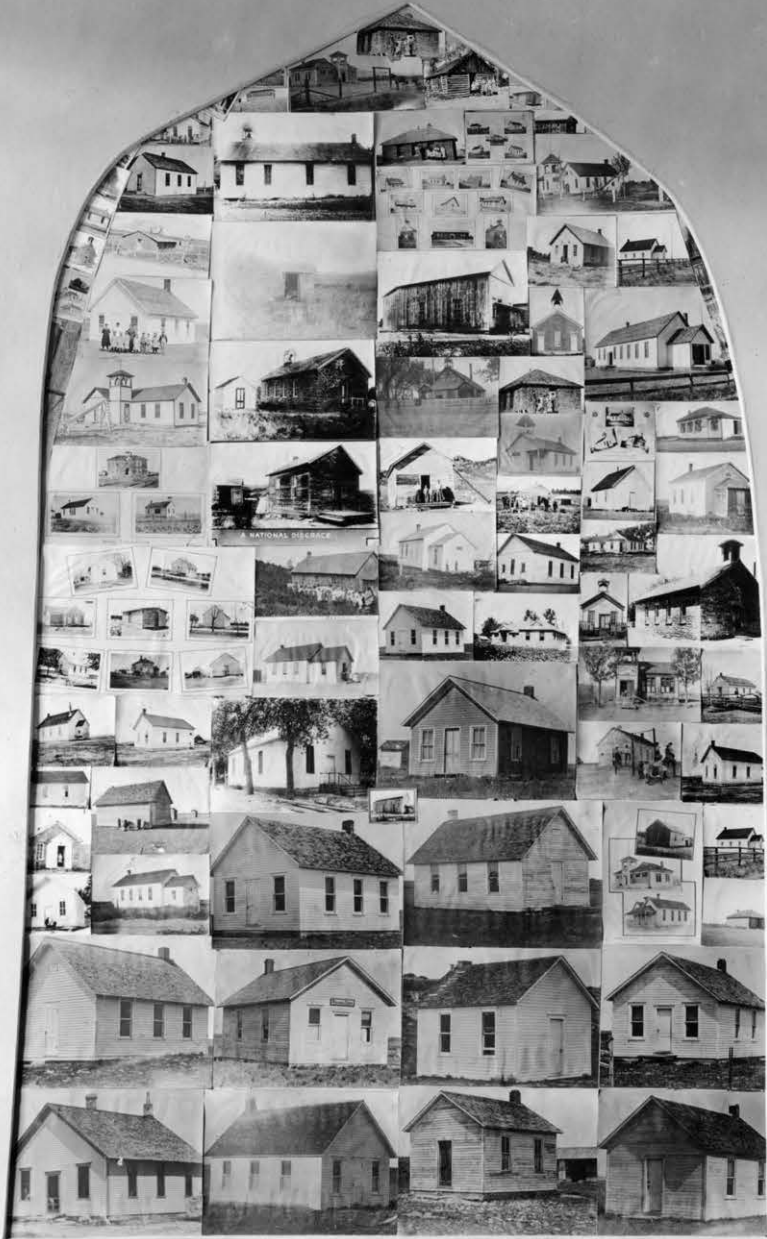
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An Educational Scrap Heap



Some of 500 abandoned buildings  
"Discarded Models"  
"Chips" from the consolidation campaign.



## The Evolution Of The "Country" Schoolhouse.

Our Schoolhouses are the very last of public buildings through which public taste has sought to express itself. Does not this seem rather strange, when we consider the fact that two-thirds of the formative days of our children are spent in these same schoolhouses? Here, then, are the surroundings, the environment that is to wield one of the strongest, if not indeed the very strongest influence upon the formation of the character of the future generations. Nevertheless, one need but delve beneath the surface of these conditions to find himself face to face with one of the most fundamental phases of human nature. Adults have from the earliest traces of history planned and schemed for the comforts and needs of the grown-ups rather than for the rising generation.

A study of the evolution of the American "Country" schoolhouse reveals our kinship to the old world Nationals and at once catalogues us as "a group" of the human beings that inherit the earth, and forever banishes the illusion that we, as a people, are different.

Our magnificent consolidated schools are the outgrowth of the ever living determination of the few, who, in every generation prove themselves to be right, in spite of the opposition of the ultra conservative masses.

In the days of the Colonies the good old English methods were followed as a matter of course. Finally, after Independence had become a fact and the hardy pioneers began

to push westward and ever westward, educational methods were distanced by the broad-ax of the woodsman and the huntsman's rifle. And, here we have the real birth of the American "Country" schoolhouse. Rude log cabins were hastily constructed, cracks in the walls daubed with mud, floors made of poles (puncheon floors) and roofs of bark and slabs. later, as each new strip of conquered lands became permanently settled these rude cabins slowly gave way to larger structures of rough boards with high, steep roof, few and small windows and the big wood-burning stove in the center; square or rectangular structures of no particular design, with no thought to comfort or convenience of either the pupils or the teacher.

The coming of modern machinery, railroads, and the further development of some of the natural resources brought such increase of community wealth as to occasion still another evolution which found expression in the square, high belfried brick schoolhouse. Although this later development was a great improvement, it still wanted many features which today are considered absolutely essential. The lighting was not planned, specially, but was just an incidental feature of the building. Health and safety features were almost unthought of. These buildings were usually planned by the school board and the contractor, none of whom had any conception of the needs of health, safety or convenience features of a schoolhouse.

The next cycle brings the advent of the city architect into the field of country schoolhouses. He was an architect only in the sense of knowing how many bricks could be piled on the steel beam without breaking it. The chief improvement which he brought to the country schoolhouse was in the heating plant and the addition of crude safety features, usually confined to some kind of outside fire escape. These buildings were modern only to the extent of heating plant and indoor toilets. (The latter only in isolated instances.) He was often paid the fabulous sum of \$50.00 or even \$100.00 just for drawing up the plans.

As the popular demand for better schoolhouses grew, grew also the cost of materials, the cost of labor, etc. Until finally the cost to a single district of the building and upkeep of a modern structure became a thing not to be borne. What was to be done? For several generations it had been a custom, in many parts of the country, when a schoolhouse became so old and dilapidated as to necessitate its abandonment to transfer the children to a neighboring district. From this practice arose the consolidated school idea. This seemed to solve the problem of cost of construction, shortage of teachers and had so many desirable features as over the single district plan that its development, in the more progressive states, has been fairly phenomenal as compared with the progress over a like period of time a few generations ago. This rapid development has been greatly



augmented by the timely advent of the automobile.

Many changes have been made in the construction of the consolidated school building and also in the location. Most of the earlier consolidated schools were located in towns and villages. This was particularly true in the New England States where the term "town" school was used. The school served the entire community or township and was located at the most central point relative to population. The village school was enlarged, the schools in the surrounding country were closed and the children brought to town. The buildings lacked the proper facilities to care for the rural children, and very little or no provision at all was made to teach subjects relating to farm life. It was, in the majority of cases a city school for country children with "city text books, city courses of study and city methods."

It has required time for the public to become educated to the idea, that in order to interest the children in school and not draw them away from the rural community, there must be some relation between the school environment and the home. The proper type of buildings and suitable grounds are two very important factors. The majority of the children in



## Grounds.

The first requisite in planning for a consolidated school building is suitable and ample grounds. An imprudent selection of a site may place the building in an undesirable place both with respect to health conditions and accessibility. Limited grounds frustrate the possibility of expansion and restrict the educational and recreational opportunities which the great out-of-doors offers to everyone. It is often a difficult matter to get the public to realize the importance of large and well situated school grounds. Animals do not thrive in small, cramped quarters, and children likewise fail to secure the benefits to which they are entitled, if they do not have sufficient space for activity.

## Location.

The term location includes the environment and topography of the site. The school plant should be located as nearly as possible in the center of the district in order to provide for the greatest convenience of the children. However, the health of the pupils should not be sacrificed to obtain this convenience. The majority of the children in a consolidated district are transported to school, therefore, the distance of a half mile or a mile should not be considered in choosing a site because pleasant, healthful surroundings far outweigh the advantages which a central

location might give.

The topography must be carefully considered in selecting the location for the plant. The best authorities agree that the soil should be as free as possible from excess moisture and the most desirable sites are high and well drained. The interstices of the soil are filled with air which is in motion just as the air above the ground, though in a much smaller degree. This circulation of air in the soil is of great importance in preventing stagnation, and, therefore; not only is it desirable to have a suitable quick-drying top-soil, but some consideration should be given to the sub-soil as well. A sub-soil of coarse sand and gravel is an asset of no small value, and should be sought in connection with the right kind of top-soil, if it is to be had without sacrifice of too many other desirable features. If a school house must be built on flat ground, the best drainage system possible should be provided. The best site is none too good for a school plant.

#### Area.

Since most of the consolidated schools are in the country or in small towns, it is not necessary to economize on the size of the site. Five acres of ground is the minimum that a school should have, however, a few of the older schools have only three or four acres. The Sargent School, near Monte Vista, has a fine fourteen acre tract of good

irrigated land in the center of the district. The Center School in Saguache County is located on a tract of thirteen acres of irrigated land. About a twelve acre tract makes a very suitable site. A consolidated school in Iowa, which the writer attended some years ago had only two acres of ground. At the present, that State as well as many others has set a minimum which schools are required to meet in order to receive state aid. In numerous schools the pupils carry on the project work on their father's farms, thus necessitating less space for that purpose at school.

#### Development.

After a suitable site has been secured its development should receive careful consideration. The location and orientation of the building should be considered first, then space for its expansion, space for foregrounds, gardens in connection with agriculture and botanical courses, space for physical education, athletic and recreational activities. Comprehensive plans for development should be made from the very beginning even though some of the improvements planned cannot be carried out at once. Much trouble can be prevented by proper foresight.

Some rural communities are employing landscape gardeners to plan the school lawn and garden spaces. Children are greatly influenced by their school surroundings and as

has been said, "Beauty of environment begets beauty of life." The landscape gardening may be done by the pupils. The consolidated school at Liberty Center, Iowa, has beautiful grounds, landscaped and set to trees and shrubbery by the students of the Vocational Agriculture Class. A complete school garden is also conducted by the grade and junior high boys. The girls can use the products for future use in the lunch room. grounds are provided aside from the space allotted for physical. The space for agricultural and botanical courses varies. As has been mentioned before, in some schools the students do some of the project work at home. Sometimes the superintendent or the instructor in agriculture takes charge of a tract and establishes a small model farm, caring for it with the assistance of the students. This plan, undoubtedly, has many good features to commend it, but, it also has some weak points. During the summer months the students, as a rule, prefer to fish and swim instead of working on the model farm, and this frequently leaves practically all the work to the person in charge.

According to the standards set forth by educational authorities, schools should have at least two acres of ground for out-door physical education. It is the opinion of many of the rural patrons that the children receive sufficient exercise at home, and do not need to play while at school, but they fail to consider the socializing influence exerted by



healthful play. In a consolidated school where we find kindergarten, grade, and high school pupils, provision for playgrounds must be made to accommodate all. The school at Coburg, Iowa, presents a very good example. Playgrounds for various age-groups are provided, and this prevents the occurrence of unpleasant incidents which result when large and small children are compelled to use the same play grounds. These grounds are provided aside from the space allotted for physical education.

The opportunity for play and physical development is one of the great advantages which the consolidated school has to offer that is lacking in the one-room rural school.

Which issue from area the potatoes  
Does his counsel answer this. He could learn  
The better a trade, not learn to get a seat,  
But never learn to do that one great thing  
Which he says.

— W. S. Belland.

. . . . . "You shall see a man  
Who never drew a line or struck an arc  
Direct an Architect and spoil his work,  
Because, forsooth; he likes a "tasteful" house;  
He likes a muffin, but he does not go  
Into the kitchen to instruct his cook--  
Nay, that were insult. He admires fine clothes,  
But trusts his tailor. Only in those arts  
Which issue from creative potencies  
Does his conceit engage him. He could learn  
The baker's trade, and learn to cut a coat,  
But never learn to do that one great thing  
Which he essays."

--J. G. Holland.



1. Old Johnstown School. 2. New Building.

## Architecture.

We have not developed a pure type of American architecture, however, there has been marked improvement in recent years.

There are three essentials of good architecture which should be applied to school buildings. The building should first of all be suitable; second it should possess strength and durability; and in the third place the architectural design should conform to the panorama. These three considerations may not be of equal importance, and the degree of cognizance which each should receive must of necessity be determined by the type of building. The exterior as well as the interior should be simple and yet refined in design and decoration. Over-elaboration and ornamentation will detract from the appearance of any building.

School buildings are especially hard to balance architecturally on account of the large window spaces and the lack of counterbalancing wall space. However, it is possible to make a well balanced, beautiful building and leave off that school house appearance which has marred the buildings in the past. It is true that public money is expended for the erection of public schools, and public taste and opinion should have every consideration, at the same time this should not displace the professional opinion of the architect on structural principles.





Crowley. 1.New Building. 2.Old Building.

## Selection Of Architect.

One of the most important, if not the most important step, in the construction of a school building is the employment of the architect.

Some people regard the architect as an almost useless expense, and insist that any good builder is capable of doing the work of an architect.

Architecture is in its nature a peculiar profession combining art, science, and business. The science of building represents the practical side of construction, and the art of designing the other side. An architect must be trained to consider both the artistic and the practical sides, that is why he is more successful than the practical builder who does not consider the artistic.

Poor work is more costly than work well done. It is poor economy to employ an architect whose price is less because he does not know his business. Consolidated school buildings are complicated and difficult to plan and construct, because, in many communities all the grades must be accommodated in one building, therefore, the man who is employed should be capable of planning a building suitable to the needs of that particular community.

The apparent dissatisfaction with the earlier types of consolidated schools, was due, in a large measure, to the ill-suited, impractical types of buildings which were constructed without due consideration to the important work of a good architect.

## Types Of Buildings.

The open and the closed are two general types of building plans for schools. The open type has the corridor open to natural light on one side, with classrooms on the other. This plan affords maximum safety owing to the location of the classrooms in relation to the corridors and the exits. The open plan is used extensively in Central and Northern Europe and is gaining favor in many parts of the United States, especially in the warmer climates.

The closed type has classrooms on both sides of the corridor. In this type the corridors receive natural light through windows at the ends and through the glass in the doors leading into the classrooms. The closed type is more widely used because of the difference in the initial cost, and since cost is one of the chief objections to consolidation, this is the type usually selected. The open type is desirable because of its safety features, but it cannot be as economically heated as the closed type, and there is also more waste floor space.

The bungalow or one story building may be of either type and its chief advantage lies in its safety from fires and panic. The cost of construction is much greater, however, and for this reason is not looked upon with much favor.

This classification may be further expanded to include the single and multiple unit types, which merely



The Hooper School.



Parker School.



Eckert School.



means a choice between two methods of housing the school. The single unit plan undertakes to house the whole school under a single roof. While the multiple unit plan has for its aim the separation of departments into separate buildings. The Center School in Saguache County is a very good illustration of the single unit type, which is very successfully and economically carried out in this case. For examples of the multiple unit type, there are the Johnstown, Windsor, and Sargent Schools, all of which are excellent examples of this particular type.

The enrollment of the school determines to a great degree which plan is the more feasible. If the enrollment is very great the single unit plan is practically out of the question. On the other hand, if the enrollment is small and no likelihood of any very great increase, then the single unit is indicated for its economy and convenience.

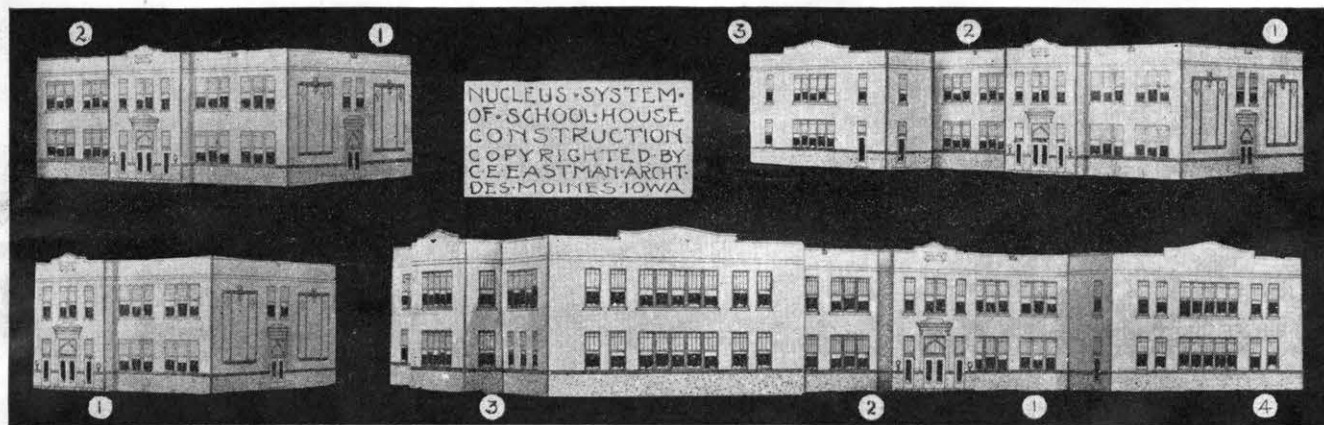
Whatever the type, the building should be thoroly adapted to the fulfillment of the purposes for which it is intended. If the building program is of the single unit, no special difficulty should be experienced in converting to the multiple unit system if the initial construction is properly planned with the possibility of this contingency in view. For, in any case the heating plant should be separate.

## The Unit Plan Of Construction.

The unit plan of construction offers a splendid opportunity to the small and less prosperous, or financially handicapped community to build a modern, up-to-date school house. Explanation is given of a building constructed under the unit type.

Unit number 1 has four rooms providing for 160 pupils. The addition of Unit number 2 will accommodate 160 more. By addition of Unit number 3, a combination auditorium and gymnasium is provided, which by using the bleacher space at one end for manual training, and the space at the other end for domestic science, and using the upper story of Units 1 and 2 for high school purposes, a consolidated school is secured which will meet the requirements of most districts. The building has fire proof corridors and stairways, and the remainder of the building may be of such construction as the district desires. A movable partition may be used to divide the auditorium-gymnasium into rooms.

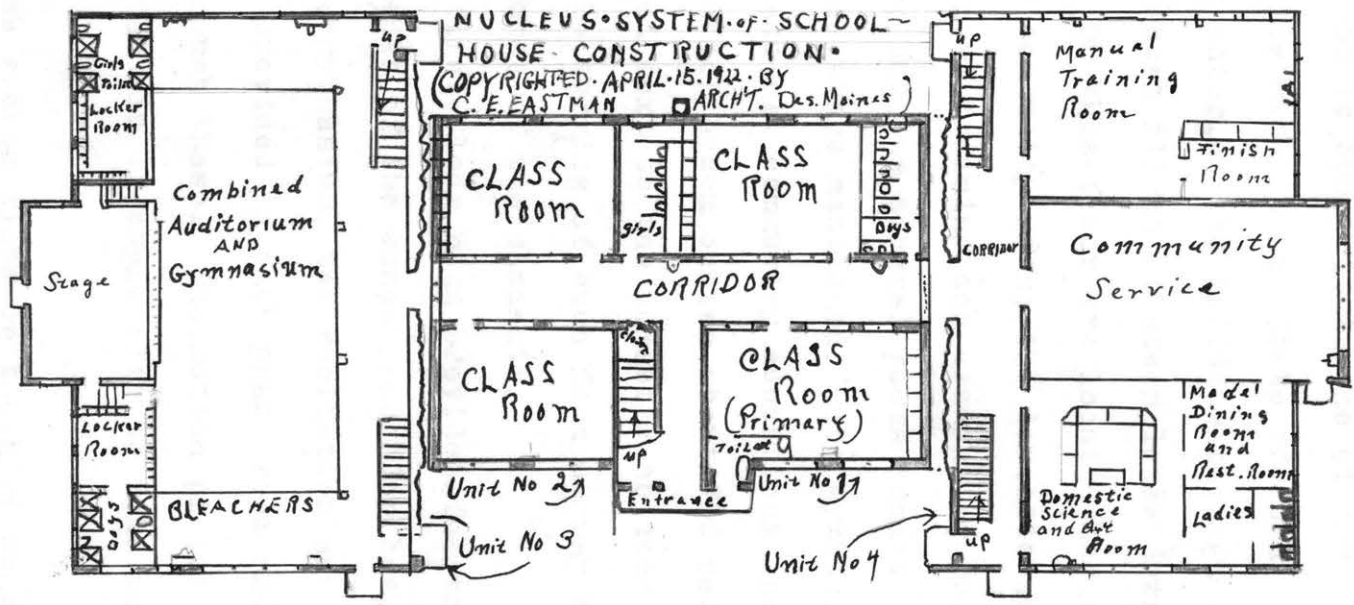
By adding Unit number 4 a large community center is secured with large manual training room, a large domestic science and art room, also junior and senior high school facilities in the most complete manner. No changes in construction are necessary except cutting out windows in ends of corridors of Units 1 and 2.



The Unit System of Construction

—Courtesy Mr. Eastman.





Ground floor plan.

Unit Plan

## The Lytton Building.

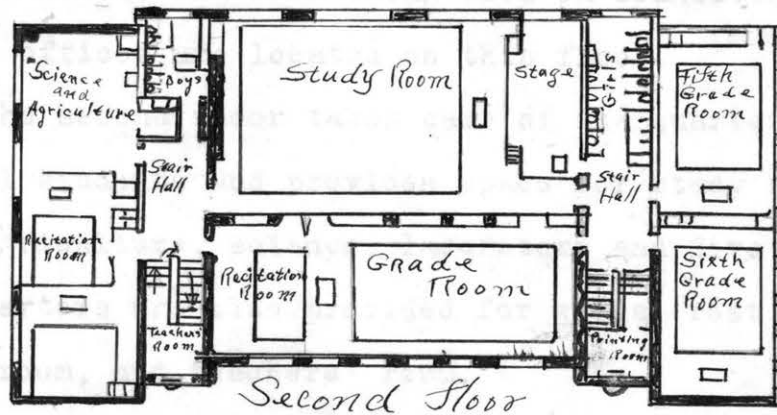
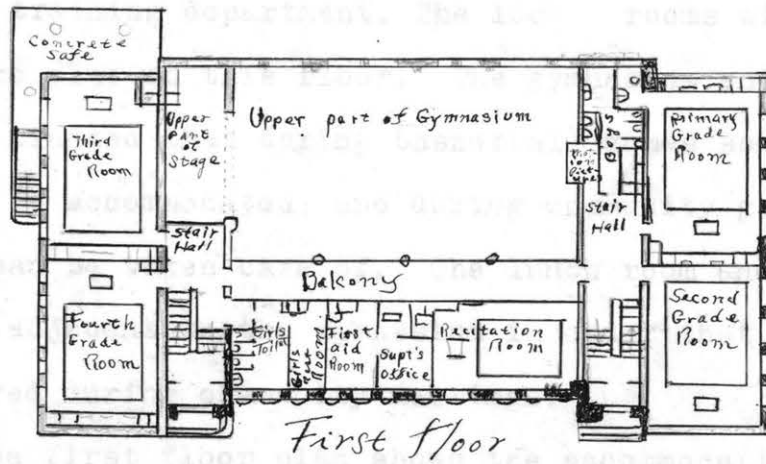
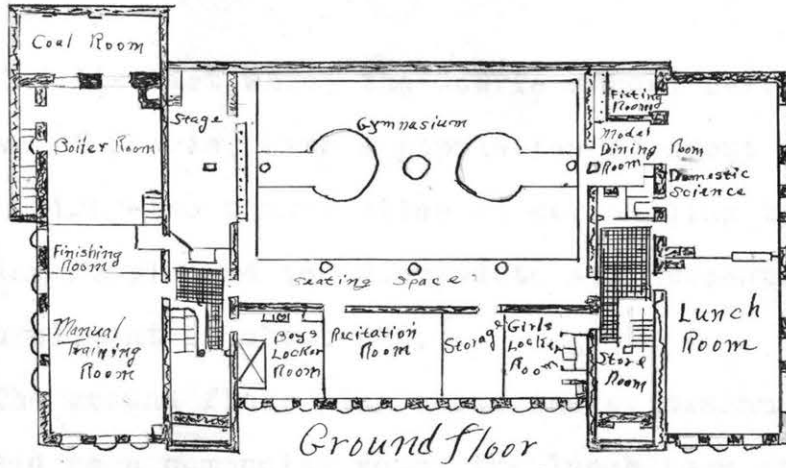
The Lytton School Building accommodates an enrollment of from 250 to 300. It is one of the most up-to-date buildings of its size in the State of Iowa.

Upon entering the building through either of the two entrances, a short flight of steps leads down to the ground floor level. On this floor are located the gymnasium, which serves as the community room; the domestic science and lunch rooms; the manual training and draughting rooms; the boiler and fan rooms; and the several rooms needed to work in connection with those above mentioned. The gymnasium is provided with a stage and all community educational activities are held in this room which accommodates about 700 people. The lunch room is located next to the domestic science room and thus facilitates the serving of such food as may be desirable for noon-time lunches of the students.

The first floor plan provides for pupils in the lower four grades of the school and also has, opening off the balcony to the gymnasium, two recitation and one sewing room. Wardrobes are provided in each grade room and the rooms are ventilated through these. The motion picture booth is located on this floor and is of ample size to take care of a standard machine.

On the second floor is the high school assembly room with library and stage in connection therewith; two recitation rooms and the science and agriculture room. The fifth, sixth, seventh, and eighth grade rooms, also the administration rooms are on this floor.

# Lytton Building



## The Gowrie School.

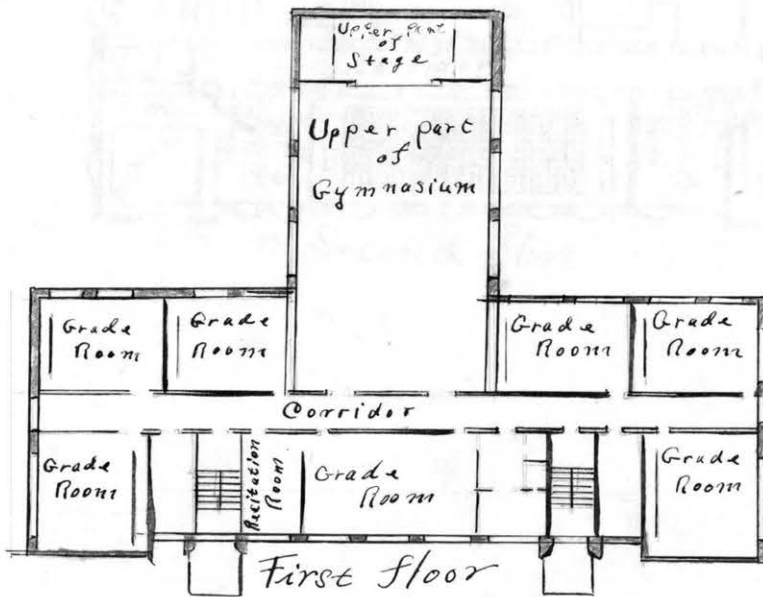
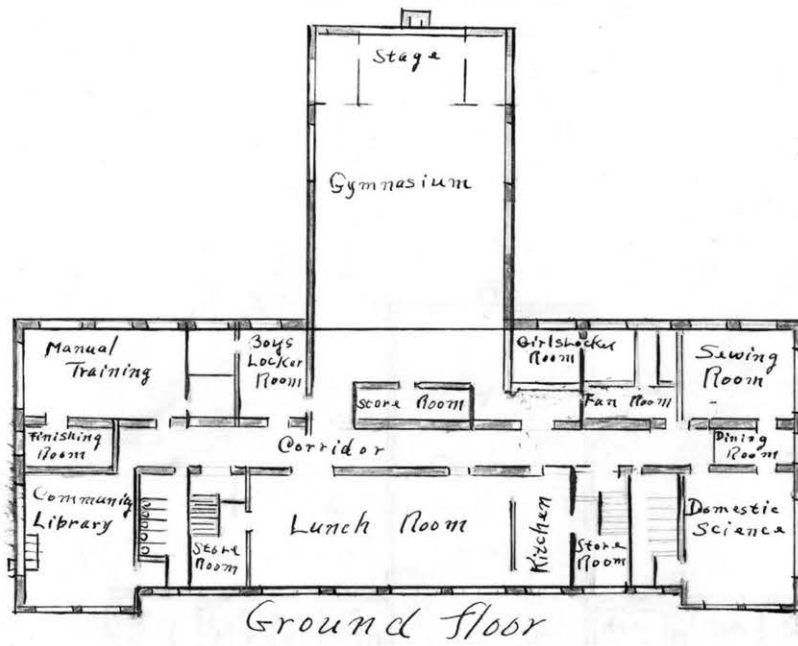
The district which the Gowrie school serves consists of the town of Gowrie, with a population of about nine hundred, and thirty-two square miles of surrounding territory. The building is planned to accommodate 475 students, and the present enrollment is about 370.

The ground floor plan shows the gymnasium, which is also used as a community room; the lunch room with adjacent kitchen; domestic science suite of rooms, consisting of sewing, cooking and dining rooms; the community library, and the manual training department. The locker rooms with showers adjacent are also on this floor. The gymnasium and community room is so planned that during basketball games some 300 people can be accommodated, and during community gatherings about 800 can be taken care of. The lunch room and kitchen are placed adjacent to the gymnasium in order that meals may be served during community meetings.

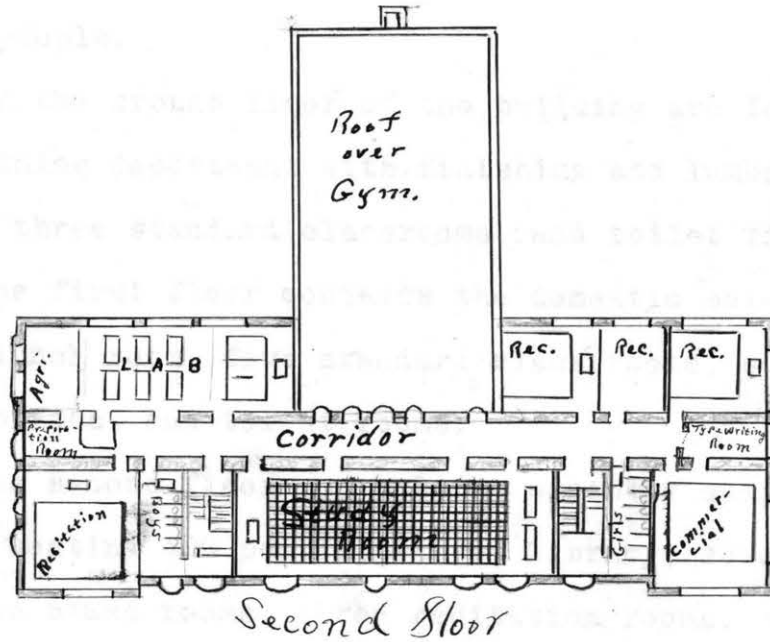
The first floor plan shows the accommodations for the students in the first eight grades, inclusive; the seventh and eighth grades working on the departmental plan of teaching, a recitation room being used in connection with this room. The offices are located on this floor.

The second floor takes care of the quarters of the high school students and provides space for study room, commercial, agriculture, science, laboratory and five recitation rooms. Quarters are also provided for girls' rest room, a first aid room, and teachers' room.

Gowrie Building



# Gowrie Building





## The Redfield School.

The school building at Redfield, Iowa, is a three story structure with basement, thoroughly fire-proof, 130 feet long and 66 feet wide. In the basement is located the heating system, locker and shower rooms for both boys and girls, and a large gymnasium with a seating capacity for about 500 people.

On the ground floor of the building are found the manual training department with finishing and lumber storing rooms, three standard classrooms, and toilet rooms.

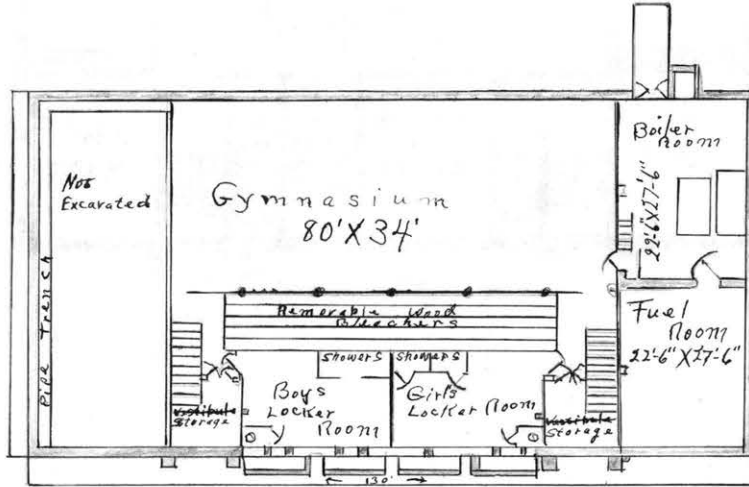
The first floor contains the domestic science department, lunch room, five standard class rooms, superintendent's office, and toilet rooms.

The second floor has a large assembly auditorium, capable of seating 400 people, stage, library, science laboratory, two class rooms, three recitation rooms, principal's office, and rest rooms.

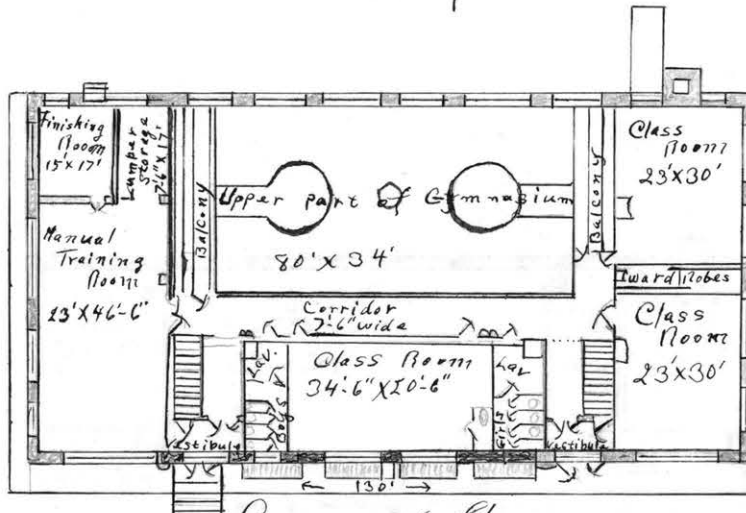
## The Sargent School.

The Sargent School Plant consists of seven buildings, 1. high school and community building 2. grade school 3. garage and gymnasium 4. superintendent's home 5. women teachers' home 6. Home for principal and mechanic 7. the parsonage.

Redfield School



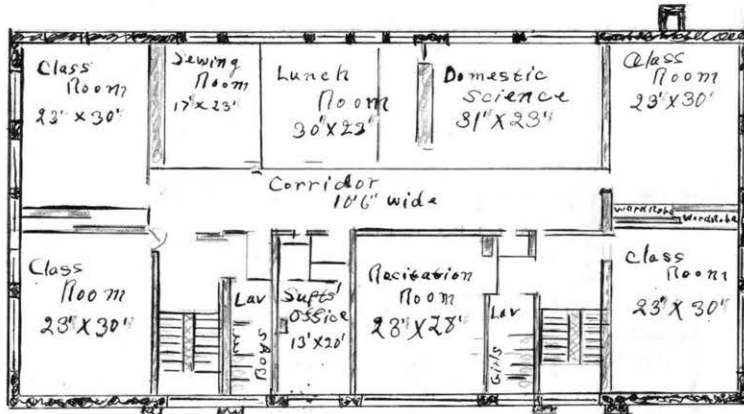
Basement plan



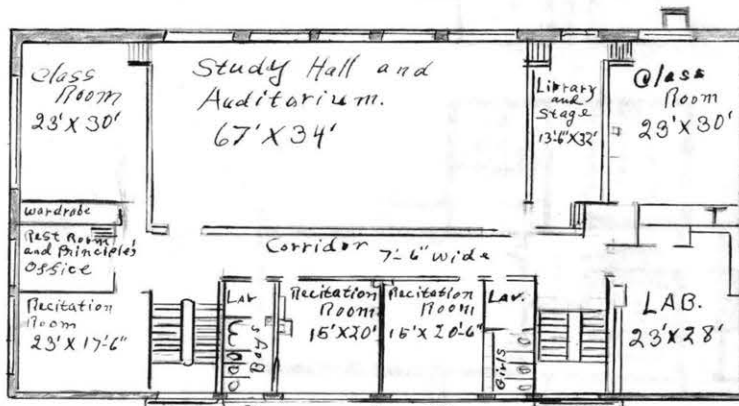
Ground floor



Redfield School

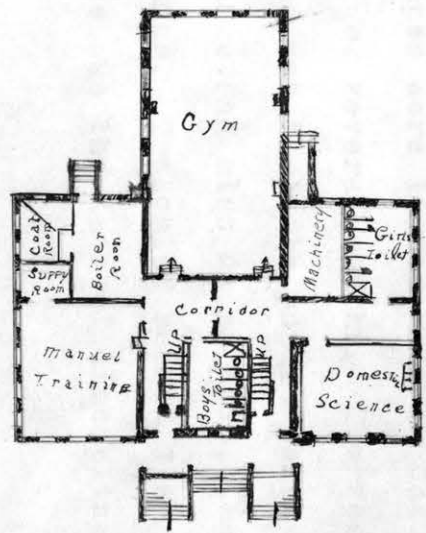


First floor

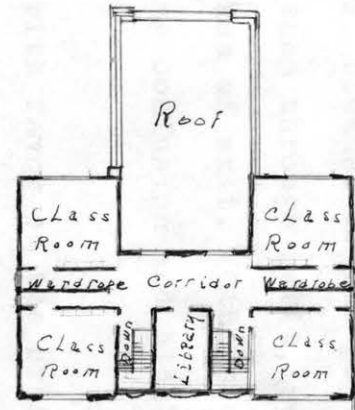
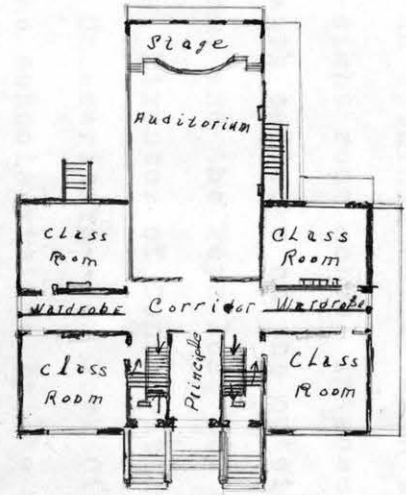


Second floor

Sargent School Grade Building



BASEMENT



FIRST FLOOR - SECOND FLOOR

## Fire Escapes.

The majority of the new, modern buildings do not have the ordinary fire escapes attached. Unless the pupils are required to use them regularly in passing, they are a hindrance in case of fire, because if the pupils are not thoroly acquainted with them through habit, some will resort to the stairways as a means of exit. Others will use the fire escapes, thus causing confusion and blockading the corridors.

"I do not look with favor on the ordinary, so called fire escape built like an upturned boiler with a spiral slide inside. With a twenty-eight room school in session, I found three of these locked with padlocks on the outside of the exit doors at the bottom, and the keys lost for over four months."--T. A. Fleming, Director of Conservation of the National Board of Fire Underwriters--New York City.

In three of the schools visited by the writer, the doors to the fire escapes were locked, and in one place they had not been unlocked for several months. The reason given for keeping them locked was that the pupils persisted in using them as an entrance and also as an exit, that the fire escapes became a nuisance. The chief reason that the fire escapes were a nuisance was the lack of discipline in the school.

An ample number of stairways, properly located, serve as the best means of safety.

## Corridors.

Circulation and egress is the primary purpose of corridors. They must be wide enough to prevent congestion while the students are gathering in the morning or passing from one part of the building to another. Adequate circulation is especially necessary as a safety feature to prevent blockade in case of fire.

No fixed rule can be given for the width of corridors. The ground floor corridor should not be less than 10 feet in width and some consolidated schools have corridors 12 feet wide and a few have them even wider. Since the students are, as a rule, on the school ground during the noon intermission, and range in age from six to eighteen years of age, it is very necessary that the corridors should be of ample width. In a number of schools the upper floor corridors are narrower because there are fewer students on that floor, and it is used much less than the ground floor. In a building with classrooms on one side only, it is possible to have the corridor narrower because the exits are more accessible and there is less danger of congestion or blockade in case of emergency.

Wide corridors offer an excellent place for pictures, for mural paintings, and other forms of art which exert an unconscious influence upon children. These would not obstruct the corridors in any way. In a consolidated school especially, would it be an excellent feature, because all the pupils would have an opportunity of seeing it daily.

## Stairways And Exits.

The number of stairways in a consolidated school building should not be restricted for the sake of reducing the cost. The building at Crawfordsville, Iowa, which has recently been remodelled, had only one stairway and one exit. The writer witnessed a panic during a fire in that building and only the efficient work of the fire department prevented a disaster as the older pupils rushed down the stairway, trampling the smaller ones under foot.

An adequate number of stairways should be placed in every building, and so arranged as to reduce to a minimum the horizontal travel distance from various parts of building to stairways and exits. Definite groups of classrooms should be designated to use a particular stairway, then in case of emergency the students will be divided into groups and avoid congestion and confusion.

No hard and fast rule can be given as to the number of stairways that a building should have as that depends upon the type of building. However, there are suggestions based upon experience and the practice of modern schools. 120 persons in line two abreast can pass a given point in about 55 seconds or less. If fire drills are properly practiced, the time can be reduced to about 43 seconds. A school building may be considered safe if it can be emptied in three minutes or less without congestion or confusion.

Some of the best authorities say that the stairways



should be located as near the ends of the building as possible, because fires, as a rule, originate in the center of the building, or in any case the smoke gathers there regardless of where the fire might have started, and makes descent very dangerous or impossible. Others object to this plan because the stairways interfere with natural lighting in the corridors.

The stairway should be in two runs from story to story, with broad landings and the boxed in type of balustrade. The open balustrade admits more light but has other objectionable features.

In many of the older type buildings the stairways are 8 to 10 feet wide which often results in disorder, and is also a great waste of space. A stairway should not be over five feet in width, and in buildings studied in the Middle West, many were found to be four and one-half feet in width, which enabled the students to pass in excellent order.

A school building should be constructed of fire-resistive material for safety and endurance, but if it is made of less substantial material, the stairways should be of fire proof construction. To make them of inflammable material, is to make the building a veritable fire trap.

The number of exits is governed by the type and plan of construction.

## Fire-Resistive-Construction.

The attention of the public should be brought to the advantages of fire proof buildings. People often have the idea that fire proof buildings are too expensive and cost much more than other construction. This is an open question. The scarcity and increasing cost of good lumber is advancing the cost of non-fire-resistive construction. The cost of fire-resistive material is gradually being reduced and the quality improved, so that at the present time the initial cost of fire proof construction is very little more than that of less substantial material, and the cost of maintenance and repairs is very much less. The fire hazard is reduced 90 per cent.

Where funds are not available for fire-resistive construction throughout, the stairways, corridors, and floors should be fire proof. Since consolidated schools are either in small towns or in the open country, where the fire department is small or none exists, it is especially recommended that the buildings be made fire proof.

In 1911 the Russell Sage Foundation authorized the first investigation of school building regulations and found that Connecticut and Ohio were the only states having regulations to safeguard against fires in schoolhouses. At that time the National Insurance Files recorded but one fire a day in school buildings. In 1921 those files recorded five fires a day and many more were perhaps unrecorded. In

the classification of buildings as fire hazards, the school house apparently heads the list of public buildings.

Insurance rates are substantially less on fire-resistant structures than on those of cheaper materials. Over a long period of time, this saving will offset the greater initial cost of construction.

If it is not possible to make the building fire proof, then a plan of construction should be used which will provide the greatest possible safety features in the way of stairways, corridors and exits.

quantity of light varies in different parts of the country. In the southern and northwestern states where there are many sunny days, a different plan must be used than in the less sunny northern and eastern states. The dust and foreign matter in the air must also be taken into consideration. Arizona, for instance, has a sunny climate but at the same time has dust storms which prevail during many months of the year and partially dim the sun. In some sections of the country the dazzling light in winter offers a problem for solution. Several states have passed laws fixing one-fifth of the floor area for glass area, regardless of other considerations and in a few states even one-fourth is required. Such laws are too drastic. They may be helpful in many instances, but also are harmful, as too much light is as bad as too little. Reliable authorities agree that one-sixth of floor space for

## Natural Lighting.

The proper lighting of a schoolroom is a local problem. Volumes have been written on the proper lighting of school buildings and there is a difference of opinion on the methods of admitting light, and on the quantity to be admitted. It is generally agreed that the light should come from the left in order that when writing the shadow of the right hand will not fall directly on the point where the pen touches the paper. In this arrangement the lefthanded pupil is generally overlooked. It is often a difficult problem to make provision for one or two such pupils, and the use of removable desks is the best solution.

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window space is sufficient in a bright and sunny climate.

Windows for lighting purposes should be placed on one side of the room only, to prevent cross lighting. In a hot climate it is often necessary to place small windows on a second side of the room for the purpose of ventilation. These can be so arranged that cross lighting or ill effects will not result.

One of the desirable features often credited to the one story building is the top lighting system. This, however, is not a desirable method for classroom lighting. It serves a very good purpose where a person has the opportunity of moving about and adjusting himself to conditions, but is not satisfactory for pupils who do not shift about, and receive light from the same angle for a long period of time.

The blackboard surface absorbs much of the light. In one school it was observed that light shades were placed over it, thus greatly increasing the light on cloudy days or during the short days of winter.

The type of windows should be determined by the plan of construction of the building. They should be arranged in groups with narrow mullions and should extend to the ceiling of the room.

The lighting system should be carefully planned because improper lighting is the cause of many pupils not doing their school work properly and thus failing in their grade.



## Classrooms.

The term classroom includes the regular classroom, the laboratory, and the study room.

The classroom is the primary unit of the school building and the size, form, and number of classrooms desired should be determined before planning the exterior of the building. In a consolidated school the rooms should be planned to suit local needs. The standard classroom is about 23 to 24 feet wide and 28 to 32 feet long. However, no drastic rules can be laid down as the size varies with use, equipment, and the size of classes. The average class is about thirty pupils but in the intermediate grades it is not unusual to find from forty to fifty pupils in a room. These numbers are too large for the best work, but from observation, it seems that in some rural communities there is a very mobile population to meet the seasonal demands for labor, and that for a short period of time the classes increase from 15 to 30 per cent. A consolidated school in Indiana attempts to meet this situation by the use of removable desks. It has been suggested that in order to prevent over-crowding, the classroom should be of such a size that when the proper number of seats are placed in the room, it will be impossible to crowd in more. This seems rather an indirect way to solve the problem. The size should not vary too much from the standard, or the pupils in the back of the room will not be able to hear and see distinctly all the work carried on at the front of the room.

The height of the classroom should be determined by local conditions. The average height is about 13 feet, but the height of any particular room should be partly determined by climatic conditions and the quantity of natural light that is available. The height of 13 or 14 feet will provide wall space for an adequate area of glass surface for natural lighting and proper ventilation, unless the school is located in an exceptionally cloudy state.

Some of the classrooms should have non-supporting partitions in order that rooms may be thrown together. This affords opportunity for expansion without serious changes in construction, and renders the building elastic and capable of being adjusted to meet changing demands. This plan seems a feasible one for use in the elementary department where the classes vary greatly in size. The classroom should have one door opening outward to the corridor. The part glass door is being adopted in many schools, in order to partially light the corridor.

#### Laboratories.

Many of the consolidated schools are using the group plan for laboratories. The size will depend upon the high school and junior high enrollment, and also upon the number of courses offered. In the older type buildings, special lecture rooms are provided adjacent to laboratories, but it has recently been urged to increase the floor space

and provide for the lecture and laboratory in the same room. This plan is advisable because it is more convenient and saves time in case any equipment is required for explanatory work in class.

There is no standard location for laboratories. The types of work offered largely determine the location. It is best to place the agriculture and botanical laboratories upon the ground floor, as this affords direct connection with the out-door gardens and agricultural demonstrations. The home economics department should be so located that the kitchen will be close to the lunch room. The chemical laboratory may be combined with the agriculture and botanical, but this is not a very desirable arrangement. It is best to place the chemistry and physics together on the upper floor.

#### Study Hall.

In the consolidated school there is, as a rule, only one study hall required. This should be directly connected with the library, or if necessary the two may be combined. However, this is a disadvantage as the grades should also have access to the library. The size of the hall depends upon the size of the school and upon the plan of organization.

One study room may be provided for the senior and junior high together. It should be centrally located, thus being convenient to all parts of the building.

## The Library.

The library in the consolidated school has its own peculiar problems. Since the school usually registers children of grade and high school ages, the library must combine elementary and secondary features. The school is the center of community life and the library should be an effective means of reaching the people. It is no longer looked upon as a mere repository for books, but constitutes one of the most effective educational units.

The library should be centrally located, preferably, on the ground floor for the convenience of both the community and the students. If the classrooms for the grade pupils contain space for reference material, then the library may be on the same floor as the study hall and directly connected with it.

Owing to the difference in use, and the location of the library, no standard size can be given. That partly depends upon the building plan and is a problem for the individual community.

If the primary children are permitted in the library, a corner should be arranged with small tables and chairs. Also a section may be set aside and prepared for the grades. This is especially desirable because if they learn while young to use and appreciate school facilities, and suitable interesting reading matter is provided, future school attendance may be promoted in this way.

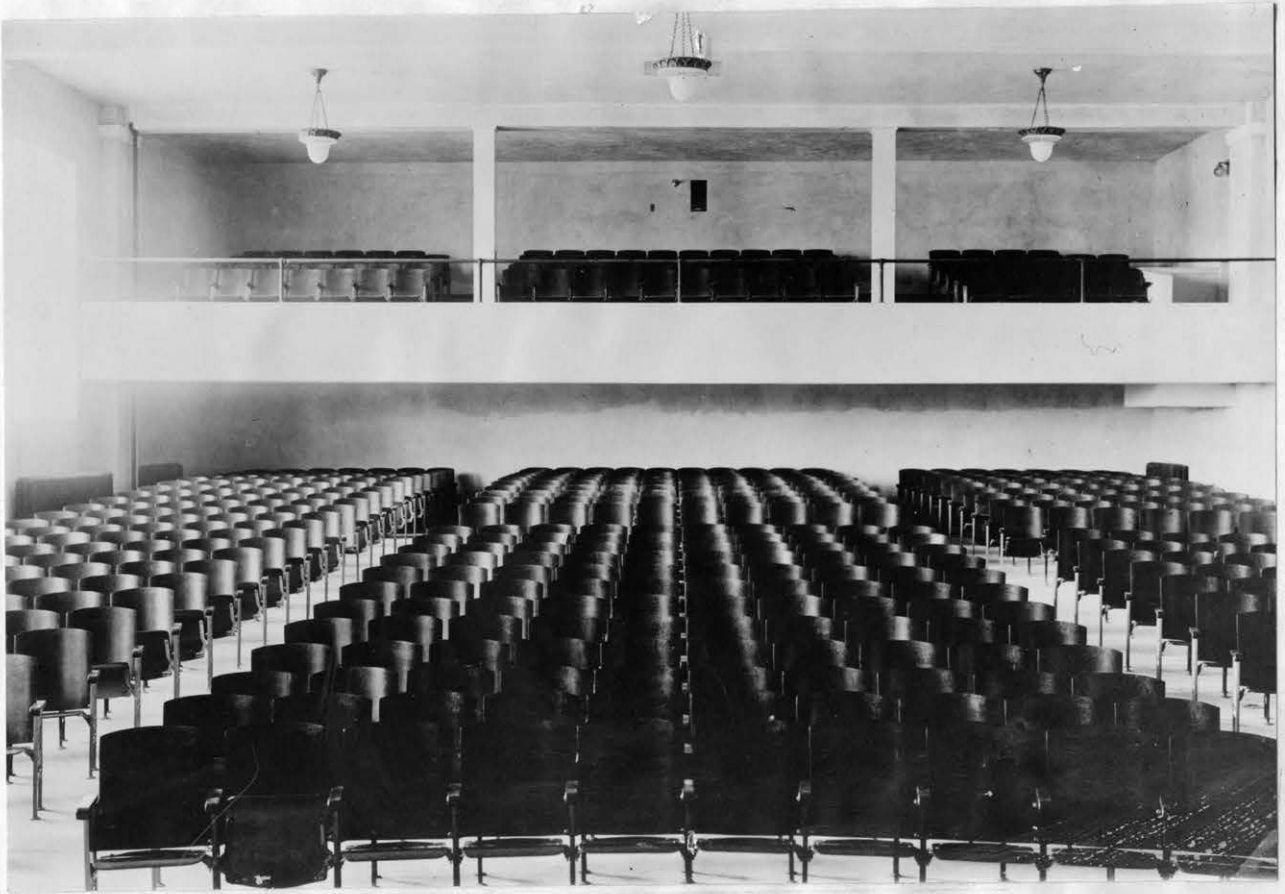


## The Auditorium.

The need for an auditorium in a consolidated school is obvious. The Sargent School is a splendid example of the use that may be made of it by the community and also its possibilities as an educational factor. The Center School has an excellent auditorium, with gallery and a stage, and has a seating capacity of 700. It is the social and recreational center of the community.

In a small school the gymnasium and auditorium may be combined. The room should be of standard size, planned for a gymnasium with suitable protection for windows and lights. During games in the gymnasium, the stage may be used as space for spectators. This necessitates movable equipment. The space underneath the stage provides a suitable storage room for equipment of either the auditorium or the gymnasium. The School at Lytton, Iowa, of which floor plans are given in this thesis, has a combination auditorium-gymnasium which has proved to be a very satisfactory arrangement. However, there are disadvantages to this plan. The floor for gymnasium work must be level, while the floor of an auditorium should rise from front to rear. This may be partially overcome by elevating the rear tiers of seats, but this causes a wide space between the floor and seats which does not make a very comfortable seating arrangement. Furthermore this plan necessitates the elimination of much useful equipment which is a bad feature.





Center School Auditorium

The auditorium should be centrally located upon the ground floor, if possible. This location will secure ease of circulation to all parts of the building and also insures greater safety. It is more accessible for community uses while school is in session without disturbance to classroom work. Two very necessary features, proper ventilation and natural lighting, are more readily secured by this arrangement. The School at Redfield, Iowa, has the auditorium on the second floor of the building, and it is used as a study hall while school is in session.

The size of the auditorium generally occasions much discussion. Should it be large enough to accommodate occasional large audiences? The size largely depends upon the school enrollment and the population of the district, and also the use which the community wishes to make of it. It should be large enough to accommodate the average school and community gatherings. Too large an auditorium is a waste of space and much useless expenditure.

In an auditorium which has a seating capacity of 600 or less, the tendency is to eliminate balconies. From observation and experience the writer believes that a balcony increases the administrative problems and does not add to the educational possibilities of the auditorium. A sloping floor with seats in amphitheater style from the first to the second floor level has been found to be a very satisfactory arrangement.



Ault School Gymnasium



The Ault Gymnasium-Auditorium



The auditorium provides an excellent place for public speaking, dramatics and music, if no special classroom is available for those subjects.

A motion picture booth of ample size to take care of a standard machine may be so placed that the auditorium will serve as a theater for the community. The booth should be constructed of fire-resistive material to eliminate, or to reduce to a minimum, the fire hazard. Visual instruction is rapidly gaining recognition and the value of educational films is indisputable. In fact, the strides it has already made indicate clearly that it is but a matter of a very short time until it will be one of the recognized, standard methods of giving instruction to large groups of all ages on such subjects as sanitation, community hygiene, first aid and various other subjects.

The foregoing requirements of fire-proof construction and recognition of future need, will at once eliminate the classroom as the place for the motion picture machine. The consolidated school at its inception may not warrant the construction of so large a plant as to include all modern and desirable features, due, in many cases to the meager and widely scattered population of its district. But this fact certainly does not justify a plan of construction which precludes the future addition of such features as are of necessity not included in the initial construction. And again, limited funds which may prevent the immediate installation





Hudson Dramatics Class

of a standard machine, need not prevent the construction of a fire-proof booth of ample size for the standard machine. The portable machine may be used from this booth until such time as the standard can be installed. Even if the booth is not actually built, at the start, suitable space should be provided for its future construction. The auditorium, however, is not to be designed primarily as a theater, but is first of all an assembly and lecture hall.

From the standpoint of its broadening influence on the community civic and social spirit, the consolidated school auditorium is deserving of a great deal of consideration in the planning of the building. No false notions of economy should be allowed to restrict the location, equipping, heating, lighting, and general thoroughness of design and construction of this particular element.

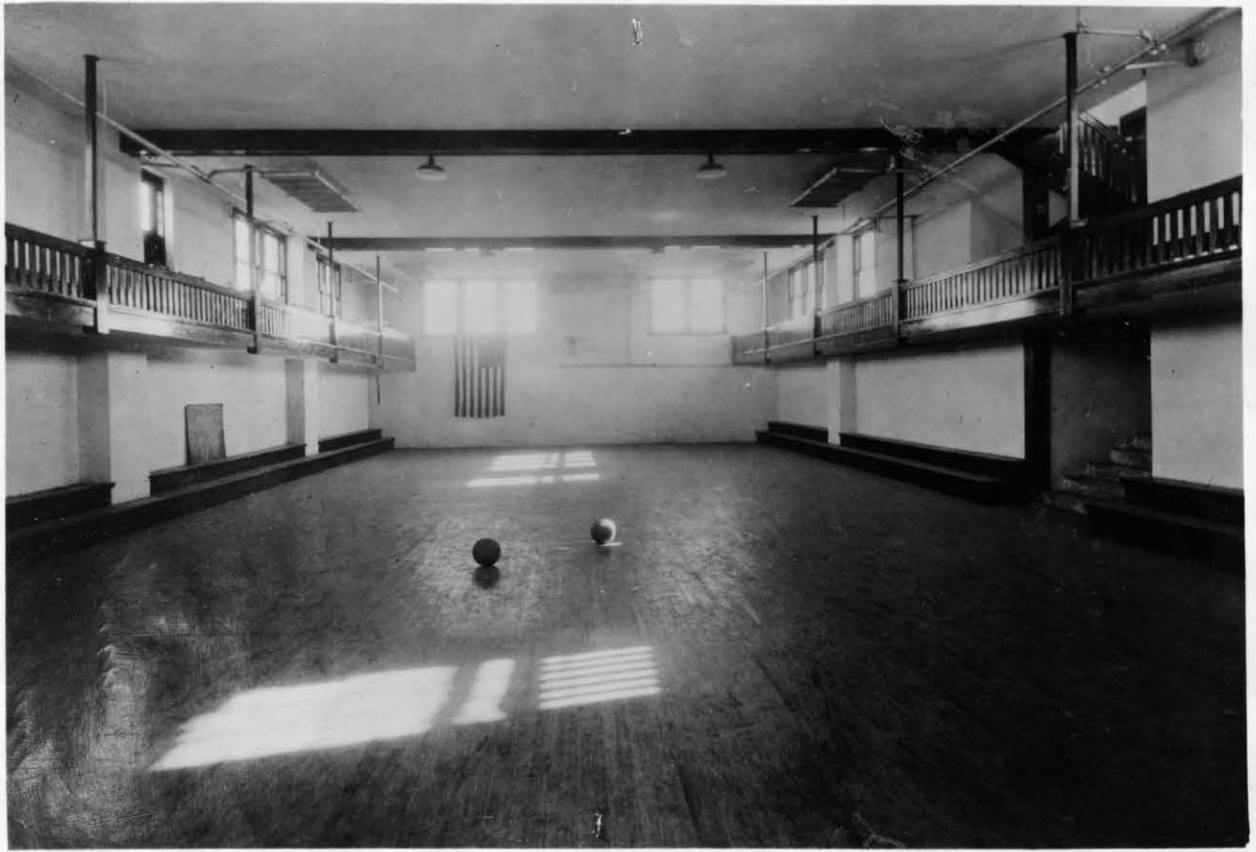
## The Gymnasium.

Educational authorities all over the world agree that health should receive proper consideration in the school program. If the health program is to be properly carried out it must be given careful consideration when the school building is planned, and provision made for out-door and indoor activities.

School practice has established minimum requirements for gymnasiums. These are not fixed but simply serve as guides. In the various consolidated schools the width varies from 30 to 45 feet, and the length from 50 to 80 feet. It should be at least 16 to 18 feet under beams and trusses.

The gymnasium should be located where it will receive the maximum light and ventilation. Windows on three sides are desirable, and if this is not possible, then on as many sides as the building plan permits. Those for the purpose of ventilation should be at floor level, but ample space should be allowed for wall apparatus and this necessitates some of the windows being at least seven feet from the floor. An abundance of air and sunlight should always enter the room, as those are two of the greatest curative agents known to man.

A few schools in this state and in other states provide separate buildings. The Sargent School has a gymnasium above the garage. Ault has a separate building used as a combination gymnasium and auditorium. The building



Otis Gymnasium.



should be located in proper relation to the out-door play grounds and athletic field. Lockers, drinking fountains, dressing rooms, showers, and toilets should be included in the building.

The number of lockers, shower, and dressing rooms for boys and the number for girls depends upon the number of students to be accommodated each period and the methods employed in handling the groups. Ten showers are usually considered sufficient for a class of about 50 or 60 boys, but more are required for girls, generally about ten for a group of 45 girls. The showers should be arranged for both individual and multiple control. An extra dressing room and a few additional showers for visiting teams should be provided if it is possible.

Space for spectators should be provided in every gymnasium. For some games portable bleachers may be placed along the sides. In a combination gymnasium-auditorium the stage may be used. The balcony arrangement may also be used and still another is the use of the second floor corridors with windows opening into the gymnasium. This is a very satisfactory method and used in a number of schools.

In the average school it is not possible to have two gymnasiums, one for boys and one for girls. If the program cannot be arranged for them to use it at different hours, a movable partition may be used.



At Del Norte the gymnasium and auditorium are so located that they may be thrown together for community activities and gatherings, and about 1000 people can be accommodated.

### The Swimming Pool.

The swimming pool has become a valuable addition to many of our consolidated schools. The pool should be properly lighted and ventilated, and constructed under the strictest rules for safety and sanitation. The minimum standard size of pools is 21 by 60 feet with adequate room for diving at the deep end of the pool. It must be installed by an expert and thoroly cared for or it will be a menace to the health of the pupils. Therefore, unless it can be installed and maintained under proper conditions, the swimming pool should be omitted.

## Agriculture.

In any rural community school the agricultural department is of such importance as to warrant careful and intelligent planning. It may, very properly, be housed in one large room. The floor space of this room should be carefully apportioned to meet the needs of the various purposes of the department. Space should be allotted for class work and laboratory, and one end of the room should be set aside for demonstration purposes. It is possible to locate the department on the first or second floor, but that is not as convenient a location as the ground floor, as it does not admit of immediate connection with the out-door gardens and project work.

The cost of this department may be greatly reduced by the rotating of classes in such manner, that the same equipment may be utilized for instruction in all classes, both grade and high school.

Natural lighting possibilities may be greatly increased if this department is placed in a wing of the building and occupies the entire floor of a small wing. If the plan of the building does not admit of this arrangement then, owing to the size of the room, it should at least be so located that two sides will be available for lighting and ventilation.

## Home Economics.

Most of our consolidated schools are giving the home economics department the space it deserves. The country girl should be given an equal opportunity with the girl in the city to learn the art of homemaking. In a rural survey made in a certain county in the State of Ohio it was found that about 85 per cent of the people suffer from some form of stomach trouble, which is, in the majority of cases, due either to poorly prepared food or wrong combinations.

The size of the home economics rooms depends upon the type of equipment and the number of related subjects in which instruction is to be given. The type of equipment should be determined in advance in order that water, gas, and sewer pipes may be definitely located to avoid future changes and unnecessary expense.

In some schools two rooms are devoted to home economics. One room in which to teach sewing, millinery, and garment making, since the equipment required for those subjects is similar. And the other room devoted to the subject of cooking and preparation of foods. However, a more complete suite of rooms is desirable. A small fitting room should be adjacent to the sewing room, the size depending upon the number of students. A model dining room should be connected with kitchen. This is a necessary addition in order to teach the serving of foods, table etiquette etc.

The home economics work for junior and senior high



Sargent School Cooking Class





Cache La Poudre Sewing Class.



school pupils differs mainly in content rather than method, therefore, the same space and equipment may be used for the work for all the students.

#### The Lunch Room.

The capacity of the lunch room depends upon the size and the location of the school. It may range from 50 to 100 per cent of the total enrollment. If the consolidated school is located in town, probably one-half of the pupils go home to lunch, but if it is in the country, it is desirable to provide for the entire school.

In order to secure the maximum safety, avoid congestion, and most of all for convenience of service, the lunch room and kitchen should be placed on the ground floor, even though the home economics department is on the upper floor. However, it is more convenient and economical if the lunch room is connected with the home making department. Both the kitchen and the lunch room should be so located that they can be thoroly ventilated in order to prevent the odors of cooking from penetrating the building. Therefore, it should have as many windows as possible for the purpose of ventilation.

If the building is small and no special room is provided for a lunch room, it is possible to use the gymnasium for that purpose. It can be equipped with a kitchen and arranged to serve as a cafeteria, or if the pupils bring

their lunches, they may eat it there. In a number of schools the rooms are used for banquets and school and community dinners. If the cafeteria plan is used, a long service counter should be placed near the kitchen to facilitate service and efficient administration.

#### Commercial Rooms.

As the commercial subjects are becoming increasingly popular, the consolidated schools are making provisions to meet the demands. Bookkeeping, penmanship, typewriting, and stenography are the subjects generally given. One large room may be used, with a movable partition to separate the typewriting department. However, two rooms of normal size are much more desirable.

There has been much criticism of schools which provide a commercial department because it is said that it leads young people away from the rural community. There are a number of consolidated schools where the desire of the students to dodge regular high school work has been indulged by permitting the substitution of commercial work to such an extent as to seriously impair the morale of those schools. A liberal education should be the foundation upon which any specialization is builded. The house is no stronger than its foundation. If the foundation be faulty, the house is surely insecure. On the other hand, a commercial course permits an early entrance into the business world to many who probably

could not finance themselves through high school and a separate business course. And, therein, lies the only supportable argument in favor of the addition of a commercial department. Its inclusion or rejection should, therefore, rest wholly and solely upon the decision of the patrons of the school.



## The Workshops.

The consolidated school needs a variety of work shops. These need not necessarily be in separate rooms but sufficient space should be provided to teach the mechanic arts which are necessary and useful knowledge to the farmer and those living in rural sections.

Farm carpentry may be given in the manual training room. The forge and repair shop requires a separate room, but it may also be used to give instruction in cement work. No definite rules can be laid down as to the number and kinds of shops that a school should have. That is governed by the needs and particular interests of the community. The Western Slope of this State would perhaps be interested in woodwork, the making of fruit containers, fruit dryers, etcetera. In the grain belt the repair of machinery might be especially desired. Therefore, the needs of the particular rural community should be taken into consideration when the building plans are made.

There is generally a distinction between the shop work of the junior and senior high schools, but the distinction is one of method and content rather than kind. The same kind of shop areas will serve all the students. Simple work for the grades may be given in the shops.

The shops should be located outside the main building and preferable in a one story building in order to have the maximum light. A location at the rear of the building



Erie Shop Class.



offers the least disturbance to the school and at the same time is easily accessible. In planning shop areas, ample space should be provided for future expansion of the department.

In case no special building can be provided, the basement should be so planned and so arranged that the mechanic arts will be properly cared for.

Professor L. R. Davies in his book on "Farm Shop Work" states that in surveys made recently he found that the greater per cent of people are interested in some form of shop work. And that practical, useful work is given preference over the skill that may be obtained from manual training in the making of small articles.

The principal should also be consulted with respect to

The teachers' rest room is a necessary part of the building. Special location is necessary and the number and size depends upon the size of the school. However, one is generally sufficient, and it should include locker and toilet facilities.

The main store room should be located on the ground floor. On each of the other floors there should be space for a small store room for the convenience of the floor.

The lockers for the students should be located where it is possible to have thorough ventilation. This is necessary in order to dry the damp coats which may be placed

## Non-Instructional Space.

In the average school about 40 per cent of the floor space is devoted to other uses than instructional activities. The non-instructional space includes the rest rooms, store rooms, offices, lockers, and toilet rooms, aside from the corridors, stairways and lunch rooms which have already been discussed. In some buildings it is even greater due to lack of careful planning. However, the type of building must be taken into consideration, and no exact figures can be given. This space serves a useful purpose and could not be dispensed with or supplemented.

The size of the administration rooms should depend upon the size of the school. In the average school the administrative department may be limited to the superintendent's office and one accessory room. In the larger schools the principal should also be supplied with an office.

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there. In no case should they be placed in the main corridor, because they are an obstruction to circulation and to any decorations such as paintings or statuary. It is best to arrange the lockers at the ends of the classrooms, where the location permits of the necessary ventilation. For the high school students the lockers may be placed at the end of the study hall, following the same arrangement as for the classrooms.

It is desirable to so plan and arrange a school building that toilets may be placed on every floor. Such a plan would eliminate much of the noise and confusion caused by pupils going up and down stairs. They should be arranged en stack in order to economize on the runs of piping. If direct outside ventilation is limited, a small fan operated independently of the general ventilating apparatus should be installed.

The heating plant should be in a detached fireproof building behind the school plant. We find that in the majority of our schools the heating apparatus is in the basement. This for the sake of economy, notwithstanding the fact, that practically all fires in school houses are caused by defective heating plants in basements. It has been estimated that detached heating plants could be constructed in 25 per cent of our schools with the money that is lost annually in

## Heating.

The heating system must be planned and installed by experts in that particular line. A heating system that is too small is often prompted by false economy, and in the long run always proves more costly than one of adequate capacity. Because, in the first place it is always overstuffed with fuel, which, of course, requires an excessive amount of fuel. This soon burns out the fire box.

It is always cheaper to install a standard, modern plant of generous proportions, having always in mind future additions to the building.

The operator of this plant should be required to pass an examination in the subject of heating plant operation just as all operators of government owned heating plants are required to do. To hire a man for this work just because he is someone's friend or relative, or as a charitable measure, regardless of his qualifications is another common error often prompted by that same sense of false economy, or by petty graft.

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school fires.

Aside from the safety feature which a detached heating plant affords, it also provides adequate fuel storage capacity. In the colder climates many schools suffer a serious handicap through lack of storage capacity. Frequently the fuel cannot be obtained during the most severe winter weather, or if it is obtainable, the price is much higher than in the autumn or early winter.

For the purpose of economy the heating apparatus should be so installed that rooms such as the auditorium, library, gymnasium, and the administrative offices may be separately heated.

#### **Clocks, Bells, Telephone.**

A modern school should have a program clock and bell system. The master clock should be located in the office and bells in the various classrooms. If a more elaborate system is desired, clocks may be placed in all the rooms and controlled by the master clock. Hand signals should also be provided for use in case the master clock is out of commission. These devices should be planned and installed as part of the construction of the building.

A complete telephone system should also serve the entire school. It should be installed when the building is constructed, however, if the system is not completed at the time, it may later be brought to completion.



## Ventilation.

The early ventilating systems were based on the theory that a constant circulation of air, inflow and outflow, is necessary to keep the air in the room pure. There are laws on the statute books of several states which require from 2000 to 3000 cubic feet of pure air per hour for each pupil. To meet these requirements, ventilating plants were designed to properly heat this quantity and force it through the building without causing draft. At the present, with the proper plant and facilities it is possible to make the inflowing air purer than the out-door air by washing it and removing all foreign matter. The temperature and humidity of the air can be kept under reasonable control at all times. D. H. Perkins, Architect, states that changing temperatures are more stimulating than a steady one.

It is a mistake to install a ventilating system which is inadequate to meet the needs of the school. If the building is of fireproof construction, it offers no opportunity for correcting without entailing enormous expense. The system should be installed by an expert, because improper installation and care are frequently the causes of trouble and dissatisfaction.

In warm climates where windows may be opened almost the entire year, ventilating systems may be used in rooms for large gatherings or only in those rooms which specially require it.

## Artificial Lighting.

The consolidated school building is used for community gatherings and an artificial lighting system is necessary, as these gatherings are usually held in the evening. Also, on cloudy days it is often necessary to have artificial light for classroom work.

The artificial lighting systems of the present day have been brought to such perfection that natural lighting is so well simulated that many large, modern office buildings are substituting artificial light for natural light because of its dependability and its facility for having it where wanted and when wanted. Electric lighting systems for school rooms are constantly being improved, and are so arranged as to fit classroom and athletic activities. The indirect lighting system is largely used.

In case the consolidated school is so located that it is not possible to secure its light from a Light Company, then it is advisable for the school to have its own light plant.

## Cleaning System.

All school buildings should be equipped with an efficient cleaning apparatus. The portable vacuum cleaner is the most desirable. The electric wiring should include suitably located wall sockets for the plugging in of vacuum machines on all floors, for, a good cleaning system is as indispensable to a modern building as heat, light or ventilation.

## Conclusion.

The schoolhouse is usually the only public building, aside from the church, in the open country. The lives and characters of the country boy and girl are vitally affected by the kind and nature of their surroundings, as well as by the knowledge acquired from books in the schoolroom. The buildings should be architecturally beautiful, properly lighted, scientifically heated and sanitary in all their appointments. An interior arranged with regard to comfort and beauty is a daily lesson in right living. Well kept grounds, beautiful with trees and shrubbery yield a rich return in higher standards, and as Norman Gale so aptly has it--

"Here in the country's heart where the grass is green,  
Life is the same sweet life it e'er hath been,  
Trust in God still lives; and the bell at morn  
Tolls with the thought of God o'er the rising corn,  
God comes down in the rain and the crops grow tall,  
This is the Country-Faith--and the best of all."

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End



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