

UNITED STATES DEPARTMENT OF THE INTERIOR

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OFFICE OF EDUCATION

WILLIAM JOHN COOPER, Commissioner

BULLETIN, 1930, No. 21

RURAL SCHOOLHOUSES  
SCHOOL GROUNDS, AND THEIR  
EQUIPMENT

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UNITED STATES

GOVERNMENT PRINTING OFFICE

WASHINGTON : 1930

sale by the Superintendent of Documents, Washington, D. C.

Price 20 cents

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## LETTER OF TRANSMITTAL

DEPARTMENT OF THE INTERIOR,  
OFFICE OF EDUCATION,  
*Washington, D. C., September 26, 1930.*

SIR: Schoolhouse planning is becoming specialized. In a few of our larger centers of population there are architects who desire no other work except the planning of school buildings. This is bringing about in our larger cities schoolhouses that are peculiarly adapted to the educational program. They are sanitary, well lighted, and properly ventilated. At the same time they are attractive enough and sufficiently monumental in character to be objects of civic pride.

The advance which has been made in construction of city school buildings has with rare exceptions characterized what we term "the rural schoolhouse." The improvements which have been made in the country school in better arrangement of windows, in provision for artificial light, in improving heating and ventilation, in sanitary plumbing, in selecting better sites, and in making adequate provision for play space have resulted from the efforts of students of school hygiene. Of these Fletcher B. Dresslar was a pioneer. Doctor Dresslar was employed for nearly a year and a half in the Bureau of Education either as an editor or as specialist in school sanitation. For the last 17 years of his life, as a member of the faculty of the George Peabody College for Teachers, he had marked influence upon the improvement of schoolhouse construction throughout the entire South. During this period also he was employed from time to time as a part-time specialist by the Commissioner of Education. Shortly before his death (January, 1930) he transmitted a manuscript entitled "Rural Schoolhouses, School Grounds, and Their Equipment," which he had prepared in collaboration with Haskell Pruett, director of schoolhouse construction in the Oklahoma State Department of Education.

This manuscript, as revised by members of our staff in cooperation with Mr. Pruett, furnishes a cross section of present practice and indicates what is good. It should be helpful to State and county superintendents in convincing rural school boards, who would build schoolhouses of the older type, that in so doing they are not only working injustice on pupils but also that such construction is not a wise use of taxpayers' money. I recommend that it be issued as a bulletin of this office.

Respectfully submitted.

WM. JOHN COOPER,  
*Commissioner.*

The SECRETARY OF THE INTERIOR.



# RURAL SCHOOLHOUSES, SCHOOL GROUNDS AND THEIR EQUIPMENT

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## CHAPTER I

### Some Rural Problems and Opportunities

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Among the greatest needs of the rural schools of the United States is that of better houses. The compulsory attendance laws in various States compel boys and girls to sit from day to day in old school buildings which have not the slightest resemblance to our modern homes nor to our modern school buildings. The old unpainted building with large roof and belfry is suggestive of the earlier days when school was conducted in the church house. In many instances the buildings are so old and so poorly constructed that they are unsafe for the children during storms and severe weather.

Classrooms have windows on two, three, and sometimes on four sides which, even then, are insufficient in number to give half as much light as should be furnished from one side only; the windows are so low that light is reflected into the pupils' eyes when they attempt to read while seated at their desks; and window shades are torn, broken, or missing altogether.

Blackboards at the front of some of the large rooms are entirely too far removed from some of the children who are seated in the rear. It is not at all unusual to find blackboards placed on the wall between windows so that pupils are required to face a strong skylight on each side of the blackboard while they attempt to read from it.

The floors, ceilings, and walls are often so defective that the room could not be evenly heated and ventilated with a large basement furnace and fan, much less with the old open box stove which is still quite generally used.

The interior walls and ceiling are unpainted, or if painted, an ugly green or blue is frequently used, which absorbs rather than reflects light and adds to the gloom where the lighting is already poor.

Everywhere young, well-trained, and enthusiastic teachers enter rural communities to work in school buildings which have no extra rooms such as workrooms, libraries, or teachers' rooms; nor such built-in features as bookcases, lunch cupboards, etc., about which they learned at the teachers colleges. The ambitious rural youths enter these buildings with unsightly nails of all kinds and sizes on the walls, on which they may hang their garments. They have no safe and sanitary place for their lunch baskets, and quite frequently they are supplied with unsafe water. Innocent children are forced to use toilets that are both indecent and totally insanitary, and they have no facilities for washing and drying their hands after the use of the toilets.

We are living in a democracy that is pledged to guarantee equal rights to all and special privileges to none; yet the investment for schoolhouses for the rural children in general is far below that of the more fortunate city children.

Mark Hopkins may have been a good teacher on the end of a log, but no one can doubt that it would have been a good investment for any community employing Mark Hopkins as a teacher to have placed him and his pupils in a sanitary, comfortable, and well-equipped modern school building.

The modern rural school plant must meet a broader need than the mere housing for educational purposes of the children of school age. It becomes a center for adult contact and for social cohesion.

The new and larger school at once becomes a community center where public meetings, which tend to bind together the divided interests represented by nationality, religion, politics, and social strata, are held. The schoolhouses must afford facilities for exemplifying the American spirit of democracy. Above the door of every rural schoolhouse in this land some such legend as the following should be inscribed and through the work of patrons and teachers the sentiment be woven into the fabric of the people:

This building is dedicated to the service of this community and to the common cause of a better life for all.

### Consolidation

The consolidated school with fewer grades for each teacher, but with larger opportunity for drill in essentials, opens an encouraging prospect for some relief from the lamentable overcrowded condition of recitations which are found in the average rural schools. Better teachers with better qualifications may be induced to stay longer and render better service when physical conditions are better, as they usually are in consolidated schools. The school work of the pupils in such schools usually is correspondingly improved.





I. STONE SCHOOL BUILDING IN USE FOR MORE THAN A QUARTER OF A CENTURY AND STILL BEING USED



II. NEWER TYPE OF CONSOLIDATED SCHOOL BUILDING



C. NEWER TYPE OF RURAL SCHOOLHOUSE

A school building designed for the use of a consolidated country district will, of course, conform to the general hygienic and elemental rules for buildings of the size required, such as are generally outlined in this bulletin. There will be many special features, such as a large assembly room, a commodious well-appointed and well-lighted library, manual training and vocational agricultural room for the boys, and home economics room for the girls. The building should be adequately supplied with pure running water in order that lavatories, flush toilets, and shower baths, with septic disposal of sewage, may be installed. The school ground will be increased in size and a school farm for vocational agriculture and school gardens may be added. Wherever consolidation has been wisely handled the people have usually kept their children in school longer and more regularly, which has resulted in better education.

It must be admitted that sometimes consolidation costs more dollar for dollar and yet it may be a saving. The cost of schools should always be considered in the light of the results obtained. Certainly with our great increase in good roads and improved methods of transportation, the opportunity for consolidation has notably increased. This movement should not be retarded by one district which exhausts its financial resources in the construction of an expensive permanent school building of the one and two teacher type.



## CHAPTER II

### Planning the Rural Schoolhouse

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While each district requires a special school building plan to suit its needs, there are certain general principles which may be named as criteria for planning all rural schoolhouses. The items mentioned in this chapter may be used by the school authorities in evaluating the plans of rural schoolhouses submitted in this bulletin and other plans in which they may be interested.

#### Professional Service

Rural school boards often fail to appreciate the value of employing professional architects to furnish plans and specifications for the new building. Too frequently a local carpenter or a local lumber dealer, who knows little or nothing about the purposes of a school building, is requested to prepare the plans and specifications which, when prepared, amount to little more than no help or advice at all. Their main objective in furnishing such plans seems to be to build a large building so as to make it as imposing as possible.

It seldom happens that a rural school board member has had previous experience in the construction of a school building, and the responsibility of planning a building which may house 40 or more rural boys and girls, six hours a day, during 150 or more days a year for the next quarter to a half century, is too great to be placed in the hands of inexperienced men unless competent guidance and direction are furnished.

Conditions are helped very little by employing an architect without giving him definite and specific guidance, for most architects are not acquainted with modern school requirements. Financial limitations are partly responsible for some of the monstrosities in schoolhouse planning, but too often where there are no financial limitations the architect has seemingly thought more of the outside appearance of the building than about the well-being of the school children and their teachers. These blunders are paid for by the people who voted upon themselves indebtedness for the construction of a school building, while the children reap the results of poor surroundings.

Many State departments and State institutions are now furnishing free plans and specifications on rural school buildings. These stereotyped or stock plans are usually limited to two or three types of each size of the small buildings and have been of value, both as suggestions to the school board, and to meet the needs of a community that is in a rush to build. There are many demands for differently planned schoolhouses to satisfy the varying needs of individual communities; the number of pupils varies; the types of school programs are different; the community makes a greater or less demand for a school building for public purposes; and the personalities and wishes of the school boards are limited in variation only by the number of persons in authority.

A stock plan for a rural schoolhouse, designed to accommodate the needs and wishes of one school, would accommodate another school about as well as one suit of clothes tailored to please and fit one man would please and fit another.

### School Architecture

The schoolhouse should be beautiful. This does not mean that it needs to be expensive. Frequently more beautiful buildings can be constructed with less money than is sometimes spent for those with high roofs, towers, and turrets that have no place on a country schoolhouse. A log schoolhouse can be made beautiful. There is power in beauty closely allied to righteousness. The dissatisfaction with country life which has caused so many young people to go to the cities is partly due to the bleakness and ugliness of the farm home, the farm barn, and the rural schools and churches. If a beautiful schoolhouse could be constructed in every neighborhood it would not be long before the people would see and feel its power.

This emphasis on the beauty of school architecture is not for the purpose of declaring it to be the prime essential. Yet none of us should forget that beauty is in its own nature useful. Unfortunately those who have built our country schoolhouses have for the most part given little or no thought to real beauty.

The country schoolhouse must be a good home and workshop for the children. Many of our newer and "fine looking" school buildings are not only poor workshops but violate every principle of hygiene so far as use for school purposes is concerned.

### Looking to the Future

When school boards have at hand complete statistical data concerning the number of children in the district of school age, the number enrolled, and the average daily attendance for the past five



or six years, and by use of this knowledge can forecast with reasonable certainty how many to provide for the present and near future, the building program can be managed with much greater assurance. But it is generally better, even if one can not see far ahead, to plan a building so that additions may be made without destruction, or without detracting from the appearance or efficiency of the original building. This is a very important consideration, and we earnestly commend it to the attention of all rural-school authorities.

Some 1-teacher buildings abandoned because of consolidation, may be moved to new centers and used as vocational units, or even as teachers' cottages.

### Location of the Country Schoolhouse

The first thing to be determined in the planning of the schoolhouse is the location. It must be planned for a particular community, to satisfy definite needs, and located on a definite school site.

*Central location.*—When school district boundary lines have been established, the people naturally conclude that the building should be located in the exact center of the district or as near to the center as roads will permit. There is reasonableness in the demand for a central location, but only when more important demands are not in conflict with it. It is far more important, for example, to have well-drained school grounds or the opportunity for securing a sanitary water supply and conditions for a good toilet system than it is to give preference to a location near the center of the district where these sanitary necessities are not readily supplied. The slight inconvenience to a few children resulting from the location of the building to one or the other side of the geographic center should not be taken seriously when the more important considerations of health, sanitation, playgrounds, and larger community interest are at stake. During wet weather and in cold climates the children will have to be protected, but parents are generally ready and willing of their own accord to furnish conveyance for the children to and from the school.

*Drainage.*—No site should be considered unless it is well drained, or can be drained at reasonable cost. If a basement is to be included in the building, the site should offer a good outlet for tile drains set all around the building lower than the foundation walls to keep the basement dry. A wet, swampy piece of land is not only a muddy, dirty place but it introduces dangers from ground air and moisture that will prove troublesome and unwholesome.

To go to the other extreme and select a high hill or a wind-swept place for the location of the school building is also an error. What



is needed is a location comparatively level, but so situated that it can be easily kept dry.

*Free from annoyances.*—School sites should be as free as possible from sources of danger, dust, noise, and other nuisances. The immediate vicinity of railroad, electric lines, highways, and offensive industrial plants should be avoided. This precaution is necessary to secure quiet study hours and the safety of the children to and from school, and to remove the danger of fires.

*Convenient water supply.*—An abundant and sanitary water supply is a matter for thoughtful consideration in the selection of the site for a rural schoolhouse. A country school building is frequently located on a site because of the proximity of a spring or a neighbor's well. The average spring in the country has proved to be a greater menace to health than many people have heretofore realized. Because of increased population and deforestation there is more opportunity both for contamination of springs and greater irregularities of water supply than was formerly the case. Spring water may appear very clear and yet be unwholesome to drink, and it is therefore risky to depend on springs for drinking water. If the site is selected with the idea of depending upon the neighbor's well, this should be carefully studied to determine whether or not, through neglect of the neighbor in caring for his premises, the water would be unsafe. It is important to select a site where a well may be dug on the school-ground without any possible chance for insanitary seepage into it and where it may be under direct control of the school authorities.

*Size.*—Every rural school should have at least 2 acres of playground with an additional acre for each 50 pupils in the school. Space for the teacher's home, the teacher's garden, and the school farm should be included extra. Sufficient space for recreation and play is essential to the accomplishment of the best results in the school. Children naturally play in small groups. If these groups are crowded it makes discipline more difficult. To crowd pupils in their play and games is as serious and wrong as to crowd them in their classrooms. It must be borne in mind also that the playgrounds seldom becomes larger, while the school building often does.

*Good soil.*—It would be possible to select a plot of ground on a hilly, rough, or rocky site which would be well drained and contain several acres and yet ill adapted for playgrounds, for agricultural work, or for beautification. Hence the site selected should be on good soil adapted to the cultivation of any plants ordinarily grown in the neighborhood so that the school ground could be made beautiful and make such a showing in agricultural experiments as would attract the favorable attention of the farmers in the community.



*Pleasant surroundings.*—Finally, the site should be selected, if possible, within range of a fine landscape view with open spaces and meadows near at hand, and farm homes, villages, rivers, or lakes and mountains in the background. (See pl. 3A.)

### Orientation of the Building

People rightly expect that the building shall be located on ~~the~~ school site with the main front toward the road.

However, facts from many scientific studies and investigations reveal that there are some good and some bad directions for orientation of the schoolroom. No school building can be well lighted if it is not properly placed with reference to the cardinal points of the compass.

Direct sunlight is the most powerful and reliable disinfectant known, and it is running contrary to one of the best established principles of hygiene to construct either a school building or a dwelling house in such a manner as to fail to get this value of direct sunlight. To be sure common glass eliminates most of the ultra-violet rays, but the drying effect of direct sunlight destroys pathogenic bacteria.

In large buildings devoted to high-school or technical education some special rooms are needed for art work, sewing, cotton grading in vocational agriculture, and for these the north light has an advantage because of its quality. North light is soft and produces more artistic shadow effects than light from any other direction. But these rooms are not as wholesome as those receiving direct sunlight, and are used preferably only for short periods during the day. For ordinary classrooms, where children remain at work during the whole day, dependence on north light is a serious error. Classrooms which must be lighted from the north should be used by the larger pupils who know better how to care for themselves.

*South light.*—Doubtless some who realize the great hygienic importance of sunlight have concluded that classrooms facing toward the south are the most acceptable. However, with direct dazzling, glaring sunlight streaming through southern windows into a schoolroom during the entire school day, it is well-nigh impossible to furnish proper light to all the pupils in the room. This difficulty is not serious in a dwelling where chairs are not fastened to the floor and where people can adjust themselves so as to get proper light either for reading or for work, but in a schoolroom where from 25 to 45 children must spend a good part of each day, it is impossible, whether the desks are fastened to the floor or not, for all the children to adjust themselves to avoid the shifting rays of direct sunlight entering the room. If, as is usually the case and probably

PLATE 2



COURTESY OF JOHN J. BLAIR

SITE SHOULD BE SELECTED, IF POSSIBLE, WITHIN RANGE OF FINE LAND-  
SCAPE VIEW



will be for a considerable time to come, the desks are fastened to the floor, the pupils can do little to adjust their positions so as to avoid the painful and harmful effect of direct sunlight on desk or book.

If shades are used on south windows they will inevitably reduce the light in parts of the room below the normal demand, and hence some of the children will suffer for lack of light. Many kinds and qualities of window shades have been devised to meet these conditions, but none of them has fully overcome the difficulty suggested.

The conclusion, therefore, is that no lot for a building should be selected which will require such an orientation of the building that it will be necessary to depend on south light for the classrooms; buildings for school purposes, especially for elementary classes, should be so planned and *so located on a school lot that the classrooms may receive either west or east light.*

*East and west light.*—In the construction of a small building there are some advantages of the east light over the west. First, an eastern exposure will permit the morning sun to take the chill out of the room before school begins. Second, it is probably true that there are in most parts of the country fewer cloudy mornings than afternoons, and hence those rooms having windows toward the east will get a better sunning than those with windows toward the west. In those sections where foggy mornings are prevalent, the opposite would be true. In buildings with eastern exposure the troublesome direct rays of the sun will have nearly disappeared by 10 o'clock in the morning. The shades can then be rolled up for the rest of the day. In the third place, the prevailing cold winds in the winter are more from the west and northwest than from the east, except along the eastern coast.

The correct choice between east and west windows will depend to a large degree on the surroundings. For example, if a school building must be placed near hills, mountains, or tall forest trees, it would be better to choose the west side for the windows, if the horizon line is high toward the east. If the opposite site be true, the east side is preferable. A range of high hills or mountains often raises the horizon line so high that the sun may not appear above it until quite late in the day. Besides, even after the sun has reached the zenith, a mountain's side will not reflect back enough light to insure good illumination. A wide expanse of sky is necessary. It will be important then to study the surroundings, to note the possible hindrances and the general outlook in order to decide wisely whether the building should be designed to introduce east light or west light into the classrooms.

Even when the difficulties with reference to lighting are for all practical purposes equal, other considerations may effect a decision. An attractive outlook from a classroom is better than an ugly one,



and it sometimes happens that this consideration decides the orientation when other things are equal. For example, if a lot must be selected near a busy, dusty roadway, much relief from the dust, noise, and disturbance may be secured by facing the windows in the opposite direction. On the other hand, the appearance of a building may demand the placing of the windows on the side from which the approach is made. All matters of this sort must be determined by local conditions. But it will always remain true that in the latitude of this country it is better and safer to depend on east or west light for schoolrooms than on north or south light.

There is still another point worth mentioning and this favors west windows. Children seated in rooms lighted from the west will naturally face north, and are then in a position to read their maps without confusion. The cardinal points on the map will then agree with the realities about them. The top of the map will be toward the real north, the left side will correspond with the real west, and altogether the representation and the reality will be more easily connected.

Thus far this discussion relative to orientation has been concerned with the proper lighting and sanitation of the classroom. The question of lighting workrooms, libraries, cloakrooms, and toilets, demands separate treatment, for in these rooms direct sunlight is not a disturbing element, and in the main the purifying influence of sunlight is for them more important. Unilateral lighting is not an essential condition in these rooms.

Work rooms in general are decidedly better for receiving abundant sunshine, for here benches and tables should be arranged to suit the convenience of the students, and more individual liberty is necessary. The same is true of library rooms. Toilets and cloakrooms require direct sunshine and abundance of light in order to keep them sanitary and wholesome. Proper orientation when applied to these rooms means provision for abundant light and as much direct sunshine as good sanitation demands.

### Lighting

As already indicated, light should be one of the first considerations in planning a school building. The children need sufficient light to read, to write, to see the work on the blackboard, and to become skillful in their industrial and vocational work. Probably more children are compelled to leave school directly or indirectly on account of defective vision than because of any other physical disability. Too often this results from improper lighting in the classrooms. If one is seated near a low window reading from a printed



page, and some one raises and lowers some opaque object to obstruct the light entering below the level of the eyes, he can readily feel the difference in the effects produced by the light above and the light below his eyes. This would demonstrate to anyone the need of having the bottom of the windows in the schoolroom at least as high as the eyes of the pupils when they are seated. The windows should be placed in a group on one side of the room and reach as near to the ceiling as possible to receive much of the sky light.

If the great majority of children were not right-handed, it would be unreasonable to demand that the windows be so placed in schoolrooms as to admit the light from the left side of the pupils when seated at their desks. But since we are a right-handed race, with brains organized accordingly, the great majority of children are rid of troublesome shadows in writing only when light is admitted from the left side, thus carrying the shadows away from the written work and relieving the vision from the disturbances which would otherwise come. Children suffer more from such disturbances than older people, because their eyes tire more quickly and their attention is more easily distracted. Hence it is a matter of importance to the health and comfort of all right-handed children to be so placed in the schoolroom that light will come from the left rather than from the right. It is only fair to the left-handed writers to seat them, if possible, so that the light may come from their right.

Even if unilateral lighting were not in accordance with the demands of hygiene it would still be wise to locate all the windows on one side, so that the other might be used for blackboards as discussed in this bulletin under the caption "Location of the blackboards."

Care should be taken in planning the building to see that when the pupils are seated so they may have light from the left, and the main entrance to the building is toward the road, that the desks are not reversed to accommodate the teacher who does not like to have the back of her desk close to the main entrance. We have seen many rooms thus badly lighted for the children just because the teacher accommodated herself at the expense of pupils.

The windows should be grouped, as much as possible, on the sides selected for orientation, to prevent cross shadows from mullions or walls between windows and extended from a point as close to the rear as safety of construction will permit, and no farther toward the front than the front row of desks. It is generally agreed that the clear glass area should equal one-fifth of the floor space. If the room is wider than 23 feet, it is impossible to get this ratio of glass area to floor space without making the walls higher than 12 feet, which is impracticable for economic construction, or without placing



the windows lower than the level of the pupil's eyes, which is so dangerous it should not be considered.

The ratio of glass surface to floor surface has been a sort of guiding principle to all school architects in the last few decades. It has been said that there should be from one-fourth to one-sixth as many square feet of glazing in a classroom lighted from one side as there is in the surface of the floor of that room. This rule has been useful, but it has also led to faulty location of windows in order to work in this amount of glazing. For example, if four windows are properly set and each has 24 square feet of glazing, and the room is 30 feet long and 22 feet wide, the ratio would be nearly one-seventh; but the children would get better light than they would if five windows were improperly set and yet furnishing a ratio of 1 square foot of glazing to  $5\frac{1}{2}$  of floor space.

No doors should be set in the front of a classroom to the outside, since during warm school days the doors are often left open and thus cause the children to face a source of troublesome light.

### Size of Classroom

The size of the classroom should vary to suit the number of pupils of school age in the district and more especially the number of pupils attending school. Rooms too small are serious handicaps, and rooms too large are wasteful because the extra space must be cleaned, kept in repair, and heated throughout most of the school year.

There can be no safe rule of a definite number of square feet assigned to each pupil. It is better to plan the rooms a certain size to accommodate the required number of desks. A room 21 feet wide will accommodate five rows of seats for the upper grades with an aisle next to the window approximately 2 feet; aisles between the rows of desks 19 inches wide, and the space between the blackboard and the first row of desks approximately 3 feet wide.

A room 30 feet long will accommodate 8 desks, including the fronts and rears, or a seating capacity of 7 pupils to each row with space of 8 feet between the first seat in each row and the front end of the room, and a space of 3 feet behind the last desk in each row. Such a plan will accommodate 35 students. To increase the seating capacity to 40 pupils an additional row of desks can be added in front. This number is the maximum for mixed grades, all things considered.

This width of the room assures good lighting provided the tops of the windows are close to the ceiling and the ceiling is at least 12 feet from the floor. This width will give sufficient space about and between the desk to manage the classes without confusion. It is economical to use timbers 22 feet long, otherwise 1 foot could be added



to the width, retaining the same number of desks, which would be a considerable advantage. Instead of having 3 feet between the first row of desks and the blackboard there would be 4 feet. This suggestion is made to emphasize the need for plenty of space next to the blackboard most used by the children.

The length of the classroom should not exceed 30 feet because beyond this distance the children can not easily hear the teacher, or readily see work on the blackboard at the front end of the room, from the rear desks.

Some objection may be raised to the size of this room because it is smaller than many 1-teacher rural classrooms, but its freedom from all incumbrances of stoves or any other impedimenta will answer these objections.

### Cloakrooms

Where no cloakroom is available, clothing is hung inside the classroom or piled on benches in the corners. No argument seems necessary to prove that such handling of children's wraps is not only untidy but dangerous because of infectious diseases. If hooks for wraps are placed on the schoolroom walls, they will prevent the use of these walls for blackboards, render the room unsightly, contaminate the air with odors from damp or soiled garments, and absorb some of the light. Furthermore, wraps so placed will be knocked down as the children pass about in the schoolroom.

Merely from the point of view of economy it will require almost as much space to make room for hooks and passageways about the wraps within the classroom as it would to partition such a part of the building specifically for cloakroom purposes. No teacher can make a room appear attractive and well kept when all kinds of wraps are hung upon the walls, and it is one business of the school to teach children the proprieties of life.

Two cloakrooms, one for the boys and one for the girls, would be better than a single cloakroom for both, but if a single room is properly placed, lighted, ventilated, and heated, it will serve the purpose. If one cloakroom only is planned for each classroom it is best to arrange two openings between the classroom and cloakroom so that the pupils may march through in a continuous line and handle their own wraps with the least possible loss of time. Ordinarily wraps are handled eight times each school day—once when school begins, twice at recess, twice during the noon hour, twice in the afternoon recess, and again when school closes. It would be easy to lose a few minutes each time if the pupils are required to pass in and out at the same door or if one or two pupils are required to handle all the wraps.

Halls and corridors can not properly be called cloakrooms nor can they be substituted for them, for wraps produce an untidy appearance in the open halls. Unless the halls are sufficiently wide, wraps or clothing may be decided obstacles in case of fire, and, therefore, a distinct menace.

Patented wardrobes and lockers are omitted from this discussion because many of them get out of order too easily to be placed in rural school buildings which have no mechanics to repair them, such as are available for city schools. If lockers are used, care should be taken to see that they are long enough to allow the wraps of the children to hang full length.

### Inclosed Hall

The inclosed hall may serve as an added protection from the cold wind and wet weather. If the floor level is much above the grade line the steps should be placed inside the hall, so they will be under cover and thus protected from ice and water. Few steps should be placed on the outside, because they become slippery and dangerous to children. In all cases it is desirable to have the steps equipped with safety treads and bannisters placed on the side to which children may hold. It is essential that inclosed halls and stairways have plenty of natural lighting. By insetting the doors they are protected from the weather and last much longer, and are generally more easily operated.

### Covered Driveways

During bad weather so many children are taken to the school in automobiles by their parents that it is desirable to have a covered side entrance so that the children may leave the cars and enter the school building without exposure to rain or snow.

### Location of Doors

For protection against danger from fire it is well to plan two doors on opposite sides or ends of the classroom to swing outward. This is legally required by a few States.

The exits from the building should be conveniently located to the playgrounds, the water supply, and the fuel house, if there is one, and allow for easy removal of ashes.

In the tornado regions on the Great Plains and other sections of the country it is important to have a convenient exit close to a storm cave on the school grounds.





A. FOLDING DOORS BETWEEN A STAGE AND THE CLASSROOM



B. ALL OUTSIDE DOORS SHOULD BE PROTECTED BY AN OPEN VESTIBULE FROM TROUBLES DUE TO WIND AND RAIN

In cold climates the use of two sets of doors at the entrance to keep out the wind and weather is helpful, but in mild weather the inner set of doors is usually kept open.

If it is necessary to have two doors placed together—that is, double doors—they will be much better protected and the hardware problem will be greatly reduced if they are separated by a 6- or 8-inch post. Double doors which fasten directly together are difficult to keep locked; there is nothing to hold the doors in shape or to prevent them from warping or to protect them when slammed by the wind, and a strip for weather protection can not be kept on either door, because neither of them is always opened first. The post between the doors may serve as a division for two lines of pupils passing in or out of the building.

All outside doors should be protected by a small porch or open vestibule from the troubles due to wind and rain.

The positions of the doors of the cloakrooms, workrooms, and libraries demand especial attention of those who are planning school buildings.

### Location of the Blackboards

The best place for a blackboard for the pupils and from the standpoint of reflected light is directly opposite the windows. When the eye is focused on a dark surface, such as a blackboard, the pupil of the eye expands so that all the needed available light may enter.

No blackboard should be placed on the window side of the classroom. If one looks at work on a blackboard adjoining a window a conflict in the demands of vision takes place. The strong light from the window causes the pupil of the eye to contract so as to reduce the number of rays of light which would otherwise enter the eye and overstimulate and shock the retina. This is just the opposite of what the eye demands in order to read easily what is written on the blackboard. This conflict is the cause of much eyestrain, fatigue, and accompanying dissatisfaction.

It is well to use all of the available space in both ends of the classroom for blackboard. Frequently, however, the teacher's end of the room is broken by doors to cloakrooms, fuel room, or library, and all this available blackboard is needed for assignments and directions. The blackboard on the side wall is usually closer to more pupils when they are seated at their desks, than a blackboard placed in the front.

The rear of the room, even if not broken by doors, is too far removed from many of the pupils to make a blackboard placed there effective for class demonstration. Such blackboards may be used by pupils outside of their regular class periods.



Young children should not spend much time studying work written on blackboards; but we can not do without blackboards nor without frequently directing the attention of the children to work placed on them.

### Basements

Until recent years very few rural schoolhouses have been constructed with basement rooms, and these have been in the colder climates of the north, but with the use of basement rooms there has been a growing recognition of their value in rural schools. In the first place, a good basement furnishes the best location for a furnace for heating the building. The word "furnace" is used here instead of "jacketed stove"; the only difference between a jacketed stove and a furnace is that the jacket surrounding the furnace is open at the top only through ducts or pipes, which are devised to conduct the warm air to different parts of the building. In all essentials, a hot-air furnace is merely a modified jacketed stove. When a furnace is used in a basement, it will be possible to heat directly, not only the classroom, but the workrooms, library, and cloakrooms. This will give a much more satisfactory and even heat to the various rooms than if dependence were placed upon a jacketed stove within the classroom itself. Furthermore, in cold weather it will give an opportunity to ventilate all the rooms to good advantage. By placing the heating device in the basement, space will be saved in the classroom and a greater amount of space for fuel can be economically provided than would be easily possible on the first floor.

In the second place it would obviate much dirt, dust, and confusion in the classroom. In spite of all one can do, even with the use of wood, a stove in the classroom is a source of a good deal of litter in one form or another, and it always makes the room appear untidy and ill kept. Moreover, a building is less endangered by fire when a furnace is properly placed in the basement than it is with a stove located within the classroom. There is always some danger of fire dropping on the floor, or of doors coming open out of school hours and thus endangering the building. A good basement with a cement floor and carefully protected joists above, to prevent overheating from the furnace, reduces the possibility of danger from fire to a minimum. A furnace also generally has a better draft than a jacketed stove set in the room above because of the greater distance between the intake of the smoke flue and the exit at the top of the chimney. The fresh-air duct can be easily arranged from the outside through the basement to the furnace without in the least disturbing the general appearance or structure of the building. In another place more extended discussion will be made of the heating of schoolrooms. Dry and well-lighted basements are always advantageous for the location



of heating plants, playrooms, and community rooms. Toilets, workrooms, and domestic-science rooms should not be located in the basement, except under rare conditions, because of insufficient light and ventilation. The same space required for toilets, workrooms, and storage of supplies can be built above the ground with good light and ventilation as cheaply as they can be included in the basement.

It is not necessary to make the basement as large as the school building but it should be large enough for a fuel room that will be convenient and have ample space for the storage of fuel for the winter else the teacher or pupils will be exposed to the weather in bringing in fuel and cleaning the furnace of ashes.

Doubtless the main objections which will be raised against the construction of basements under rural schoolhouses are the expense of construction and the difficulty of keeping them in a sanitary condition. A basement should not be constructed in a school building located on flat, wet land, unless there are abundant opportunities for properly underdraining it, or, rather, surrounding it with drains so that it will not become damp or allow water to seep in during a rainy season.

The best method of keeping basements dry is to surround them with tile drains, set at least a foot below the level of the basement floor. To surround the building with tiles is better than to attempt to run a drain beneath the floor. The tiles must be large enough to catch and carry away all of the water flowing toward the basement, and the ditch must be so constructed that there will be ample flow into it from all directions. Comparatively little surface water sinks directly into the drain from above; the water comes up from below into the drain and is thus carried away, frequently after having traveled some distance underground. This principle is not generally understood by those who have not had large experience with the use of drain tiles. The pressure of the water increases with the depth and naturally that lower down would be the first to escape, just as in artesian wells. If, therefore, a drain is placed all about the school building and below the level of the basement floor, there is no probability that any flow of underground water will reach the school building, for it will be carried off through the tiles thus placed. They thus serve to keep the water line in the ground lower than the basement floor.

When a rural school building is located on high, gravelly soil, with no drainage toward it from any direction, it will not be necessary to surround the building with a drain, for a good strong cement floor and cement walls will prevent the entrance of any moisture that might otherwise come in. However, it is generally safer and frequently not expensive to surround the building with a drain as indicated, and this makes assurance doubly sure.



The contour of the ground and the nature of the soil as well as opportunity for carrying water away from the building will have much to do with the depth of the basement. Ordinarily the distance between the finished floor of the basement and the joists of the floor above is about 8 feet. If the depth of the finished floor is 4 feet lower than the natural grade around the building it would be necessary to raise the foundation wall 4 feet above the surface of the ground to allow all of the light and ventilation possible.

### Auditorium

It matters not whether it be a one-teacher school or a large consolidated school, the school building is the community center and should be arranged to recognize this fact and to accommodate public meetings which are held to discuss matters of interest and importance to the community, arrive at a better understanding of the needs of each other and thus foster the support of social democracy.

Whenever sufficient money is available a separate auditorium should be provided to accommodate more than the maximum enrollment of students in the school.

Small schools may arrange for a folding partition between two classrooms to be used for community meetings and school assemblies. There are several types of folding partitions in common use in the country schools, some have folding doors, others have two counter-balanced doors, and still others have patented roll partitions. Whichever type is used it should be of sound-proof construction and provided with as much blackboard space as possible because the pupils in one room will necessarily face the folding partition.

If one or more classrooms are used to serve the purpose of an auditorium the stage must be omitted from the classroom for it is a relic handed down to us from the time when schools were conducted in churches and it now serves only as a stumbling block for pupils and teachers of our modern school buildings. A fairly satisfactory stage arrangement, however, may be had by building an industrial room with an elevated floor and connected to the classroom by large doors which open back on the stage and serve to separate the stage from the dressing rooms. Such doors may be provided with blackboards on which the children may write when doors are closed during school days.

### Gymnasium—Auditorium

During the last few years many consolidated schools have attempted to combine auditoriums with their gymnasiums so that they may have both with the least possible cost. Although much money



has been spent for these combination rooms they have not proved altogether satisfactory and were not expected to do so.

Perhaps the chief difficulty with this combination assembly room and gymnasium arises with the management of the chairs, needed for assembly purposes, but in the way in its use as a gymnasium where games are to be played or regular gymnastic exercises are engaged in. This difficulty, however, can be largely obviated by framing the stage for the storage of chairs beneath. In this way folding chairs can be put off quickly and placed on the floor, or stacked and stored away with equal care.

There are many communities desirous of separate rooms for assembly and gymnasium purposes but financially unable to command both. This combination will serve them efficiently for a time, as we know by actual experience with them. The common folding chairs can be most easily, safely, and quickly put out of the way by the use of a light "car" made from 2 by 4-inch material set on edge. This car should be just long enough to fit the space under the stage and wide enough to receive readily the length of a folding chair with about 3 inches to spare. Standards at each end to hold the chairs, and castors beneath should, of course, be included.

In the warmer sections of our country, there is less need for the use of a gymnasium, when ample playgrounds are furnished, for it is better when possible for children to play out of doors than in any inclosed gymnasium. (See pl. 4B, opposite p. 68.)

### Workrooms

The rural schoolhouse should be designed to accommodate and encourage many legitimate phases of school work now generally neglected in the country. All district schoolhouses, those for 1-teacher schools, as well as those of the consolidated type, should have at least one workroom—two would be better—where manual training, domestic science, and related subjects could be taught according to laboratory methods. In a district where the number of school children does not exceed 30, one good-sized, well-lighted workroom can be made to accommodate both boys and girls by alternating their work. Here the boys can be taught to make useful articles of furniture for their homes or for the school and to apply their arithmetic and drawing to real problems. Such work can not be done in the regular classroom. When a separate room is provided much of the manual work can be done while the teacher is hearing other classes recite.

The boys can use the workroom as an agricultural laboratory as well as for shopwork. The workroom is needed by the girls for cutting, sewing, cooking, canning, millinery, laundry work, and for all other subjects directly connected with women's work in the home.



A well-prepared teacher can make the workroom of a district school a very significant connecting link between the school life and the home.

### Library and Teacher's Room

It may be repeated that the school building belongs to the whole community, hence everybody has a right to use it under proper restrictions and to make it the general civic center of the community. Practically the only public library within reach of the rural people is housed at the public school. Most schools throughout the country have some general reference books and they need convenient places to keep these books where they can be consulted readily and easily by patrons and pupils without disturbing the classroom work. It is not necessary in a small district school to have a large room for the library, but the room should be made the most beautiful and most interesting one in the building. It can be made attractive at very little expense by inexpensive rugs placed on the floor and little touches of decoration on the wall and the appearance of comfort and an atmosphere of quiet study. The ordinary classroom, with its necessary discipline, does not furnish the incentive nor the atmosphere of a reading room. The library room can be kept neat and tidy and will exert a tranquilizing effect on the children who are accorded the privilege of using it. A tasteful, cozy, and inviting library room in some of our district schools would help mightily to develop a dissatisfaction with rusty stoves, broken window panes, dirty floors, a hodgepodge of chromos on the wall, ill-kept school grounds, and a general air of neglect so commonly seen about country schoolhouses. There can be no doubt but that this reflex influence will go beyond the school into the home.

The library may be located close to the classroom and connected with it with a clear-glass partition so placed that the teacher may supervise project study work in the library and that the pupils when seated may not see each other and be attracted by each other's movements. The pupils in the library for project study in small groups may talk without disturbing the work in the classroom and may not be disturbed by recitations which the teacher will be conducting with other students. This arrangement offers an opportunity for students to help each other over their difficult problems without taking the time of the teacher who may then work with other pupils.

### Fuel Room

If a fuel house has not already been constructed on the school ground, it will probably be more economical to include a fuel room in the plan of the new school building, and certainly it would be



more convenient for women teachers or small students to carry coal from such a room than from a fuel house at some distance from the building.

The room should have concrete floors, a brick or hollow tile wall, and a fire-resistive material for the ceiling. If the fuel room is included in the basement with the central heating plant, both should be placed in a fireproof inclosure. If the fuel room is on the level with a classroom, the doors should be close fitting so that dust does not enter when coal is being placed in the fuel room. Both outside and inside doors should be protected by bars, which can be placed in as the bins fill up, and removed to the level of the fuel as the fuel is used. The size should be ample to include the fuel supply for the winter, or at least to insure a supply against a period of severe weather.

### Closets

One of the essentials for good housekeeping in the school as well as in the home is a sufficient number of spacious closets for storage of unsightly things when they are not in use. A closet for cleaning equipment and janitor's supplies, one for the play and athletic supplies, and one for the storage of teaching equipment are suggestive of the types needed.

### Indoor Toilets

There are many objections to toilets separate from the school building, even when the best provisions are made for decency and health. Whenever running water is available, the school authorities should not overlook the opportunity of building a septic tank and installing indoor flush toilets to overcome the great objections to the outdoor toilets.

The indoor toilets should be connected with the separate cloak-rooms to insure privacy and should have an abundance of natural lighting, sunshine, and ventilation. Dark toilets and poor ventilation are conducive to unclean thinking and obscene language. Toilets in the building permit a more direct supervision of both the toilets and the children who use them. Insanitary conditions are more readily detected and, therefore, more promptly corrected than in the case of toilets placed outside, or in the basement.

Chemical toilets when properly installed, and given the right care and attention, have proven satisfactory. The school authorities, however, should make sure that they will receive proper attention and care, otherwise they will be unsatisfactory, and just here we wish to say as emphatically as we can that any equipment in rural schools



that demands regular and technical supervision will generally prove unsatisfactory because of the lack of this type of supervision. This has made chemical toilets unsatisfactory in many places. Probably the safest and surest way to install chemical toilets in connection with the school building is to have them placed in a separate wing, or a few feet away from the main building, and connected with it by a covered walk or pergola arrangement.

### Built-In Features

Some of the common necessities in schoolhouse furniture can be built in by the contractor constructing the building in a better way, and for less money than the same convenience can be had at any other time or in any other way. The schoolhouse is not complete unless these are included. A *lunch cupboard* which is screened fly tight and properly ventilated is essential for containers of the noonday lunches, which rural school children are almost always required to take to school with them. The cupboard may be placed in the little domestic science room or workshop, so that when the children are served, a supplementary hot dish for their lunch may be conveniently added to that which they have brought from their homes. It is important that the lunch cupboard be in a room that can be heated so that the children will not be required to eat frozen foods during the extreme cold weather. A *case and locker for the teacher* may be built into one end of the girls' cloakroom at little extra cost. A *bookcase*, whether in a small library room or in the main classroom, takes up less valuable space when it is built into the wall, and is more attractive when it is treated and finished in keeping with other woodwork. Likewise a *first-aid* cabinet built into the wall takes up little space and is inexpensive. The students, especially the girls and teachers, will use and appreciate a mirror built into the door of the cabinet. A *fire extinguisher alcove* built into the wall definitely locates the fire extinguisher for ready use when it is needed. A *bulletin board, three feet square*, made of some composition board will cost the contractor practically nothing, but may be very beautiful when it is trimmed to match the other interior woodwork. *Exhibit case* for trophies may be built into the wall close to the entrance to the auditorium. *Picture moldings* are very convenient and useful, and without them walls are usually marred and rendered unsightly by the use of nails and other fastenings for hanging pictures. The best type of these for school buildings are those set inconspicuously into the wall, and flush with it. Such prevent the gathering of much dust.



## School Equipment

After the floor plan has been drawn up to scale, it is well to draw the furniture to scale, and cut out these small drawings and place them on the floor plan to determine how the equipment may conveniently be arranged. Moving a door just a few inches either way might make the equipment more easily placed by giving just a few additional inches for the space of a bookcase, sand table, or cookstove. Features which are to be built in the wall, such as bulletin boards, and first-aid cases, should be arranged in the little spaces between doors or windows and not on long wall spaces most desirable for blackboard use.

## Individual Community Problems

The proximity of rural schoolhouses to a trade center, which will then be the social center, may change the needs of the school building for community purposes. The likelihood of a consolidation within a few years may dictate the material used in the building, and thus a cheaper, and less permanent type should be constructed. Some of the schools, for example, in the cotton sections of the South are operated during the summer, between the cotton chopping and the cotton picking, to allow a longer term of school without interfering with the child who helps in the labor of cotton production. In such communities, the school buildings must be planned with adequate ventilation to keep the buildings as comfortable as possible during the extremely warm weather.

These examples will suffice in illustrating the numerous problems which must be studied individually for each community throughout every section of the country.

## Planning the Larger Consolidated School Plant

Too many of our consolidated schools in country districts have attempted to copy some existing schoolhouse in a near-by city, and then put on the same program which the city is using. Therefore, the new buildings are generally very little better adjusted to housing the greater rural high school program from many points of view than are the old ones. Especially is this true in the more conservative sections of the country.

The school plant designed for consolidated school districts will have need for more than one building. There must be the main school building and possibly separated from it a home economics cottage, and a vocational agriculture building, the school truck barn,



the superintendent's home, the janitor's home, and under some conditions, a teacherage.

The main school building may contain a large assembly room to furnish opportunity for entertainments, lectures, and civic gatherings to satisfy the desire for a wider social contact and companionship. (See pl. 1B, opposite p. 3.)

An ample library room will be needed to house the school and community library which may serve as a sort of extension school in matters of agriculture, home-keeping, and sanitation, and in the dissemination of good literature for both parents and pupils.

Extra rooms for special subjects such as music, art, and dramatics may be included.

Mechanical equipment usually omitted in smaller rural schools, may be included in the new consolidated school building with the assurance that it will be properly cared for by experienced janitors, or school building superintendents.

Newly organized consolidated districts will find it comparatively easy to secure professional help in planning the new building and only enough attention is given to it here to show that consolidated school buildings should be thoroughly studied and carefully planned.

### Summary

Most States inspect mines and factories with authority to protect their citizens who work in them. It seems reasonable, therefore, to assume that States, as organized institutions of government to protect its citizens, will exert more authority in seeing that the school building, as a workshop for the children—citizens, of the State—is *safe* so that the child may work without being in danger of losing his life during a windstorm, or as a result of an accident on a dark stairway, or because of a fire hazard; *hygienically correct*, so that the child will not be physically injured because of impure air, improper heating, and improper lighting, or by being unduly exposed to contagious diseases because of a lack of other sanitary conditions; *clean surroundings* so that the child's morale will not be lowered because of ugly and insanitary toilet conditions and their inevitable suggestions; *efficient* so that the teacher and pupils may accomplish the maximum amount of results in the least time, with the least possible loss of energy, and the keenest interest.

The rural school child as a citizen of the United States is entitled to a workshop in a style of architecture that will furnish inspiration for work and develop a love for the beautiful.

## CHAPTER III

### Plans of Rural School Buildings

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A few type plans of small rural schoolhouses are offered in this bulletin for study and to serve as suggestions to those who are planning new buildings. It is not presumed that these designs will wholly satisfy the needs of any individual community, but they may prove helpful in the production of even better plans.

#### One-teacher School Building to Face the North or South

This simple plan of a small 1-teacher school designed to accommodate 30 pupils may face the north or south with the classroom lighted from the east or west. In either case there would be breeze windows well above the blackboard in the rear of the room. Separate cloakrooms are provided for boys and girls. One auxiliary room adjacent to the teacher's end of the classroom is arranged for convenient supervision. Three windows are arranged in the work-room so that whether the building faces the north or south it will receive some sunlight and cross ventilation. The flue is arranged close to the main entrance for two reasons. First, if the building faces the north, it would be desirable to have the stove close to the main entrance on the north and, second, to add to the architectural effect of the front of the building. It will be observed that while the building may face the north the front door is well protected, and in such a case would open to the west. The emergency exit is arranged at the end of the hall between the cloakroom and the work-room. The arrangement of the doors offers opportunities to the teacher to have separate entrances for the boys and girls and each with the cloakroom convenient to the entrance. (See figs. 2 and 3.)

#### One-Teacher School Building to Face East or West Only

This plan may be used on a lot fronting east or west, and in either case the classroom will get good lighting. If the building faces the west, the classroom windows will be in the east and thus away from the severe west winds. The teacher's eyes will be somewhat protected from the windows in the library, which will be on the north,



and therefore much better than having the teacher face light glaring into the south windows, which would be the case if this plan should be used in a building facing the east. However, if the building faces the east, there would be a blank wall for protection against the north

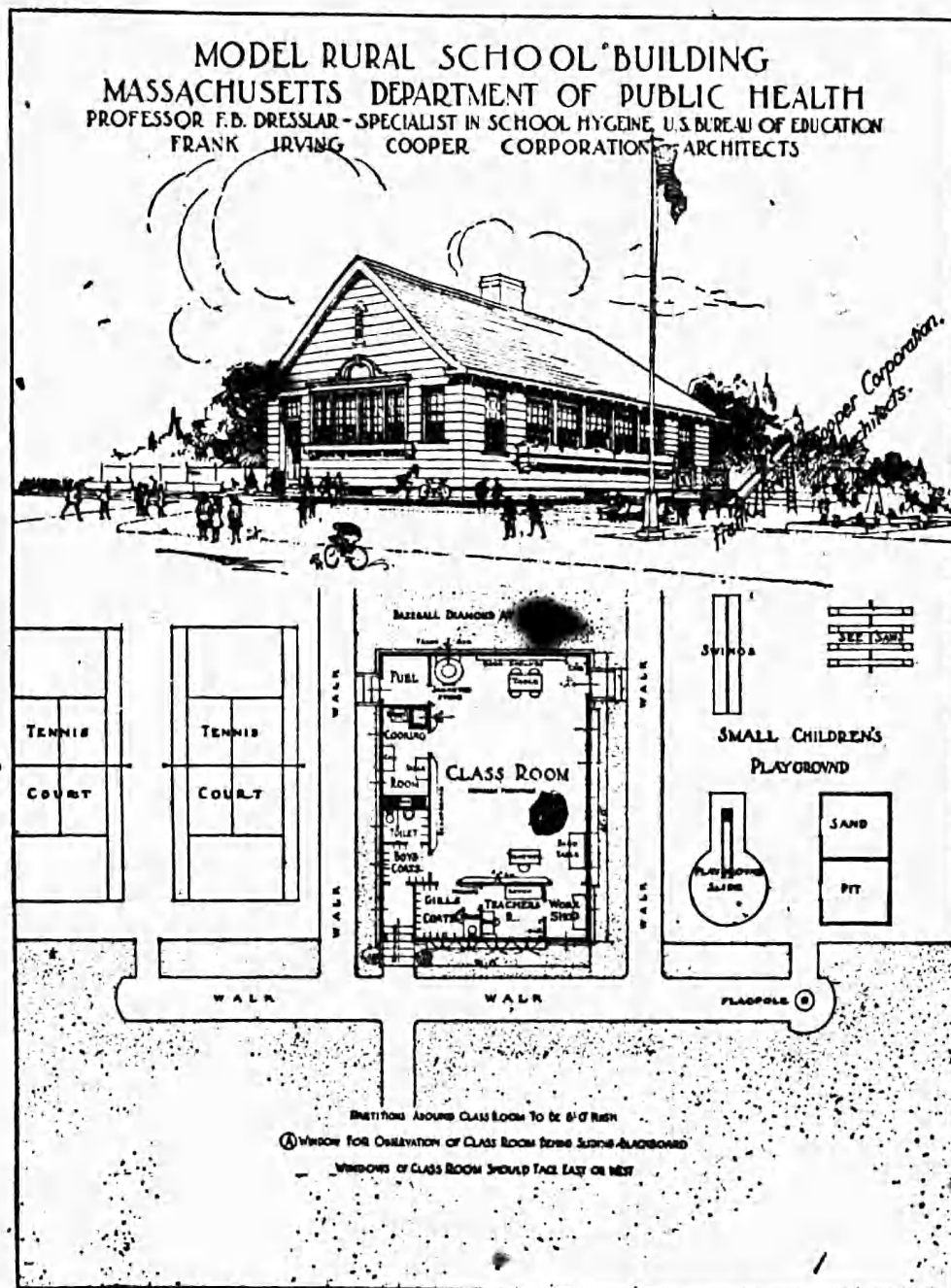


FIGURE 1.—One-teacher building

wind, and the openings and the auxiliary rooms would then be on the south. Separate cloakrooms are provided for the boys and girls, and an additional closet for the teacher. The library may be separated from the classroom with a clear glass partition or with an attractive colonnade. In either case the teacher has complete super-

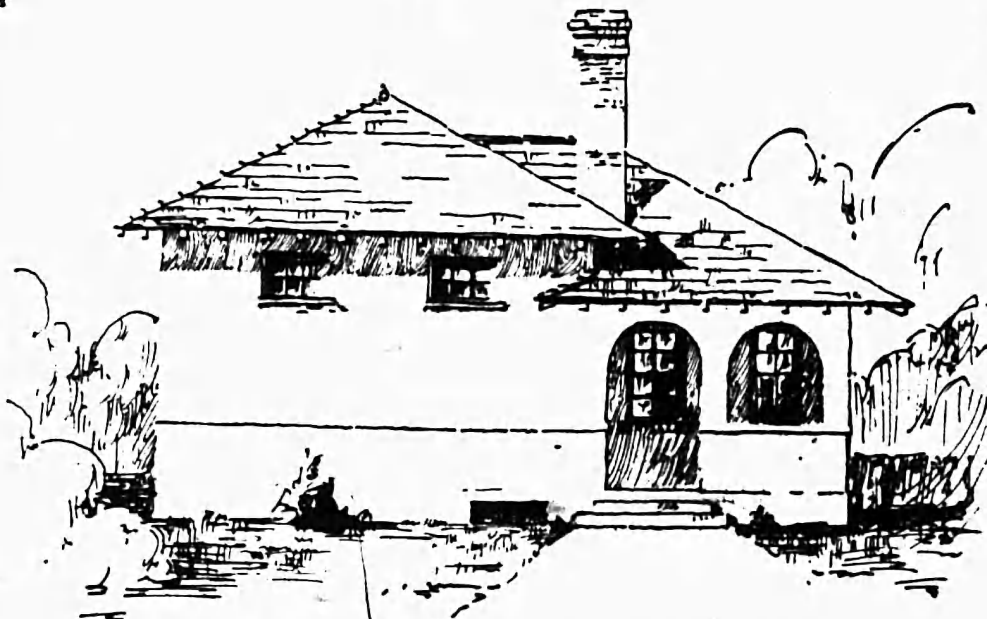


FIGURE 2.—One-teacher school building to face north and south only

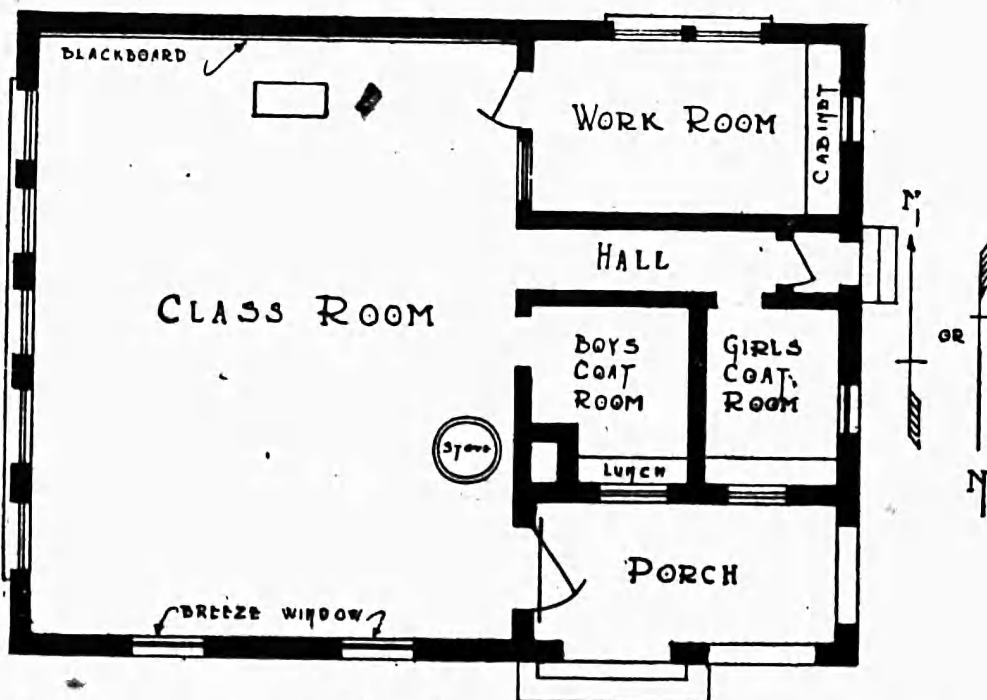


FIGURE 3.—Floor plan of one-teacher school building to face north and south only

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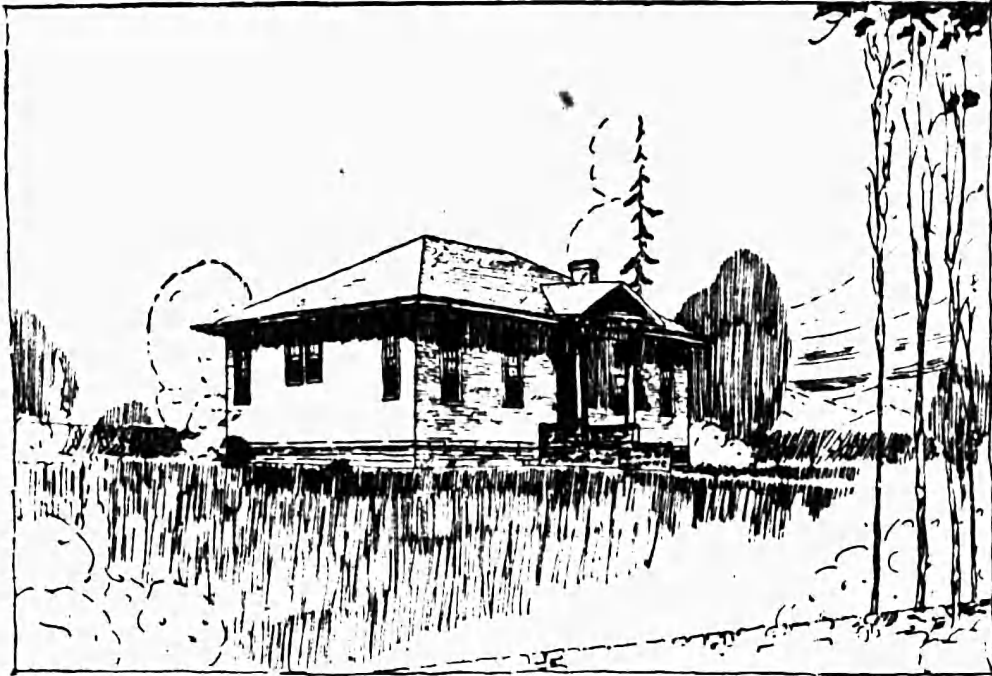


FIGURE 4.—One-teacher school building to face east and west only

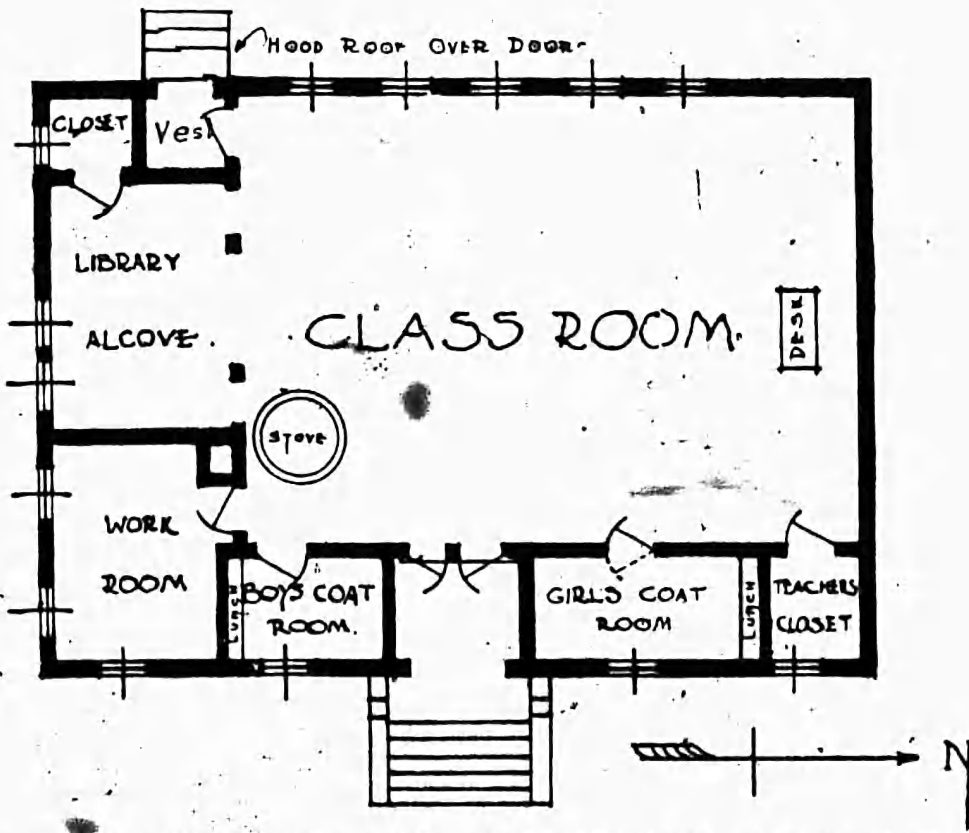


FIGURE 5.—Floor plan of one-teacher school building to face east and west only

vision of the library and classroom, regardless of her position in either. A closet is arranged convenient to the library for storage of records and supplies. The emergency door is arranged in the rear, and might also be used by patrons entering the school building to use the library. The workroom is arranged as far as possible from the teacher's desk or the place in which most of the recitations will be conducted. Most of the blackboard will be arranged in the front of the classroom. The chimney is so located that even with the jacketed stove, the library and the workroom may be well heated. It would be an easy matter to put a cook stove or range in the workroom for the girls. Cases and built-in features may be included if desired. (See figs. 4 and 5.)

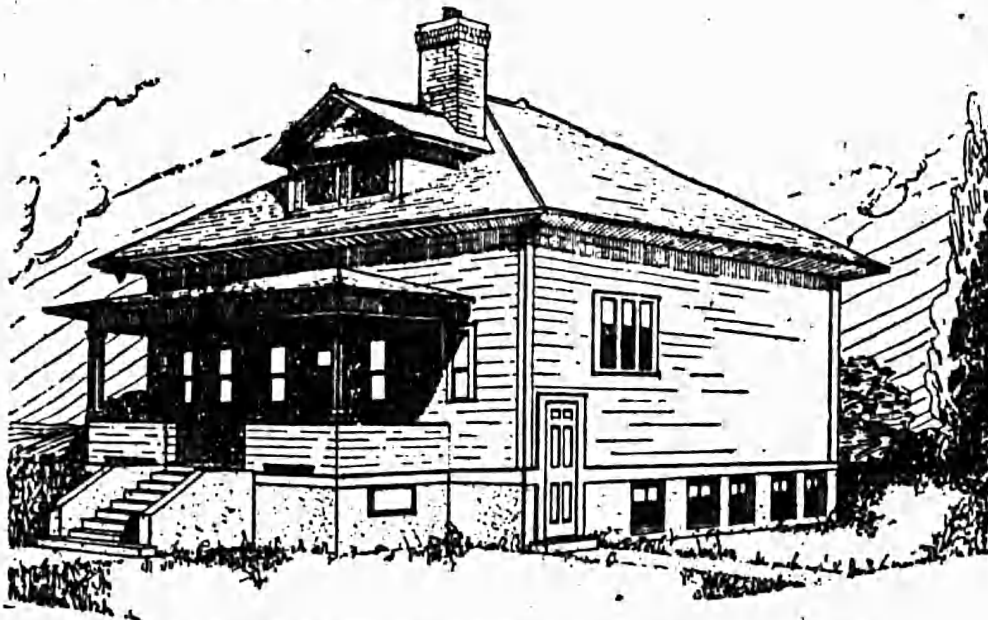


FIGURE 6.—One-teacher school building to face east or west only

This building was planned by Samuel A. Challman, of the Minnesota Department of Public Instruction, and is known as the Minnesota plan No. 2-F. The building may face the east or west with almost equal advantages. Separate cloakrooms are provided for boys and girls. The toilets are entered through the cloakrooms and are well lighted and well ventilated from the east or west. The library is conveniently arranged for supervision by the teacher while in the classroom. The front entrance to the hall is somewhat off center, but the architectural appearance in the front is made symmetrical in design by the use of a porch which is also an added protection to the front door. An emergency door not provided in the original plan may be added in the rear for those States legally demanding such. The stairway to the basement is convenient for



teachers and pupils, and with the landing on the level of the grade, only half of the stairway is needed when the basement is used for community purposes as the patrons may enter the building from the ground level.

The basement gives space for the heating plant and the storage of fuel and allows adequate space for a community lunch room with a kitchen adjacent. Of course, it would be unreasonable to use this plan, with its basement approximately 4 feet in the ground, without making sure it will always be dry. The only practical way to do this is to set a farm drain tile ditch all around it at least 8 inches lower than the cement floor, and bring it to the surface with a slight

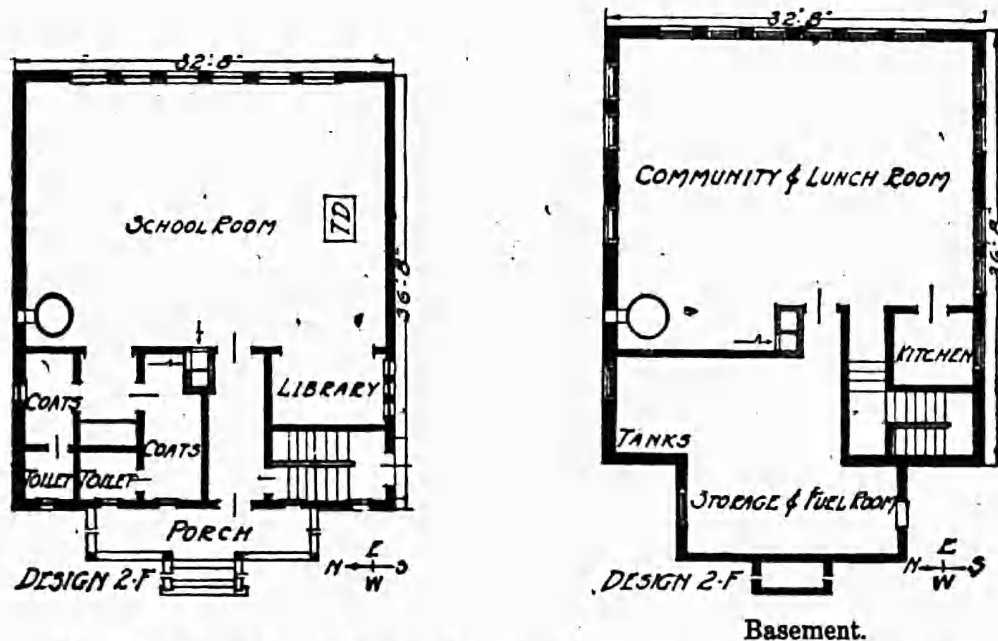


FIGURE 7.—Floor plans of one-teacher school building to face east or west only

down grade. If this can not be done because of lack of sufficient fall, then the basement room should be left off, for a wet, muddy basement is intolerable.

Those who do not have sufficient funds with which to build the former designs may get a suggestion from this design. This plan may front the east or west with about the same advantages and disadvantages as mentioned of Figure 5. Separate cloakrooms are provided for boys and girls and one auxiliary room which may be used as a library or workroom. An open vestibule at the entrance gives added protection to the front door. A hood roof should be placed over the emergency door in the rear for protection from wind and weather. As in the plan shown in Figure 5, the heating plant is so arranged that the workroom or library may be well heated in connection with the classroom.

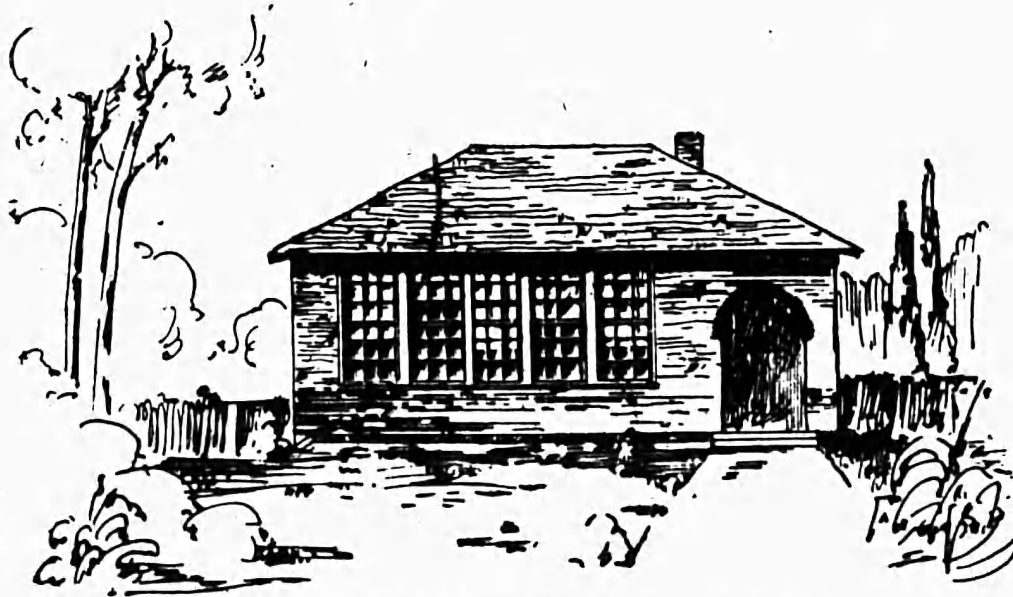


FIGURE 8.—One-teacher school building to face east or west only

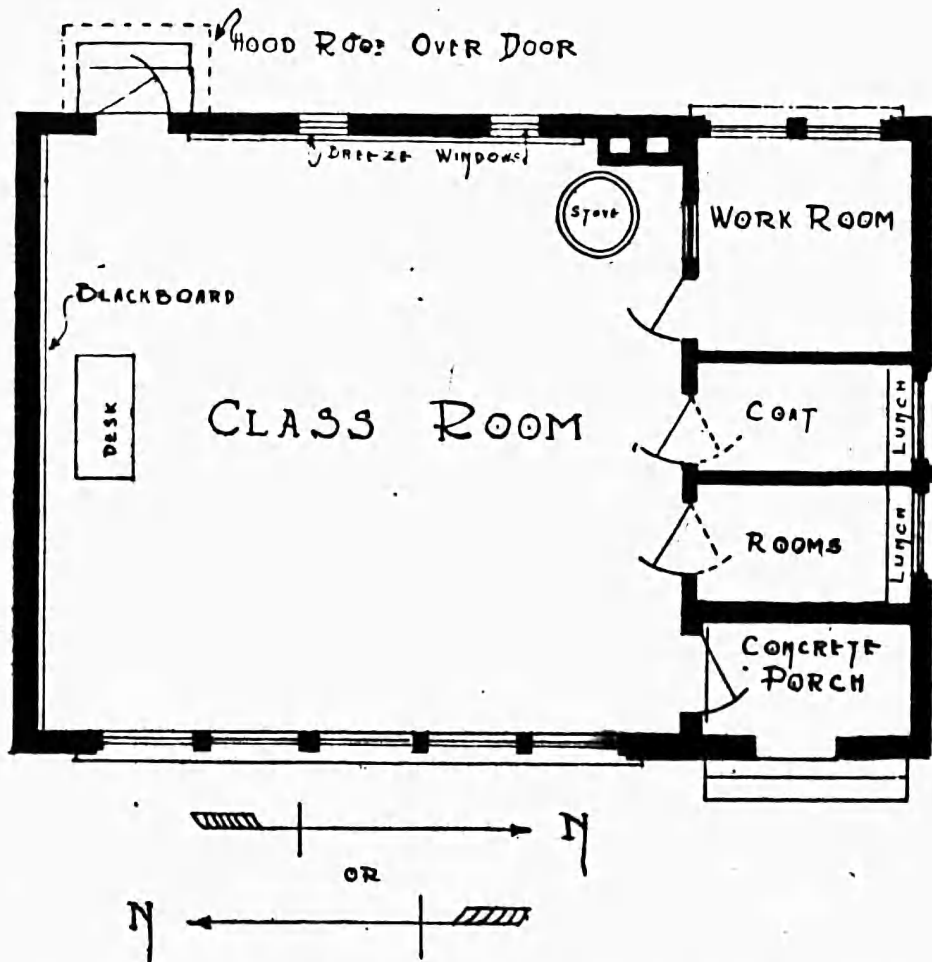


FIGURE 9.—Floor plan of one-teacher school building to face east or west only



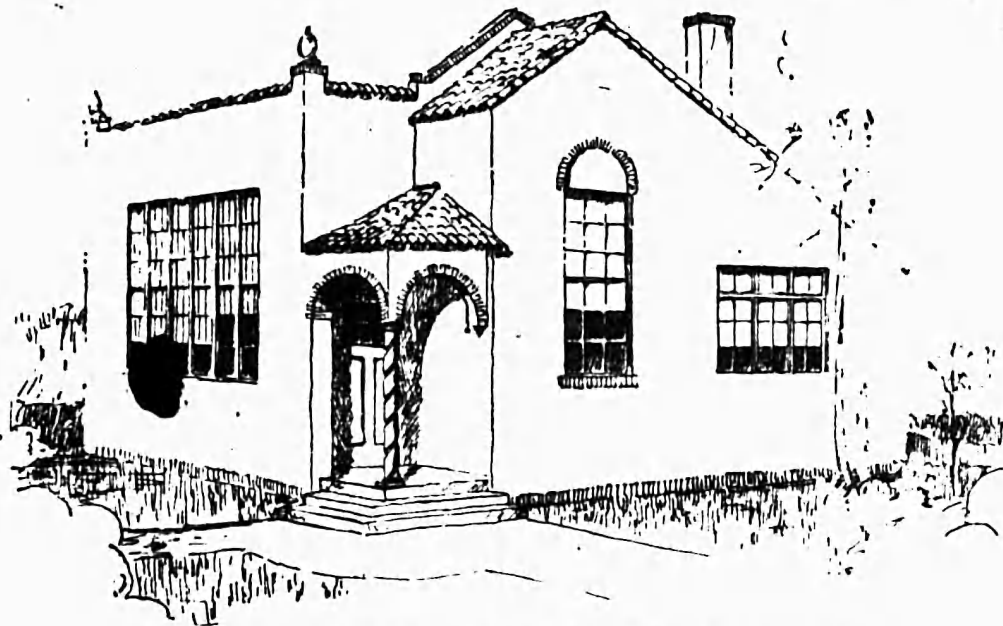


FIGURE 10.—One-teacher school building adapted to crossroads

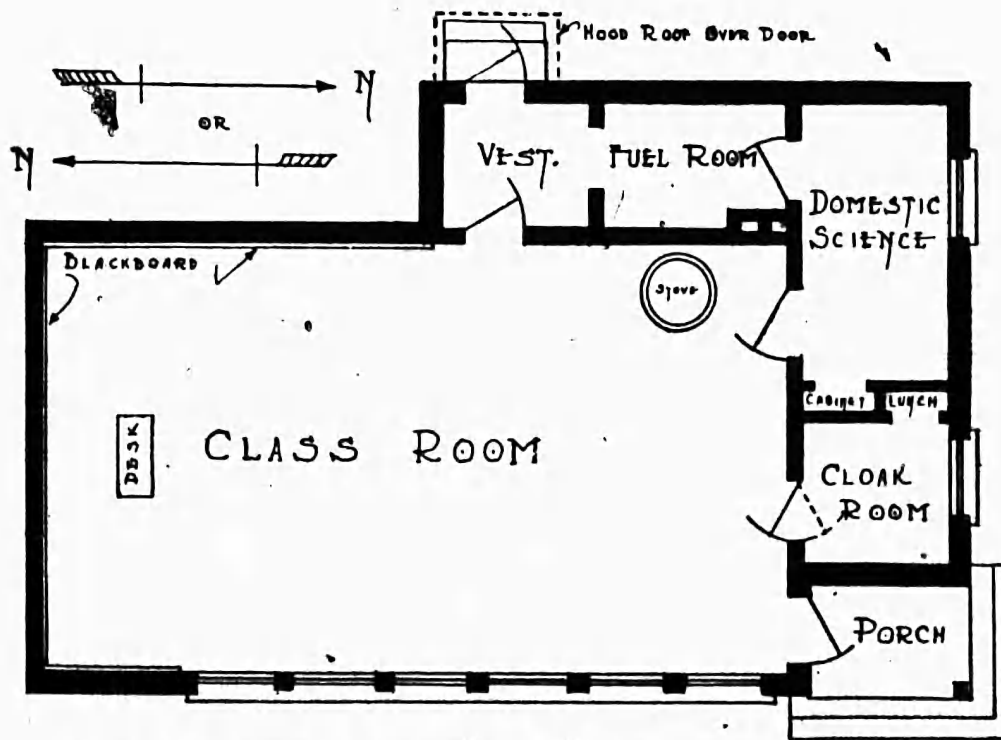


FIGURE 11.—Floor plan of one-teacher school building adapted to crossroads

### One-Teacher School Building Adapted to Crossroads

Frequently school buildings are located at crossroads and school authorities desire to have new buildings face both roads. This design can be used very nicely if the roads run to the south and west, or to the east and north of the school site. However, it can not be

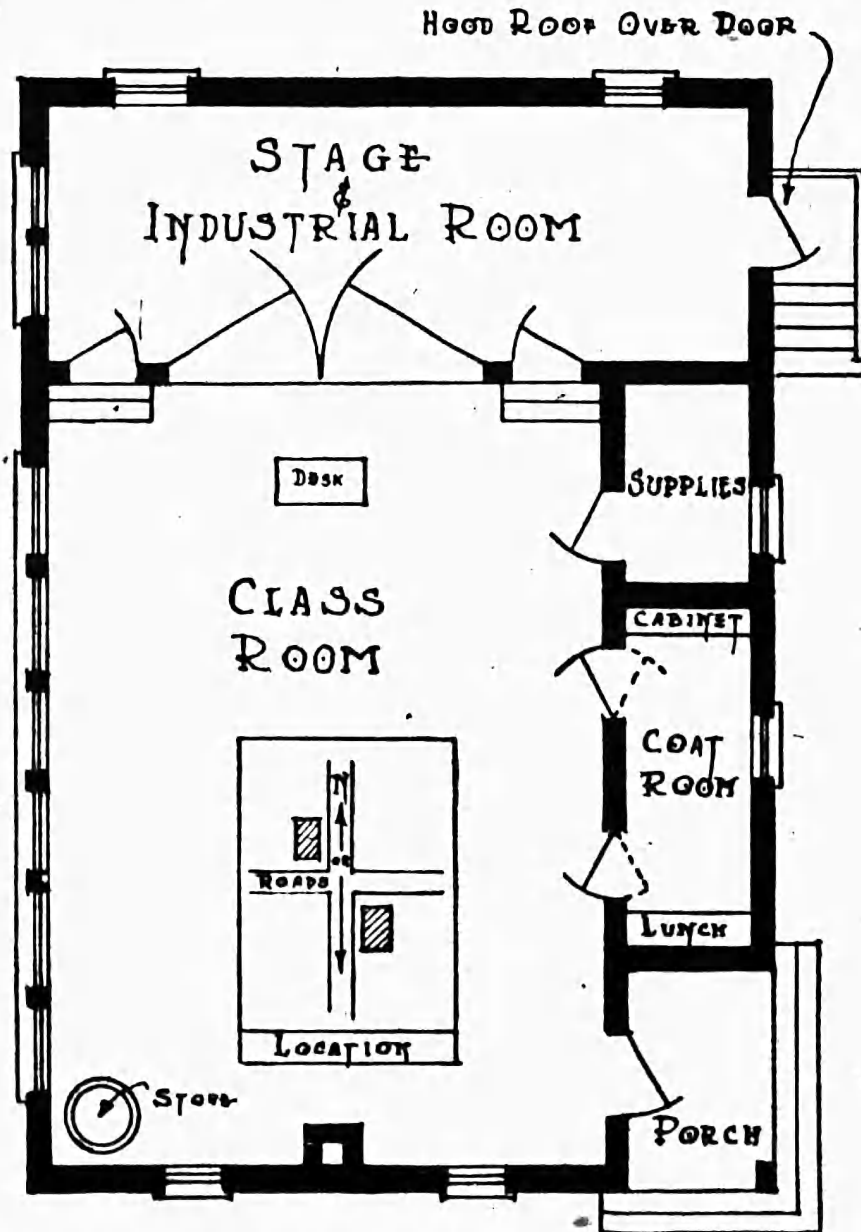


FIGURE 12.—Floor plan of a one-teacher school building adapted to crossroads

used at all if the roads run to the south and east, or to the north and west of the school site. The design is best adapted to a site having the roads to the south and west of the site, and the building placed so the windows will be in the west and the blank wall to the north.



If the classroom windows are in the east and the building faces the north and east there should be a window placed in the domestic-science room on the west, as the windows shown in the plan would be on the north. The large window in the cloakroom insures plenty of light and ventilation. The ceiling in the domestic-science room, fuel room, and rear vestibule is somewhat lower than that in the main classroom. The short windows in the domestic-science room are sufficient in number to insure plenty of light, and at the same time to suggest the appearance of a modern farm-home kitchen. A screened lunch cupboard is built into the domestic-science room to match a case, provided for the teacher, in the cloakroom. The flues for the classroom heater and for the domestic-science stove are built together. The fuel supply is conveniently arranged to serve both stoves. (See figs. 10, 11, and 12.)

This floor plan is for the opposite crossroads situations as discussed in connection with Figure 11. The architectural treatment may be similar to the other crossroads plan or it may be changed to suit the wishes of the school authorities. The industrial room is shown as combined with the stage. The folding stage doors are provided with blackboards so that when the doors are closed, the blackboards will be in front of the classroom. The stage should be built high enough so that a chalk rail may be placed along the top at the front. The emergency door is designed to serve as the second door toward one road. If the stage is not to be desired for community meetings, the same space may be used for a workroom with the floor put on the same level as the classroom, and a solid wall in place of the stage doors shown.

### Two-Teacher School Building to Face the East or West

This building was planned by Mr. C. M. Hirst, of the Arkansas Department of Education, and is known as Arkansas plan No. 2-C. It may face the east or west with almost equal advantages. This plan gives opportunity for the school building to become the community center. A folding partition is arranged between the two classrooms and a combination stage and industrial room is placed in the front. The smaller pupils should have the room adjacent to the stage so that their small desks will be in the front when the building is used for an auditorium. The library will then be convenient to the pupils in the upper grades. The partition between the stage and kitchen may be omitted, and the floor of the kitchen raised to the level of the stage to increase the size of the kitchen or industrial room. A boiler room is included so that one of the modern steam-heating plants may be installed. The smoke flue from the boiler

room may also be used by the cookstove in the kitchen. If the two jacketed stoves are preferred, the boiler room may be used as the fuel room. The toilets are conveniently arranged so that they are

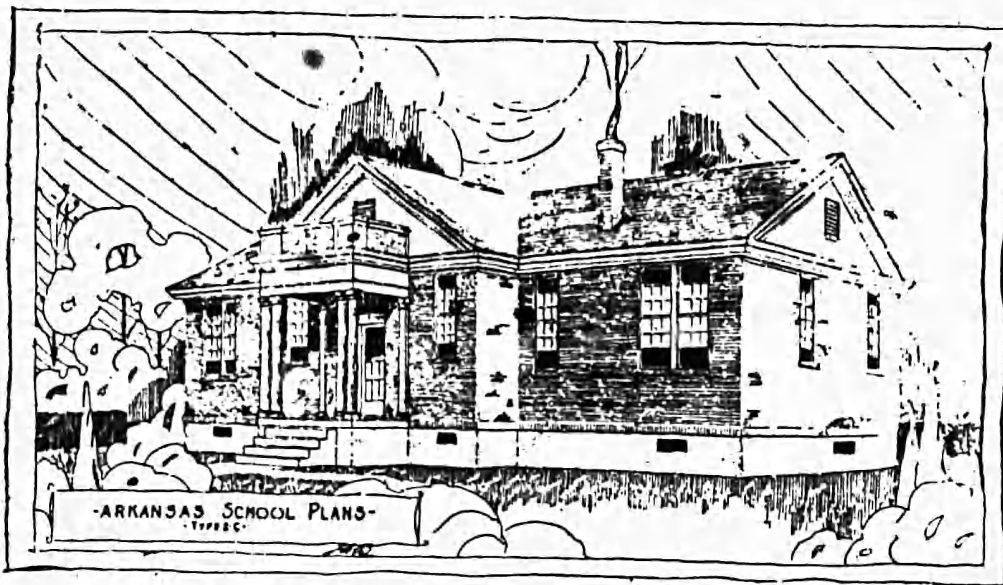


FIGURE 13.—Two-teacher school building to face east and west only

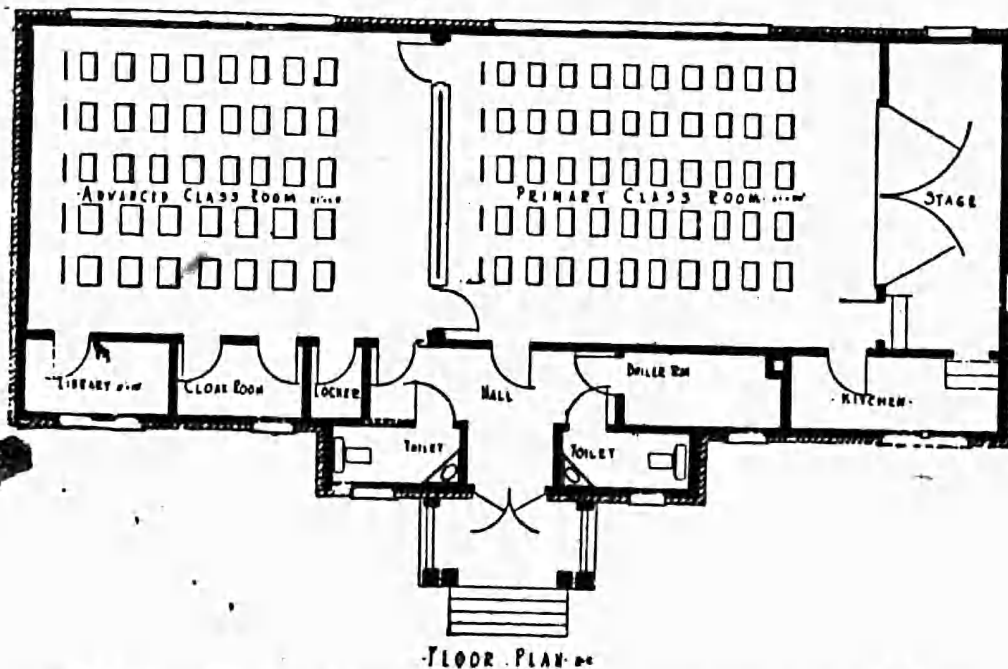


FIGURE 14.—Floor plan of two-teacher school building to face east and west only

easily supervised by the teacher and easily accessible for pupils from the classrooms or playgrounds. However, they should be included only when running water is available. (See figs. 13 and 14.)



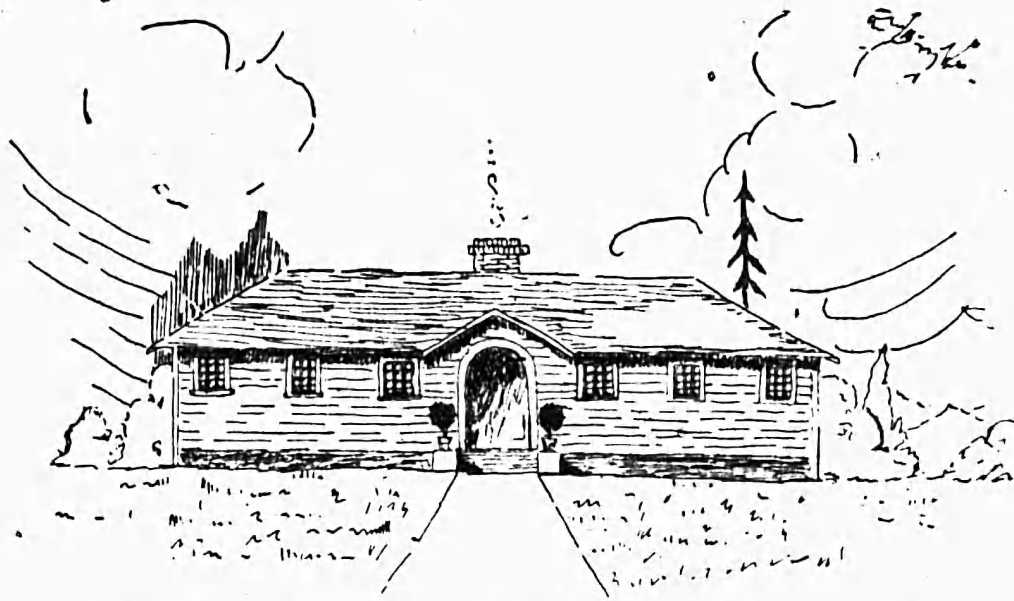


FIGURE 15.—Two-teacher school building to face east and west only

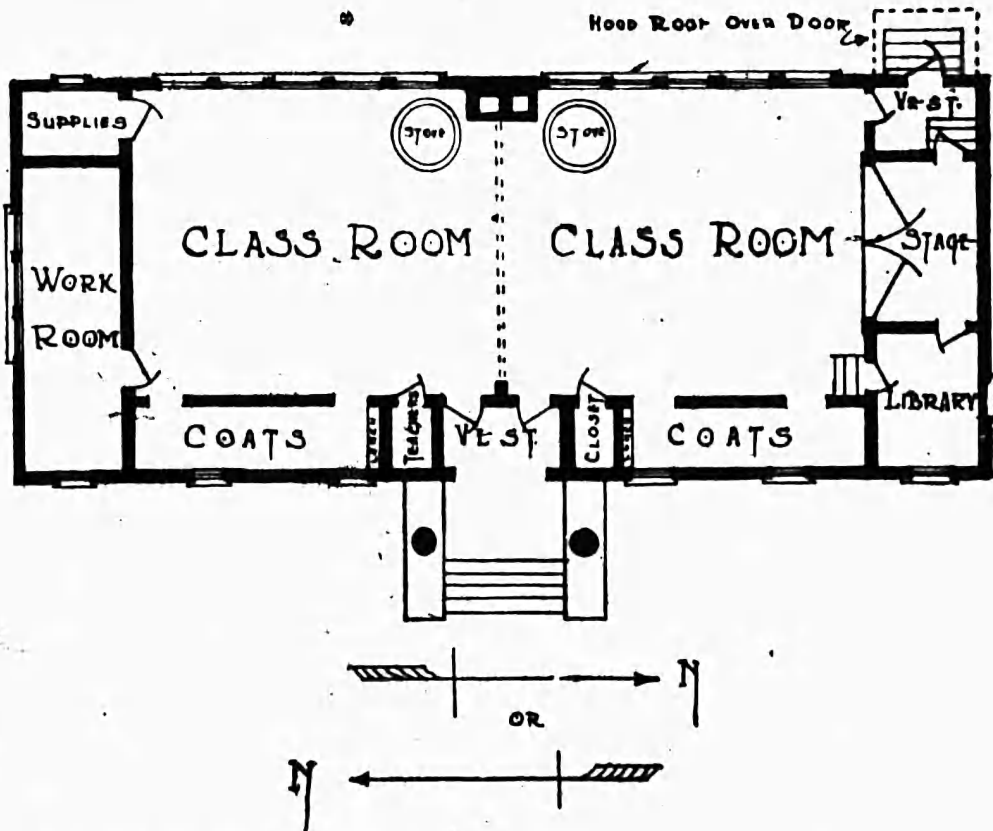


FIGURE 16.—Floor plan of two-teacher school building to face east and west only

This 2-teacher school building designed to face the east or west has very simple and straight lines for economical and substantial construction, and yet contains most of the special rooms and features.

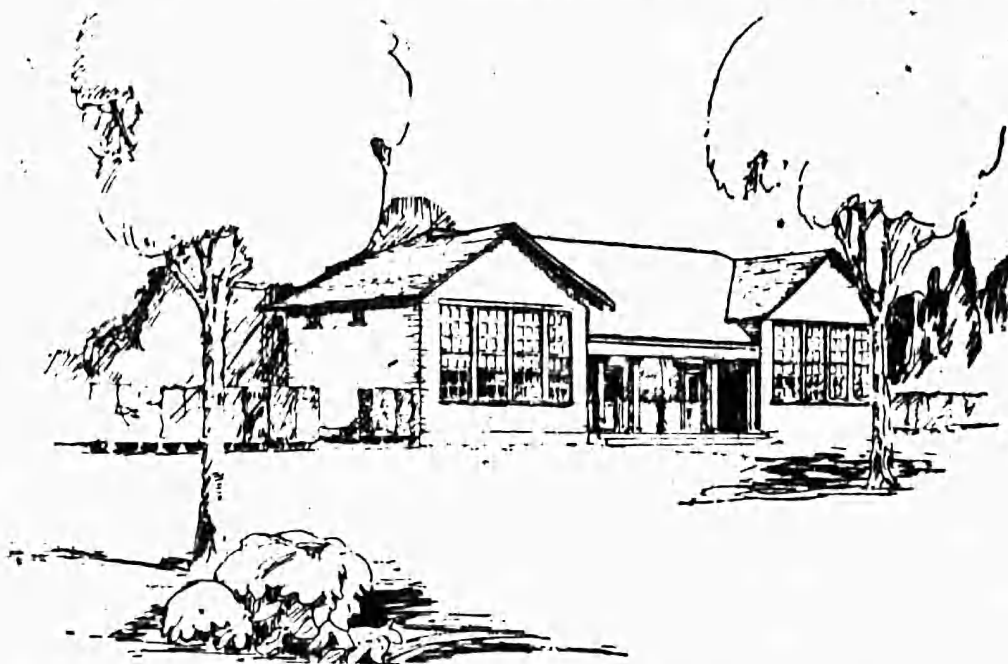


FIGURE 17.—Two-teacher school building to face east and west only

desired in a model rural school plan. The two classrooms may be converted into an auditorium for community purposes by the use of a folding partition between the rooms. The pupils, when seated

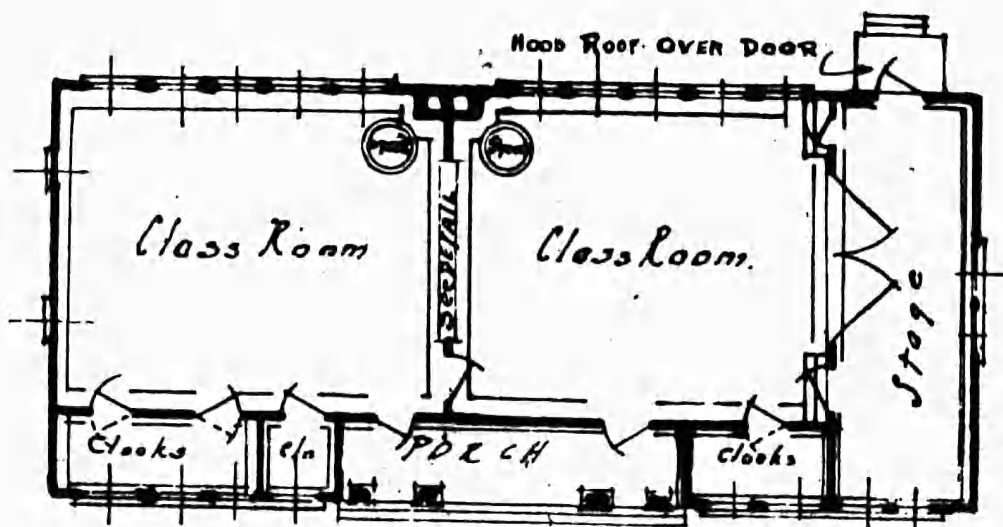


FIGURE 18.—Floor plan of two-teacher school building to face east and west only

with the light to the left, will be facing a built-in stage at the front. Each classroom has a large, well-lighted and well-ventilated cloak-room with two doors so the pupils may march in a continuous line





FIGURE 19.—Two-teacher school building to face north and south only

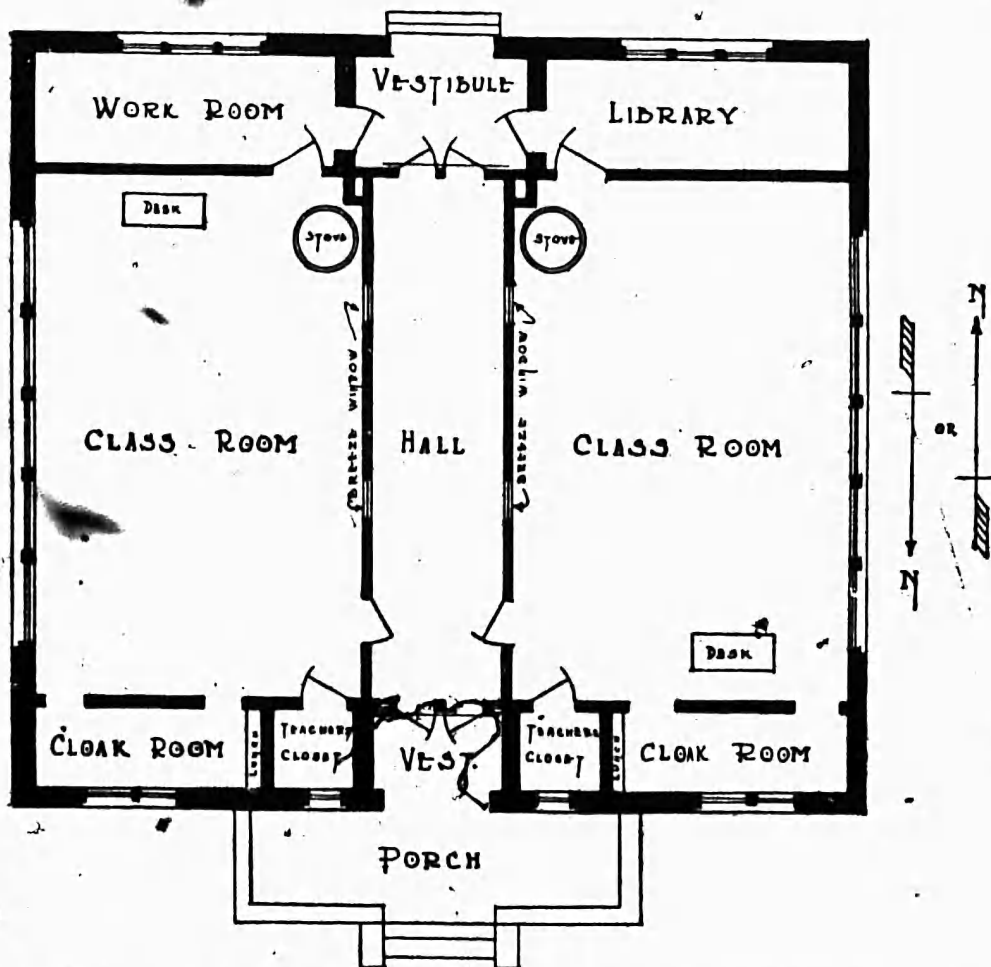


FIGURE 20.—Floor plan of two-teacher school building to face north and south only

while handling their wraps before and after the play periods. Each teacher is furnished with a supply closet. If the building should face the east, the large workroom would receive the light from the south and east. A library is conveniently planned and is large enough to offer all the opportunities for beautification that are discussed under the head of libraries, in Chapter II.

This plan may be used by school authorities who want a 2-teacher building to face the east or west, and with just the minimum essentials in the building, and at the same time want it to be homelike and attractive from the outside. (See figs. 15, 16, 17, and 18.)

### Two-Teacher School Building to Face the North or South

This plan is submitted as a suggestion for those who want a 2-teacher school building facing the north or south, and are more interested in having a good classroom building than they are in having a community house. A large, well-lighted cloakroom and teacher's closet are planned for each classroom. The library and workroom are so arranged that they may be used by the pupils from either room. The library is conveniently arranged for the patrons who wish to use it without disturbing the school. The workroom may be equipped for domestic science and be used by the farm women's clubs even while school is in session. (See figs. 19 and 20.)

It is very difficult to plan a 2-teacher school building to face the north or south with the classrooms lighted from the east and west, as they should be, and at the same time make it possible to throw the two rooms together for community meetings. Many proposed 2-teacher school buildings for a lot facing the north or south should be constructed with a side of the building toward the road and the main front to the east or west because it is easier to plan 2-teacher school buildings facing the east or west.

However, this problem has been well solved in the building which was planned by Mr. S. L. Smith, director for southern schools for the Julius Rosenwald Fund, and is generally known as Rosenwald plan No. 20-A. The building may face toward the north or south, and in either case the front would be attractive and the classrooms would be lighted from the east or west. Each classroom has a separate cloakroom and a separate entrance conveniently arranged to the cloakrooms. The classrooms may or may not be connected by folding partitions. The industrial or workroom is very large and well lighted and conveniently arranged for use by teachers and pupils from either room.



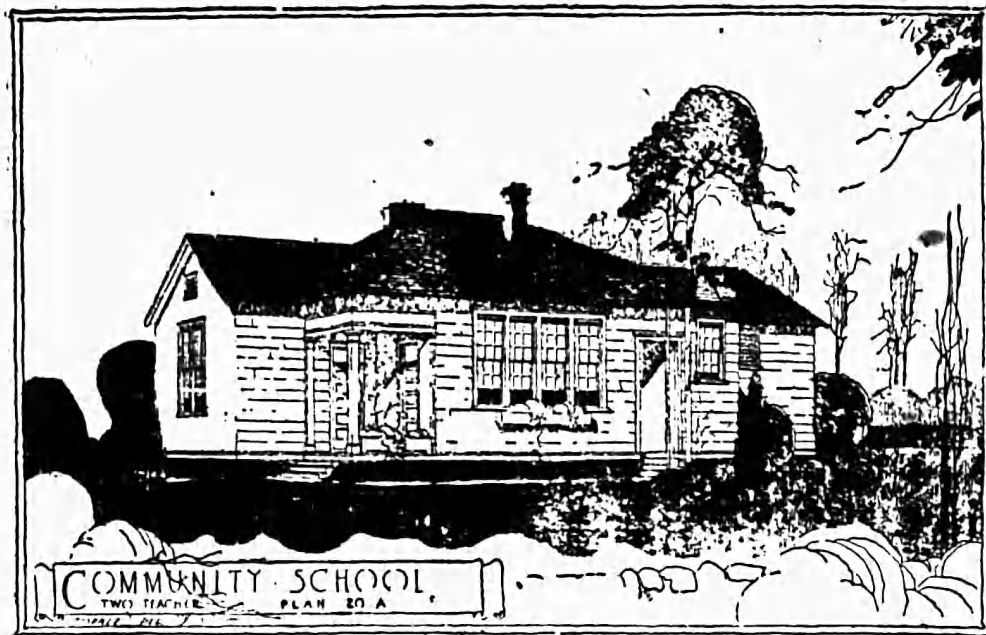
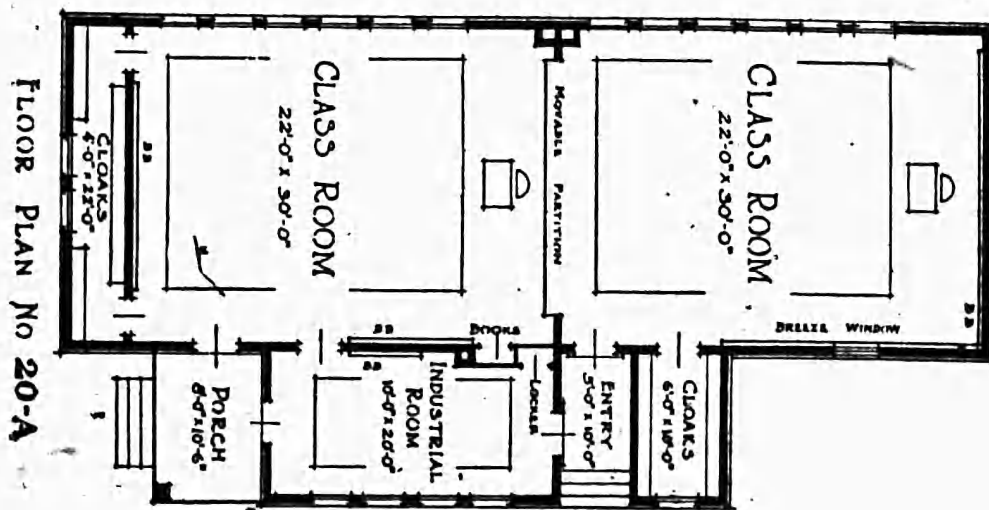


FIGURE 21.—Two-teacher school building to face north and south only



TWO TEACHER COMMUNITY SCHOOL

FIGURE 22.—Floor plan of two-teacher school building to face north and south only

This plan is submitted for those school boards who are very limited in finance and yet who want two classrooms hygienically correct for the school children, and which may be converted into the use of an auditorium by the use of folding doors. As explained under discussion of the previous plan, it is impossible to plan a

2-teacher building with folding doors between the rooms for auditorium purposes, and have the classrooms properly lighted with the pupils facing the front and light from their left, unless the rooms are planned end to end. It is admitted, however, that it would be cheaper to have the rooms side by side and put the building more in the shape of a square if it were possible to get the proper lighting and the auditorium feature at the same time.

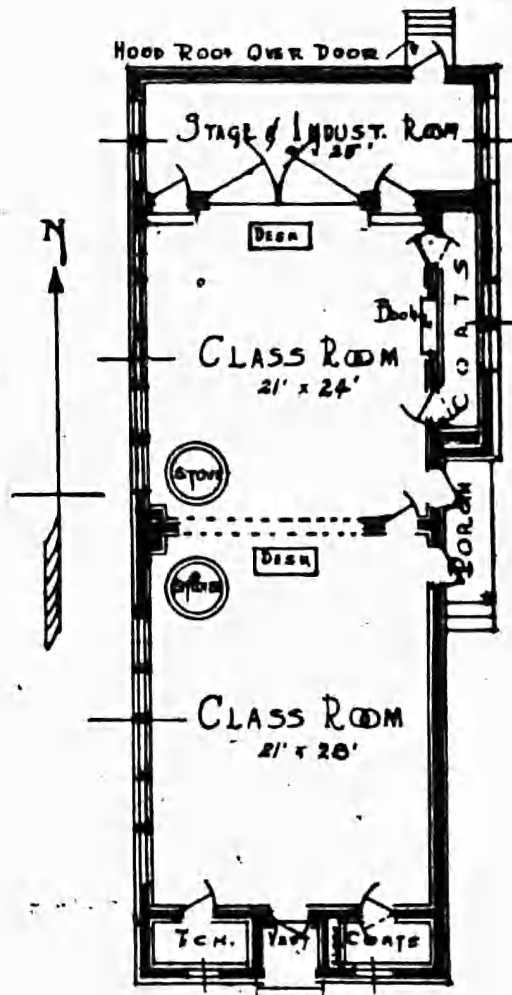


FIGURE 23.—Two-teacher school building plan to face north or south only

### Three-Teacher School Building to Face the East or West

This 3-teacher plan has the community auditorium feature with folding doors as discussed in some of the previous plans. The stage and industrial room are combined as in the case of some of the plans of the 1 and 2 teacher schools. A cloakroom is provided for each one of the classrooms. (See figs. 24 and 25.)

### Three-Teacher School Building to Face the North or South

This attractive building, which has many desirable features, was designed by R. E. Ledbetter of the Alabama Department of Education. The classrooms are lighted from the east and west and each room provided with a cloakroom. Rooms for manual training and domestic science are sufficiently large to justify their names. If the manual-training room is not wanted, the same room would make a very desirable library convenient to all students in the school, and easily accessible to the patrons during school hours. (See fig. 26.)





FIGURE 24.—Three-teacher school building to face east or west only

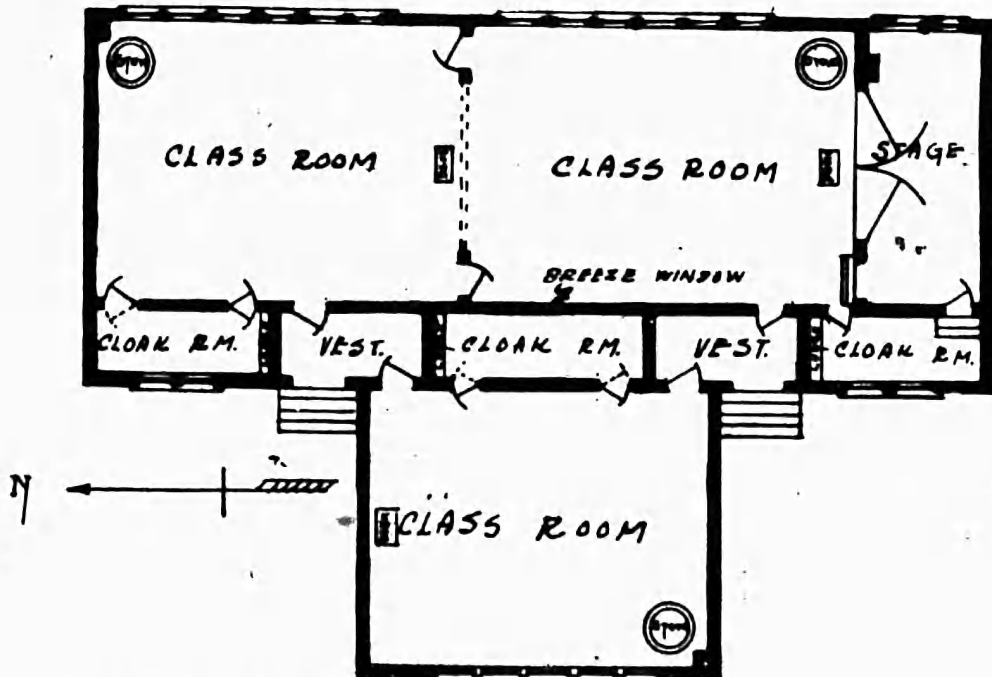
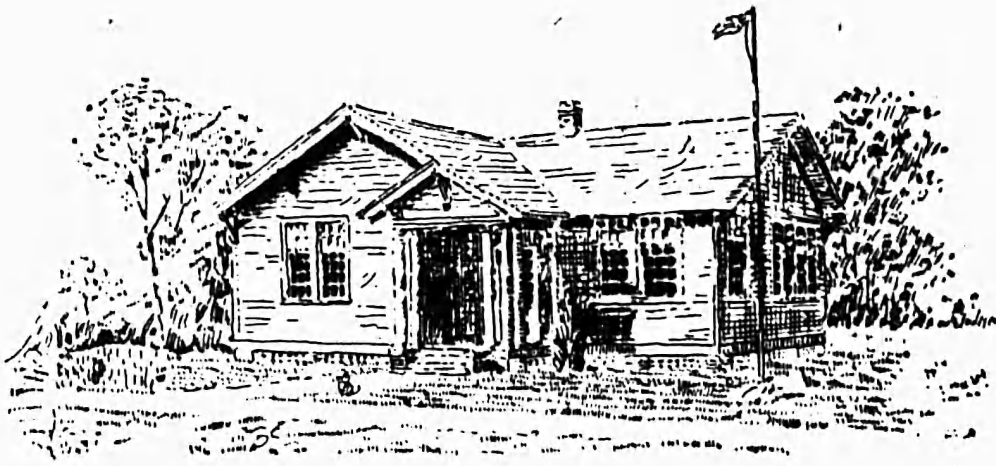


FIGURE 25.—Floor plan of three-teacher school building to face east or west only



ALABAMA 3-A

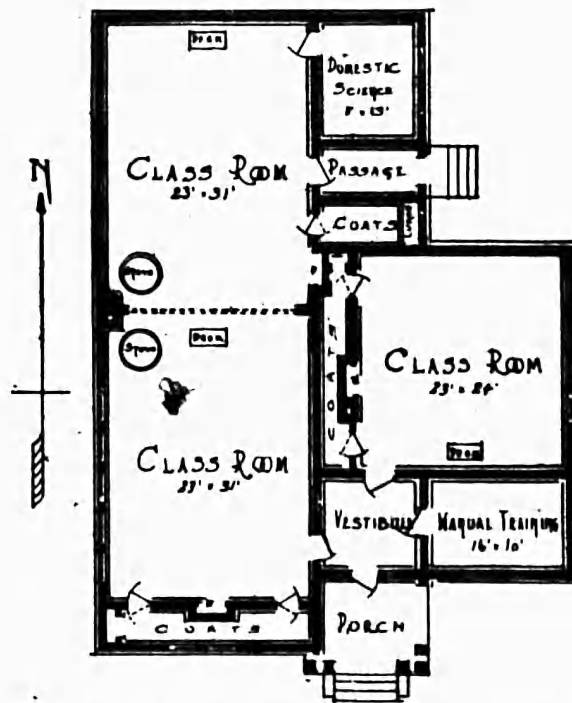


FIGURE 26.—Three-teacher school building with floor plan to face north or south only  
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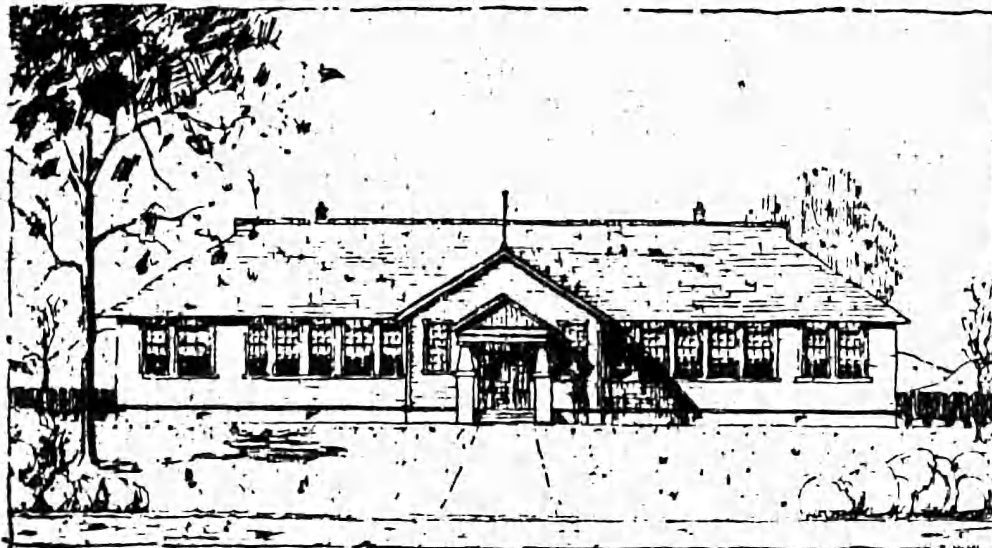
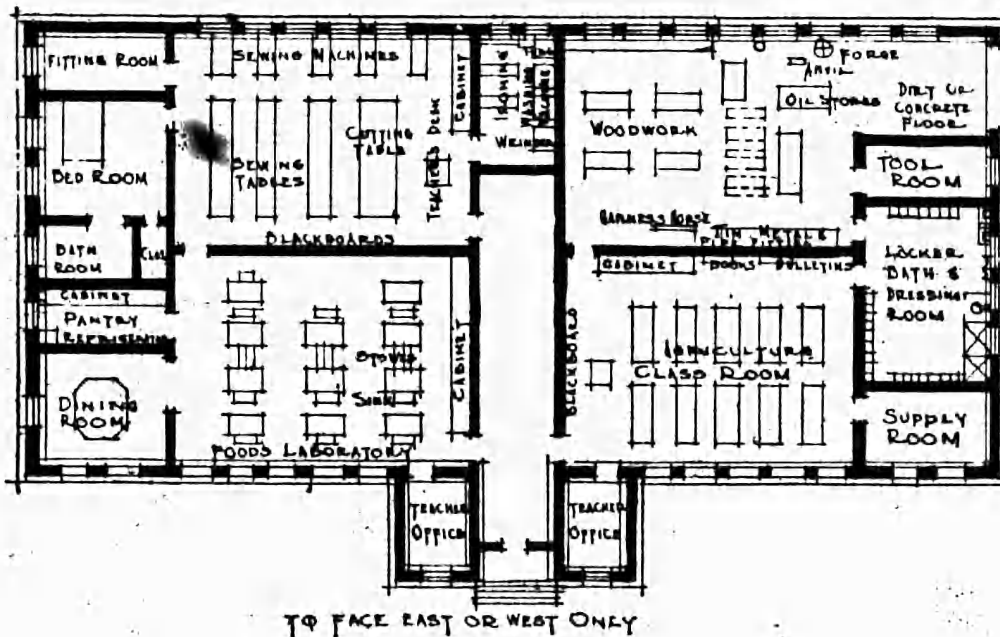


FIGURE 27.—Vocational building for agriculture and home economics should face the east or west



HOME ECONOMICS &  
SHOP PLAN  
SCALE 1/8" = 1'-0"

FIGURE 28.—Floor plan for vocational building for agriculture and home economics

## Vocational Buildings

With the increase in Smith-Hughes agriculture and home economics in the consolidated schools, there is a greater demand for separate vocational buildings especially designed to house this work and to remove the noise and odors from the main school building. The vocational departments which require so many extra smaller rooms, are much easier planned in separate buildings such as the plan submitted, than they are when planned as a part of the main school building. (See figs. 27 and 28.)

Figure 28 illustrates a combination building designed to house vocational agriculture and home economics. The building should face the east or west to insure plenty of sunlight in all rooms. The home economics department has a large laboratory for sewing and a large foods laboratory. In connection with the sewing laboratory are smaller rooms for laundry, form and fitting rooms, and a bedroom which may also be used as a home-nursing room. A bathroom and closet are connected with the bedroom and home-nursing rooms. In connection with the foods laboratory are the pantry and practice dining room. There are separate offices for each teacher.

The vocational agriculture department is provided with a regular classroom or a laboratory and a large supply closet for laboratory equipment. The shop with its special dressing room and shower bath and separate tool room offers an opportunity for boys to work in the environment of a modern shop. The doors are sufficiently large to allow admittance of automobiles and most kinds of farm machinery.

Sometimes it is desirable to have the vocational agriculture and domestic science in separate buildings. The Federal Board for Vocational Education has bulletins on planning the rooms or buildings for vocational agriculture and also on planning the home economics cottages.

## The Teacher's Home

The teacher's home is often a desirable part of the consolidated school plan and occasionally even of a smaller rural school, provided good rooms and a place for board are not easily obtainable in private homes. In rural schools with two or more teachers, the teacherage attracts more married men to serve as principal and induces them to remain longer in the same district. The teacherage gives the teacher a freedom and independence not ordinarily found in the usual boarding place.

A teacherage designed to accommodate several teachers should be built on the style of an apartment house for each two teachers to do



light housekeeping together, for many teachers do not always live together in harmony. A large living room may be desirable for a social center for all the teachers. Sometimes the first floor may be so arranged that a large living room, dining room, hall, and an extra room may be thrown together as one for social activities. The farm women's club may develop a model kitchen and furnish dishes sufficient to serve at their afternoon meetings in the teacherage. The young people's club in the community would purchase folding chairs and folding tables for parlor games.

The teacherage should be one of the most beautiful and most modern homes in the community and should harmonize with the architectural treatment of the school building, provided the latter is a modern type. The living accommodations for teachers are never quite satisfactory when they are included as a part of the main school building.

In larger school systems it may be desirable to build a separate building for the superintendent of the school and one for the janitor, who should live on the school grounds throughout the year.

Teachers' homes are too often placed upon the school grounds to occupy space that should be used for the playgrounds. The homes should be located where privacy and freedom from children at their play will be secured for the family of the principal or teacher who may occupy it. The best location is generally to the rear and considerably to one side of the school building, and provided with convenient access to the main road. A garden and place for chickens and a cow will make the place seem more homelike to the teacher and his family. A garage for the teacher's car is essential.

No plans are submitted for a teacher's home, since most lumber companies have an unlimited supply of plans of homes which are available to school authorities and which are satisfactorily used in the construction of teacherages.

## CHAPTER IV

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### Constructing the Rural Schoolhouse

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#### Financing the Building Program

Many States still have a district system of taxation to support the school and to raise money for the construction of new schoolhouses. Most school buildings are financed by bond issues which in most States are limited to a specified percentage of the total valuation. The district system of financing the construction of school buildings necessitates great differences in the kinds of school buildings erected in adjoining school districts, because of the tax limitations mentioned, as well as differences of popular demands.

To plan new school buildings, one must consider the financing ability of the district, and the amount of money which it can put into the new schoolhouse. Often the strictest economy must be observed because of the limited and fixed available funds. This does not mean, however, that a building can not be properly planned, for however small and whatever materials of a cheap kind are needed, a well-planned building will not cost any more money, probably less, than one poorly planned. This financial difficulty which rural schools are required to confront is not the rule in cities.

Several States have appropriated funds with which to aid in the construction of schoolhouses which conform to certain State standards.

If those in authority and those advising with local authorities are to help most effectively in the planning of the new building, they can often serve best before the bonds are voted or the budget for the building is made. It is a pitiful situation to observe some communities, which could vote sufficient funds with which to build and equip excellent buildings, to find after the bonds are voted that they are financially unable to secure the buildings which they had in mind from the beginning. So many school authorities say that if they had had advice sooner they could just as easily have voted more money for the kind of building which they now see they want, and should have. It is true that no one knows exactly what a school



building will cost until a reputable contractor places his signature to a statement that he will furnish the materials and construct the building for a specified amount. However, those in the building business can figure the cubical contents, and by a comparative cost of the "cube" they can figure fairly accurately the cost of the proposed building. Then, too, quite frequently those responsible for securing the funds forget that school equipment costs much money, and if all the money is spent on constructing the building, they are disappointed in the final result because of this discrepancy, and its consequent incongruities.

### Working Drawings, Specifications, and Contracts

The plans and specifications are instruments which should completely describe a school building as it is to be when completed. Contractors and builders appreciate as complete a description in words and drawings as it is possible to make. The old statement "close business makes close friends" can well be applied to the agreement between the contractor and the school authorities. In altogether too many cases, builders have been set to work in the construction of a new building with no more complete plans and specifications than just the mere outside dimensions of the "box." Not only is it necessary to define clearly the types and grades of materials to be used, but it is also necessary to describe the standard of workmanship which will be expected.

The contract agreement should outline how the school authorities and contractor should proceed step by step until the building is completed and all business affairs are settled. It must clearly outline the time limit for the work, the type of supervision expected, the times for payment, the liability and what will be the necessary step if the unexpected happens. An affidavit from the contractor to the school authorities can be made to guarantee that all bills for labor and materials have been paid. A signed statement by the school board accepting the school building from the contractor prevents any question from arising as to the ownership of the building and the one carrying the responsibility in case of a disaster such as fire or tornado about the time the building is completed.

### Materials

The materials used in the construction of school buildings will vary greatly in different localities depending upon the funds available and the distances from the supply of building materials which are to be shipped and the length of the haul from the local market and the shipping point. It is desirable to have the larger consoli-



dated school buildings and others which are permanently located and can not be consolidated, built of fireproof or semifireproof construction. While such construction is difficult and more expensive, it is more nearly in the reach of rural people than it was a few years ago. The extent to which such materials are used will depend largely on the accessibility of the different materials in the local supply.

It is well for the school authorities to study the materials found in the local market and from the cost, cost of labor, durability, etc., determine before the contract is signed the exact materials and type of construction to be used in the building.

### Excavations and Grading

The possibilities of excavating for a basement are discussed in the preceding chapter. If basements are not used, the excavating may be just sufficient for footings to carry safely the load of the walls, and prevent any uneven settling of the walls. Grading and back filling are usually included as a part of the general contract, and should be, for it can be done usually at less cost at the proper time than later.

### Foundations

Native stone, brick, or concrete may be used for the foundation with about the same degree of satisfaction. The choice should be made on the basis of cost under local conditions. The foundation walls should be ventilated in such a way as to prevent dry rot and to prevent small animals from getting under the floor. There is a decided advantage in the use of concrete in those sections of our country subject to violent windstorms, for with steel rods imbedded in the foundation, the whole building can be tied together effectively.

### Floors

Perhaps no more serious mistake can be made in the construction of a rural school building, unless it be a failure to provide plenty of light, than in bad construction of floors. The importance of double floors for school buildings in every part of our country needs to be emphasized. Naturally in cold climates double floors are necessary; yet even in the South during periods of sharp weather, children are likely to suffer from cold. It is almost impossible to equalize the heat in schoolrooms during cold weather if floors are not practically air-tight. A warm room acts as a sort of exhaust flue to gather draughts of outside cold air from all directions, especially up through the floor, and, therefore, the temperature, at the floor line unless the



floors are double and properly closed, will be almost invariably several degrees lower than at the breathing line.

This is one of the reasons why children and teachers complain when the thermometer goes as low as 68° F. at the breathing line. If the floors are properly protected and the heat of the building is properly distributed, it would be comparatively easy to reduce the temperature in most of the schoolrooms without objection, and to gain thereby from the point of health and efficiency. Many of the rural schools reporting single floors are not only uncomfortable, but dangerous in cold weather, because of the draughts and the dust brought up in this way.

The under or rough floor may be made of any well-seasoned, rough lumber of even thickness, and should be laid diagonally across the floor joists and then covered with some form of asbestos quilt, deadening felt, or, if expense must be reduced to its minimum, good quality of building paper. Upon this, at right angles with the joists, should be laid the boards of the main floor. Floor material of good quality is becoming more and more expensive, and as a result dealers are economizing by using lumber unfit for schoolroom floors. A good quality of white oak well-seasoned in boards not more than 3 or 3½ inches wide, tongued and grooved and blind nailed makes a good floor. Maple flooring is also a good material because of the closeness of the grain and its toughness and wearing quality. A hard pine with boards not more than 3 inches wide, properly tongued and grooved, and carefully nailed will make an excellent floor.

School authorities will save a great deal of difficulty if they have a competent workman to oversee the work in laying the floors so that defective places in the boards are cut out and that the boards are carefully fitted together, and that all nails are put in place with a nail set instead of with the edge of a hammer or hatchet.

After the floor has been laid, it should be planed or sandpapered to an even surface. Before it is used, it should be treated with hot linseed oil, and then, after it is thoroughly dried, it should be waxed. The oil will fill the pores of the flooring and prevent it from shrinking, and the wax will give it a finish so that it will not mar easily nor hold the dust.

Inasmuch as some school authorities are going to the extreme in the construction of fireproof school buildings to the extent of building a concrete floor in the schoolroom, it may be mentioned here that concrete is such a good conductor that it quickly extracts the heat from the feet and thus will reduce their temperature far below the necessary physiological temperature of the body. If a part of a classroom were floored with uncovered concrete, and another portion of the same room were floored with uncovered wood, though the



temperature of both might stand at 68° F., the concrete would seem cold, while the wood would not. Since both are practically 30° F. below the normal temperature of the body, the concrete quickly lowers the temperature of the feet, and discomfort and uneven circulation prevail. Concrete, therefore, in cold weather, always seems cold to the feet, and moreover, is dusty, and because it does not easily yield to the tread, it is hurtful to the human mechanism. So few schoolhouse fires actually start in the floors that one can not on this basis justify the use of uncovered concrete floors, and thus far, there has been no covering material manufactured that is lasting and satisfying in all particulars.

### Flues and Chimneys

Safe flues are built on a concrete base, and extend well above the highest part of the roof. The flue base may be made large enough for the flue and stove. A flue lined from top to bottom with tiles made for this purpose is a most important means of preventing fires and helping to strengthen the flue against earthquakes and wind storms. No schoolhouse chimneys or flues should be constructed without the use of these tiles. They will more than pay for themselves in reduced insurance.

### Doors

Comparatively little is to be said concerning the doors of schoolrooms, for those generally used are of the stock pattern, and in the country no others are ordinarily available. It is to be hoped that we shall get away from the customary panel doors in time, especially for school buildings, and come to use the plain door with no panel effects. These are now manufactured in a few places and have proven acceptable. No panels mean no ledges to gather dust and dirt, and plain doors are more easily kept clean.

### Transoms

Transoms in schoolrooms, and for that matter in dwelling rooms, are largely a delusion and a snare. They are usually the dirtiest places in the room, are rarely used, and have been continued out of mere habit. Generally they are so far out of reach and so hard to open that they can not be used. As a result they merely add to the expense of building, gather dust, and render the room untidy. It costs a great deal more to set transoms properly than one would imagine. "Breeze windows" and doors may be utilized to admit



and distribute breezes in hot weather much more safely and easily than transoms. Those who are planning rural schoolhouses would do well to abandon transoms.

### Windows

Windows divided into small glass greatly reduce the cost of upkeep. A window made up of 18 lights 12 by 14 inches has exactly 21 square feet of clear glass area. If the classroom is planned 21 feet wide, as suggested in the preceding chapter, it will require only one window for each 5 feet in length to have the clear-glass area equal to exactly 20 per cent of the floor space. A double-hung window seems to be most satisfactory because it can conveniently be shaded from the inside and screened for protection from the outside. In case of a lack of room for sufficient windows the use of prismatic glass in the upper sash of the window will add greatly to the distribution of the light. Nothing but square-topped windows should be considered, as the oval and other types of tops cut out so much of the best sky light. Separate glazing above the windows proper necessarily adds extra framing, and frequently do not serve as well for ventilating purposes as a window which is easily opened at both top and bottom. The top of the window should be placed as close to the ceiling as safe construction permits. If the bottom of the window is below the level of the pupils' eyes when they are seated at their work, it will allow injurious light to enter. Hence they should be set at least 4 feet above the floor.

Small breeze windows used for ventilation in an outer wall on the opposite side of the light windows of the classrooms are best arranged when pivoted in the middle of the sash, and tilted in at the top to turn the air upward against the ceiling, and to turn out the water during rains. The glass in the breeze windows may be painted or covered to prevent cross lights in the classroom, if there be any such trouble connected with their use. If a breeze window is placed between two classrooms or a classroom and a hall, it may be pivoted in the center, or made in two small sashes hinged to the sides and opened into the room. We, in general, do not recommend breeze windows opening between classrooms. Pivoted windows always make it difficult to screen them from flies or other pests. In any case, however, breeze windows should be set close to the ceiling, and well above the blackboard.

### Window Guards and Screens

It has been demonstrated that persons may be burned to death in a 1-room 1-story school building when fire breaks out and panic ensues. Any guards or screens placed over the windows should be



hinged or otherwise fastened so they may be easily opened for exit from the inside. Some schools in the South are in session during warm weather, and at times when flies are both annoying and dangerous. A window screen which would protect the glass may be made of small wire and woven into such small mesh that it will also protect the children in the schoolroom from flies, mosquitoes, and small pests. This precaution will offer opportunity to impress upon the children the great importance of such provision in their homes.

### Lathing and Plastering

Lathing and plastering make an excellent schoolroom wall above the height of the wainscoting. In large rooms it is necessary to treat a ceiling for acoustics if metal lath is used for plastering on the walls because such walls are likely to produce reverberations and annoying echoes. There seems to be some question about the use of plaster for ceilings in rural school buildings because the buildings are so frequently neglected, and when once a leak in the roof occurs, the plaster cracks and is seldom repaired because of a lack of skilled workmen close to the building. In time the plaster loosens and may be a real menace to the children. Falling plaster, besides being somewhat dangerous, has been known to produce panics.

When plastering is used the surface should be made firm and hard so that an occasional cleaning with a damp cloth will not harm it. The ceiling must be tight so the warm air will not escape into the attic. If board ceilings are used, they should be made tight by fitting building paper between the ceiling joists in the attic, or composition board fitted snugly against the ceiling from below. The latter, when properly painted, gives an interesting texture, and is a good insulator.

There are some composition boards in the building-material market which are tough, durable, and nonconductive and which make excellent ceilings for schoolrooms. These better grades, however, should not be confused with heavy paper boards which, if the roof should leak, would be ruined by one wetting.

### Scuttle

A scuttle concealed in the ceiling from a cloakroom and made accessible by a small door and a short ladder gives an added opportunity for fighting fire in the roof. It also offers opportunity for making inspections of the lower side of the roof and the upper side of the ceiling.



### Roof

Avoid unnecessary gables, towers, and fancy roofs, as they have no place in school architecture and add to the cost of upkeep. The material used in the roof is important from the standpoint of fire protection and renewal. Roofs of fire-resistive material can often be had in the local market at about the same price as shingles or more combustible material. A roof ventilator or well-screened louver in the gable will circulate the air within the roof, and thus make the problem of heating and ventilating in the main classroom somewhat easier.

In the warmer and dryer sections of our country, such as western Texas, parts of Oklahoma, New Mexico, Arizona, and California it at times seems almost imperative to use metal roofs, for other types dry out and shrink to such an extent as to prove unsatisfactory. Of course, metal roofs are good conductors, and make attics extremely hot or cold according to the state of the weather, but if cared for, last well and have value in fire prevention.

### Cornice

Avoid any cornice design which requires the windows to be lowered from the inside ceiling to accommodate the demands outside. The overhanging roof with approximately 2 feet of exposed rafters or outlooks gives an added protection to the windows and eliminates the need for window shades in the schoolroom except early in the morning and late in the afternoon. The open cornice with the exposed rafters does not rot out as soon as does the old box cornice, nor does it become a place in which birds and insects may harbor. In the northern climates, and for school buildings receiving little light because of mountains or trees, the cornice will necessarily have to be very narrow above the windows and the roof with less overhang to allow the maximum amount of light to enter.

### Eaves Troughs

Under ordinary conditions, eaves troughs and leaders should be provided to carry away the water from the roof of the building. If there are no eaves troughs, the water will fall down all about the building and saturate the ground, making it difficult to keep the basement or foundation walls dry. The water from the roof should be carried away a sufficient distance to prevent any of it from finding its way back toward the building. When a drain is placed well below the level of a basement floor, the roof water can be carried



down through the leaders and through cemented sewer tiles into this drain. Care must be taken, however, to prevent the débris which gathers on the roof and in the gutters from clogging the leaders or the drain below. Generally, there should be some form of trap or screen between the sewer tile and the end of the leaders to catch the coarser materials and thus prevent clogging.

Eaves troughs, however, have their disadvantages, especially in cold climates. Frequently, when the roof is covered with snow and the atmosphere is below the freezing point at the eaves, the heat escaping from the schoolroom will cause the underside of the snow to melt. A part of this water will freeze in the troughs and leaders, and in time they will be clogged with ice and rendered worse than useless. Some builders in the north have given up the eaves troughs, and depend on a drain directly below the eaves to catch and carry away the water falling from the roof. They lay the drain a safe distance below the level of the walls, give it a good gradient, fill the space above it to within a few inches of the surface with coarse broken stone or bowlders, put a thin coat of soil and sod over the broken stone, and thus let the water sink quickly to the tiles. When stone is near at hand, this method of drainage will cost less than the use of leaders and eaves troughs and has proved acceptable in many places.

Besides the difficulty experienced with ice, eaves troughs are easily clogged with leaves and are frequently broken. Constant care should be exercised to keep them in proper condition. Frequently mosquitoes breed in the water left in a sag of the trough after a rain, or when a down spout is stopped.

### Building Hardware

Any hardware put into a school building should be simple, convenient, and yet be safe from intrusion. If any screws are exposed either in the knob, bolt, or elsewhere in the lock, the lock is soon out of repair. Many locks put on the doors of schoolhouses are easily unlocked with an average skeleton key. The rear door or emergency door may be equipped with bolts or with an ordinary lock equipped with a closet spindle with the door knob on the inside and nothing on the outside so that without the use of a key the door is always unlocked from the inside and locked from the outside. This is an important item because most outsiders who enter the school building for pilfering enter from the rear door.

*Door checks*, which are inexpensive, save their cost several times over in the wear and tear of doors in slamming.



*Coat hooks* which are fastened on with two screws are the best kind to be specified in the new building. If a wire screw hook is used, a staple should be added to secure the hook to the wall so that it may not be easily unscrewed or bent out of place.

### Painting

*Exterior wood* must necessarily be painted both from the standpoint of economy and attractiveness. Before any paint is applied, all woodwork must be entirely dry, all knots and sappy places must be treated with best grain alcohol shellac, and no paint should be applied on a damp surface or until the preceding coat has had ample time to dry. Best results are produced by using not less than three coats of the best grade of paints.

Any of the following color schemes may be used: White body, light gray trimming, dark green roof; silver gray body, stone or white trimming, dark green roof; steel gray body, brown or lead trimming, black or dark green roof; straw body, dark brown trimming, dark brown roof; light cream body, light brown trimming, dark brown roof; slate or bungalow brown body, pearl gray or white trimming, and black roof.

Solid white has not been suggested because it reflects light too much to be used as body color for public buildings. Another reason why the solid white body has not been suggested is that it shows weather effects so quickly.

The painter should paint and trim all outside houses and toilets in the same color scheme as is used in painting the school building on the outside. The name and number of the school district should be painted in a conspicuous place near the entrance, and the toilets should be indicated as "Boys" and "Girls" in large letters.

*Inside* painting of the schoolroom when properly applied according to some harmonious and artistic color scheme adds greatly to the ornamentation of the inside of the schoolhouse. Paint which dries with a flat dull finish without any trace of gloss and which is made from inert pigments ground in oil and varnish makes a soft velvety finish which is the delight of the eye because it is restful and gentle and has an undoubted hygienic value. It is hard drying, nonporous, and is repellant to the accumulation of dust and dirt so that it is easily kept clean and sanitary. It does not change, fade, or flake as does the colored whitewash and calcimines which are sometimes substituted for interior wall decoration. If plaster is used on the walls, it is necessary to let it remain unpainted for several months so that it may have sufficient time to cure properly.

It is now known that some colors have a depressing or elevating effect on individuals. Scientific investigations show that colors



near the red end of the spectrum seem to force activity, incite and induce greater effort, and consequently leave the individual more or less irritated and fatigued. White, when too strong, is dazzling, and fatiguing rather than soothing. Probably the most satisfactory color scheme to use in painting the inside of the building is to have the lower portion of the wall from 3½ feet to 4 feet (wainscot height) above the floor a light brown, mahogany, or walnut finish. The walls above them to the picture mold should be very light buff or light cream; and the ceiling should be light cream. This combination of colors produces an effect that is restful and cheerful, and at the same time does not absorb too much light.

*Wall paper* hides the dirt, and the paste breeds germs and vermin. In some States the use of wall paper in the schoolhouse is prohibited by law because it is conducive to fires.

*Floors* should be stained and waxed or otherwise treated so they may easily be kept clean and sanitary. The ordinary cheap grade of floor oils may contain an undue amount of paraffin and consequently might be conducive to schoolhouse fires, though the danger from this method of treating floors, we believe, has been greatly exaggerated.

### Plumbing Fixtures

Any rural school can have a barrel elevated on a platform to hold enough water to provide daily for the children to wash their hands. For rural schoolroom use it is probably better to install an ordinary enameled kitchen sink than it is a lavatory because it will accommodate more pupils at a time, and is certainly as easy to keep clean. If possible, the sink should be placed in the domestic science room or workroom.

The installation of other plumbing fixtures, such as drinking fountains and toilets will depend upon the availability of running water.

### Light Fixtures

With the rapid development of electric power lines throughout the country there are added opportunities for rural schools to have electric lights. There are several successful electric farm-lighting plants which are within reach of the average rural school. Whether natural gas, artificial gas, or electricity is to be used to furnish artificial lighting in the new building, adequate provision should be made from the beginning to have all pipes or wires properly concealed. If an auditorium stage is to be lighted, it should be done with lights from above and down the side with all footlights omitted as they are too harmful to the eyes, especially the eyes of school children. All electric wire should be inclosed in safe conduits. (See figs. 29 and 30.)



## Heating and Ventilation

In the planning of the new rural schoolhouse the opportunity for heating and ventilation must be carefully considered. Before entering on a discussion of the various methods employed, it will be well to consider briefly two questions: How much ventilation is required? At what temperature should the schoolroom be kept?

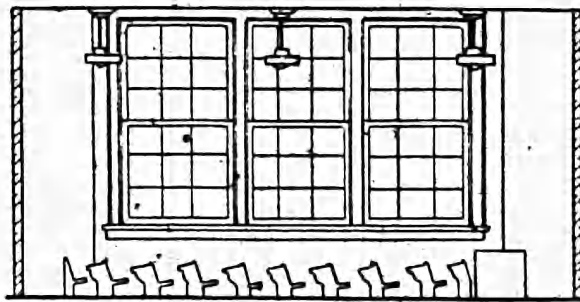
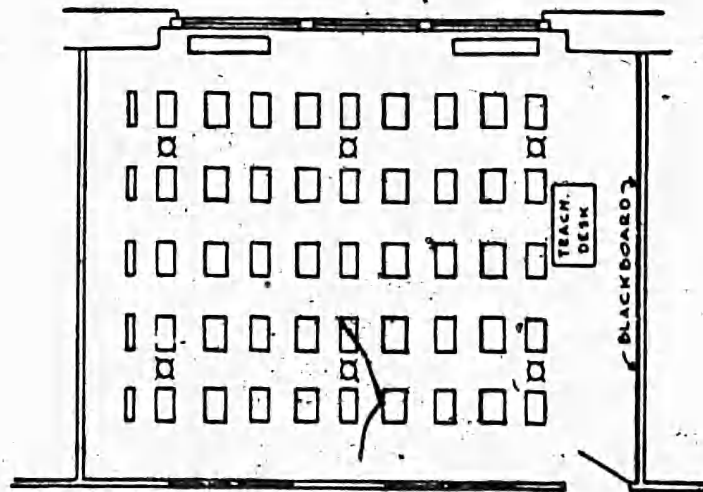


FIGURE 29.—Plan for artificial lighting for schoolroom

A comfortable, evenly heated room, with a complete but slow and even change of air several times each hour, increases the efficiency of the school. Better work is possible on the part of both teachers and pupils, and the danger to health is lessened. By reducing the number of colds, coughs, and sicknesses to the minimum, there is an



X INDICATES CEILING-OUTLET FOR ARTIFICIAL LIGHTING.

FIGURE 30.—Floor plan for artificial lighting for schoolroom

improvement in attendance, in discipline, and in scholarship, and a reduction in the average cost of daily attendance.

In answer to the second question, very thorough investigations of this subject, especially those conducted by the New York Commission on Ventilation, have established the fact that a temperature of from 66° F. to 68° F. (with a relative humidity around 50 per cent)

is the best for school work. Certainly 70° F. is the maximum allowable.

These figures may all be misleading, however, for the construction of the schoolroom and the methods of heat distribution enter vitally into the question. For example, one schoolroom with damp walls and poorly constructed floors may be quite uncomfortable at 68° F. One frequent complaint from teachers arises from the fact that there is too much disparity between the temperature at the breathing line for the children while seated and that for the teacher while standing. There is real difficulty here, and it can be remedied only by double floors well deadened and protected from drafts and more effective methods of evenly distributing the heat. Naturally, heated air, moving by the force of gravity, will seek the upper part of the room, and unless it finds an exit there will remain until it becomes cooler than the ascending currents, when it will slowly descend:

The simplest way of maintaining a supply of fresh air is by opening the windows; but unilateral lighting in schoolrooms too often has resulted in unilateral ventilation. Breeze windows or openings on the wall opposite the classroom windows are helpful in offering opportunity to produce a natural circulation of air. To prevent drafts upon children near the windows air deflectors should be placed at the windows. Plans must be made in the beginning for sufficient natural ventilation in rural schoolhouses because mechanical ventilation is impractical at least for the small schools.

Attics should be well ventilated to carry out the superheated air between the ceiling and the roof during very warm weather. This may be done with louvre ventilators in the gables or roof ventilators on the ridge of the roof. All ventilators in the roof should be properly screened to keep out birds, insects, and rain or snow. Auxiliary rooms must be heated and ventilated and cloakrooms should be heated and ventilated sufficiently to dry out wraps and purify the air during the day. If the bottoms of cloakroom doors be set 6 inches above the floor, with an opening near the top, there would be sufficient circulation of air so that children would not be required to wear wet wraps at the end of a school day.

The best way to ventilate with a hot-air furnace, or jacketed stove, during cold weather is to bring the outside air in through the heater, and remove the foul air from the floor by openings through exhaust pipes warmed by the heat of the chimney. The air from the outside, which is brought through the heater, is warmed and lies near the top of the room. The air then becoming colder sinks toward the floor where it passes near the breathing line and may easily be removed by ventilating flues. Thus a current of pure warm air is passed in, and a current of contaminated air passed out. Fresh-



air intakes must always be above the floor level. This system of ventilation may be produced by a jacketed stove in the classroom or a hot-air furnace in the basement, but with either means of heating and ventilating the windows should be opened occasionally and the air flushed out. Five minutes with open windows is sufficient.

A jacketed stove, as the name indicates, is a stove surrounded by a jacket of metal between which jacket and the stove is an air space connected directly by means of two ducts with the outside fresh air. By building a foul-air outlet in connection with the smoke flue, the air is circulated in the room ventilated as above described.

The jacket or shield of the stove should be made of painted steel of not less than 24 gage, and should be lined with heavy corrugated sheet tin, or bright sheet iron, and made as nearly radiation proof as possible with the use of heavy layers of asbestos between this lining and the jacket. The door in the jacket must be large enough to permit the handling of fuel and ashes to and from the stove.

Hot-air furnaces are so well known that any extended description is not necessary, except to mention that they should not be confused with pipeless furnaces that do not provide fresh air intake. The furnace in the basement has the great advantage of keeping fuel and other débris out of the classroom and confining the fire hazard to a central location which may be made fireproof. The distribution of the hot-air ducts in these makes it easy to heat the auxiliary rooms as well as the main classrooms. If a furnace is to be used for heating, it is essential to install one sufficiently large to heat all the air needed without the necessity of overheating the fire box and thus introducing uneven temperature.

For both the jacketed stove and hot-air furnace it should be remembered that when cold air comes in contact with overheated radiating surfaces, it expands and becomes dry. Such air is in effect desert air, and when introduced into a schoolroom will rapidly absorb moisture from the skin, and especially from the lining membranes of the eyes and air passages.

All hot-air furnaces should be supplied with some means of moistening the air before it is introduced into the schoolroom. Especially is this necessary in cold climates where the amount of moisture mixed with the air is necessarily small, and where its temperature must be raised 40 to 70° F. The expansion of the air thus taking place will further reduce the percentage of saturation very greatly, and serious and annoying dryness will result; and then we have a desert atmosphere in the schoolroom. The problem of heating is intimately connected with the problem of securing satisfactory humidity in the air.



Obviously, the supply of fresh air to the radiating surface of a hot-air furnace or, for that matter, to any heating-surface used should enter through a clean passageway, and the fresh-air chamber near the furnaces should be carefully constructed of glazed brick or lined with smooth, hard cement, in order that as little friction as possible will result as the air passes to the heating surfaces. The floors of these air passages should be cemented and kept scrupulously clean, for any dirt or dust that enters them will quickly find its way into the schoolrooms.

If the opening for the entrance of fresh air is placed 6 or 8 feet from the ground, there is much less likelihood that dust from the playground, the roadway, or street, or contaminated ground air will be drawn into the schoolrooms. This opening should be securely screened so as to keep out the larger particles floating in the air during high winds, and to prevent anything from being thrown into it, such as apple cores, orange peels, or anything else that would vitiate the air or litter the floor. These passages must be carefully closed below and as far as possible made air-tight, so that foul air may not be drawn into them from the basement. The location of the opening to receive the in-going fresh air is a matter of much importance on account of the influence of winds, the danger from dust, and the need of drawing the air from the purest source possible. It has been found that if this air can be drawn from the south or warm side of a building, there will be a decided saving in fuel. Carpenter says:

It may be demonstrated by a properly protected thermometer that the average day temperature of air is higher on the south than on the north side of a building. The difference often reaches 10° F. An average of 5° F. would make it highly advantageous to take the air from the south, rather than from the north side of a building. If an average rise of 35° F. is needed in the air temperature in ventilating work, then-one-seventh of the heat required for that rise could be gained by choosing a south as against a north location for the inlet.<sup>1</sup>

The fresh air must be brought into the bottom of the heating chamber so that even on windy days there will be no possibility for reverse currents, and that at all times there will be as little hindrance to the easy movement of the air as possible.

All things considered, especially when an ample radiating surface is installed, when the ducts leading to the rooms are mathematically proportioned and not too long, and when proper means are afforded for humidifying the air, hot-air furnaces are fairly satisfactory in the milder climates of our country, and if carefully kept in repair, there is no valid argument totally condemning them. The main

<sup>1</sup> Heating and Ventilating Buildings, by Dr. Rollo C. Carpenter, pp. 451-452.



troubles come through overheating, lack of humidification, and unbalanced system of ducts leading to the various rooms, and neglect in upkeep.

It is unnecessary to state or discuss in this place the various rules used for determining the exact amount of radiating surface needed to meet easily and safely the demands to be made upon any system of heating.

These are matters for the engineer to determine, and a school board will act wisely when it seeks and pays for such advice. This caution, however, ought to be given: Some expert engineers—indeed, many of them—know little about the demands of schools, and it is always better to select for consultation one who has made a careful study of the peculiar needs of schoolroom heating, and especially one who has no connection with manufacturers of heating systems. One duty, and a very important duty indeed, which such an expert adviser ought to be called on to perform, is to test the plant when completed and be sure it fulfills the contract signed. In large consolidated school buildings a low-pressure steam heating system should be used, for this system can be more accurately adjusted and more safely used.

## CHAPTER V

### Remodeling Rural Schoolhouses

If the reader will picture to himself an old 1-room building with two or three small windows on each side, a door in the gable end, a high-pitched roof, surmounted by some make-believe belfry or tower, and a small chimney emerging at the comb of the roof near the center of the building, he will have before him the exterior out-



FIGURE 31.—Typical one-teacher rural school

line of the prevailing type of the old rural schoolhouse we are now trying to eliminate.

An examination of the building reveals that it is made of wood and rests on brick pillars, with more or less open space between the floor and the ground so that the wind sweeps through without hindrance. The floors are single, made of rough boards, and the cracks are more or less stopped up with dirt. The building is generally unpainted or perhaps was once painted. Many of the boards on the side are disconnected or missing.



Within the building the observer will probably find a box stove in the center, rusty and dirty, probably hoisted on halves of bricks, or if a little more caution has been exercised, standing in a box filled with sand, into which the legs of the stove extend. A rusty pipe runs straight up through the ceiling into the central flue. A teacher's desk probably surmounts a useless and troublesome platform. There

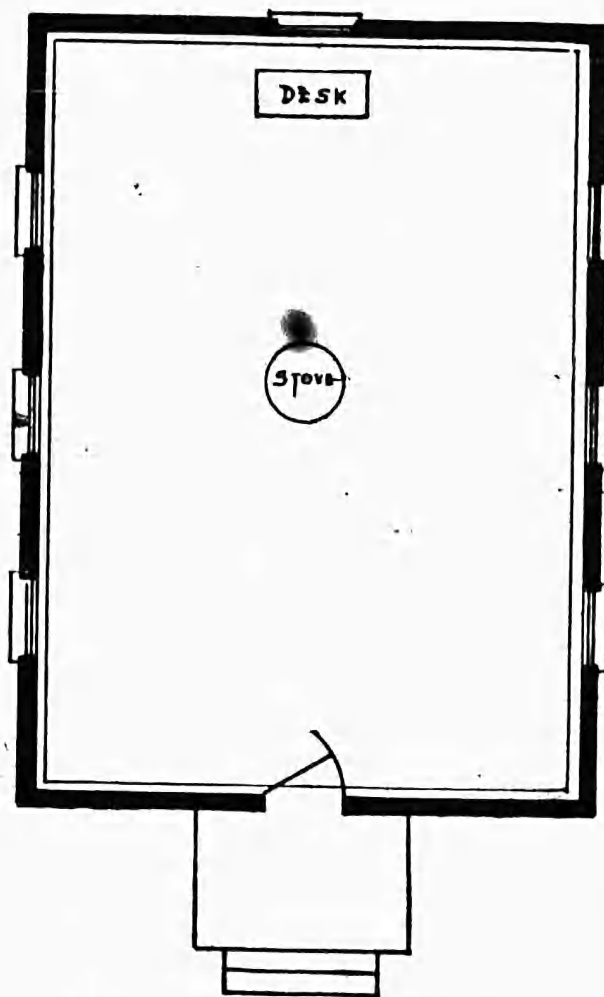


FIGURE 32.—Floor plan of typical one-teacher rural school

is no cloakroom nor closets nor built-in features to assist in keeping the room tidy and homelike in appearance.

Suppose this building is in a fair state of repair so that it is too good to give up and too bad to be used as a schoolroom. What can be done to make it more comfortable, more sanitary, and more useful, and at the same time more satisfying in appearance? This is a practical question and should be dealt with in a practical manner. A careful study should be made of the building and the school needs before reconstructing or remodeling is attempted. Many of the buildings are too old to justify the expenditure of much money.

Sometimes the site is inadequate, and it is better to sell the building outright or tear it down and use the salvage in the construction of the new building on a new site or in the construction of a teacherage, playhouse, or industrial building.

One of the first things to consider in the remodeling of a school building is the arrangement of the windows. The windows should all be moved to the left side of the children when seated. Windows which are too low may be raised in the wall so that the light would come from above the eyes of the children when seated, and window boards set under them so as to deflect the entering air toward the ceiling. A study of the school population of the district might reveal that the room is needlessly large for the number of pupils to be accommodated. If such is the case, partitions may be added to allow for cloakrooms without much expense.

Of course, a regular jacketed stove should replace the box stove, as soon as possible, and should be connected with a properly built smoke flue and ventilation chimney, properly set in end wall.

Old buildings are not the only ones which need remodeling: Many new buildings might be increased in usefulness and appearance by a few slight changes.

Old buildings have frequently been enhanced in appearance and made more comfortable by veneering the walls outside with bricks and plastering and painting the inside walls and adding a new floor. Soap and water freely applied to woodwork often gives surprising results, and paint of the right colors has a magic about it to transform the hideous and ugly into the acceptable and beautiful.

The direction which the building faces and the interior dimensions will be the factors in determining whether it is better to remodel by reducing or increasing length or width.

### Reducing Length

A remodeled 1-teacher rural school building with the windows moved to the left and transom windows and an emergency door placed in the right and cloakrooms added on each side of the entrance at the front. Within these cloakrooms may be placed a lunch cupboard and a supply case for the teacher. Within the new partition may be built in a first-aid cabinet and possibly a bookcase. (See fig. 33.)

### Reducing Width

A wide schoolroom may be reduced in width by adding cloakrooms along the inside. The old windows on the cloakroom side remain, and new windows are placed on the side in the classroom. Sometimes old buildings are too wide for unilateral lighting, and this plan is the solution. (See fig. 34.)



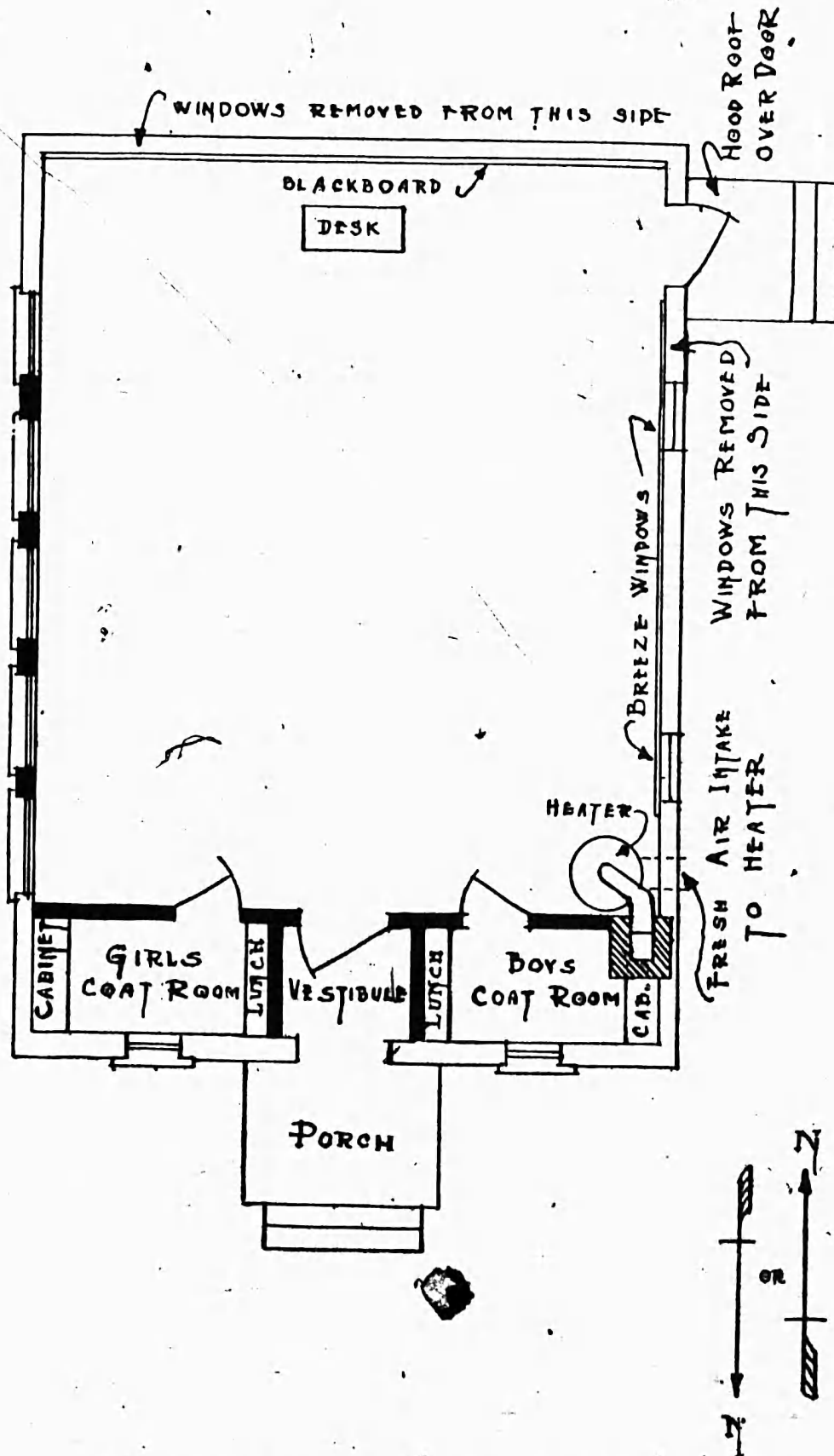


FIGURE 33.—Floor plan of remodeled one-teacher school building

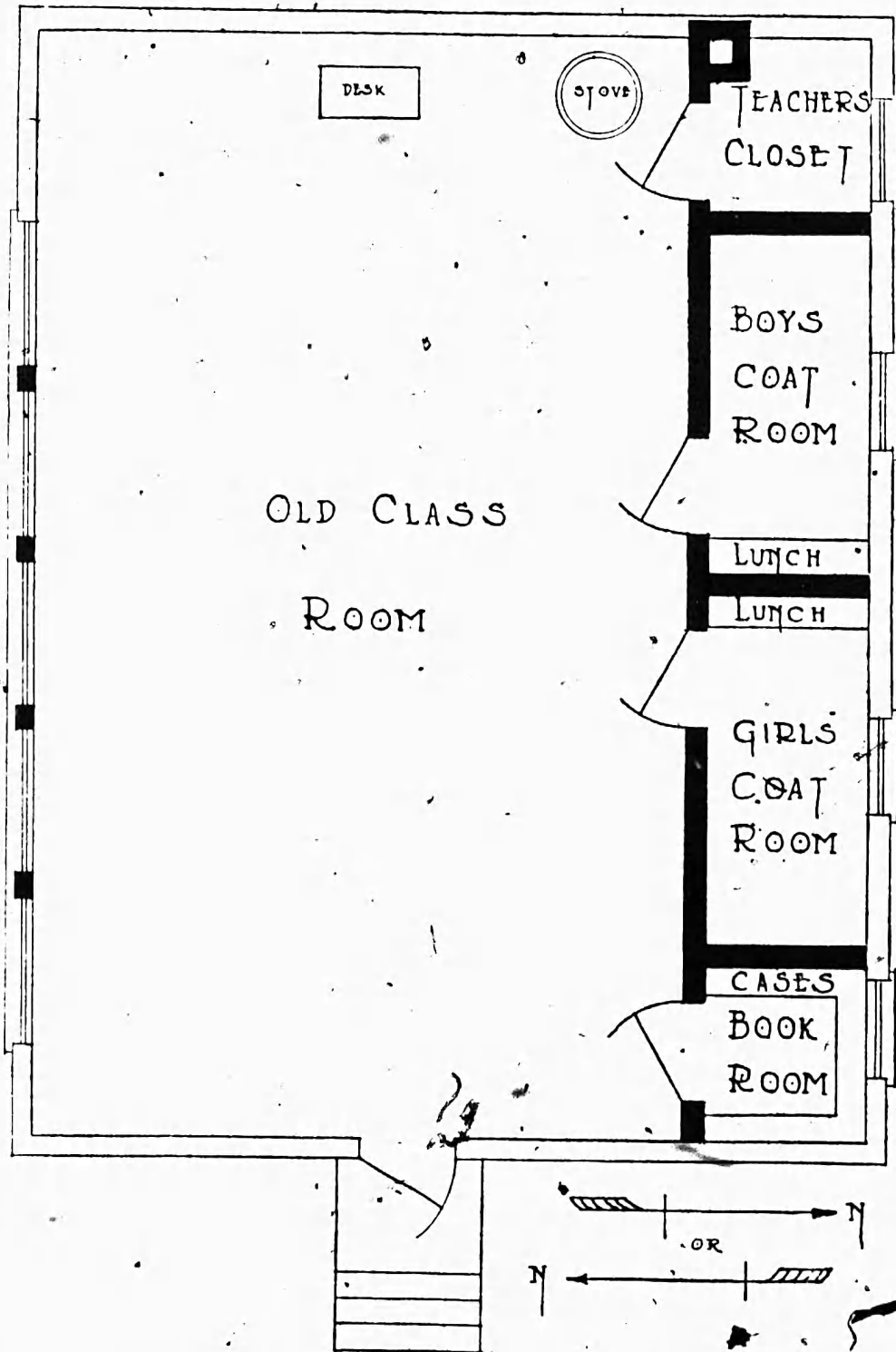


FIGURE 34.—Floor plan of a school-room reduced in width



### Increasing Length

An addition to the front of an old building may be made to provide cloakrooms. The addition could be made in the same manner as shown in Figure 35. (See pl. 4A.)

### Increasing Width

Increasing the width as in this plan is a good method of changing the front of the old building without moving the building. The doors take the place of the three windows on the side of the old building. Inasmuch as the cloakroom walls may be considerably lower than the classroom walls, this is probably the most economical way of making additions to the present building. The addition, building to make the architectural appearance desirable. (See fig. 36.)

### Reducing Two Stories to One Story

Grandview, District 34, Cherokee County, Okla., had an old 2-story building, with one classroom on each floor entirely too large for the number of pupils in the district. It was 10 feet from the floor to the ceiling in the first story and 8 feet from the floor to the ceiling in the second story.

The wall was cut down so there would be one story with 12 feet from floor to ceiling. The building was made rectangular the full length to include the vestibule. The stage was added on the side.

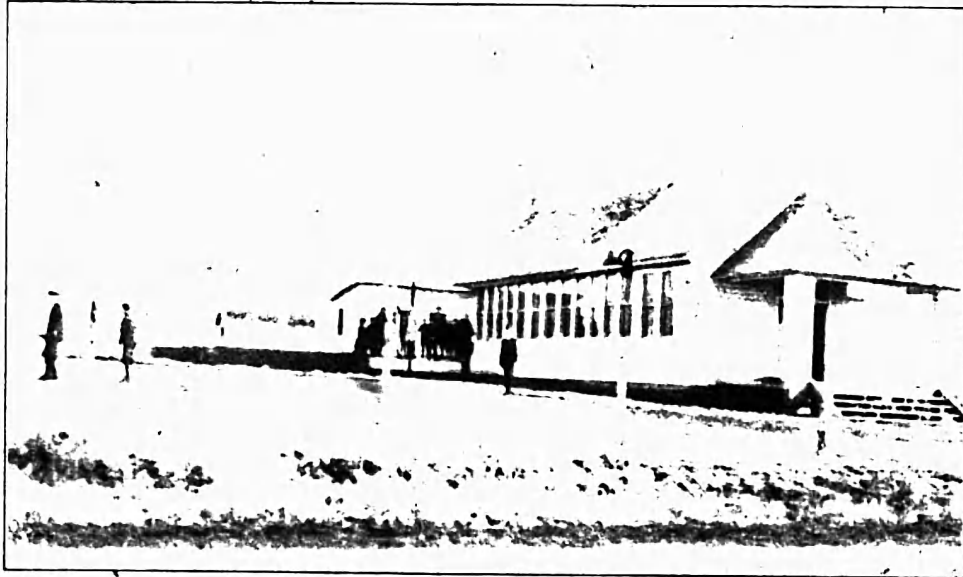
The remodeling of the building, which cost the school district only \$1,200, produced a primary room with a seating capacity of 40, separate cloakrooms and unilateral lighting from the east; an upper grade room with a seating capacity of 35, cloakroom and adjacent domestic science room with unilateral lighting from the west; and an auditorium which could be increased in size by the use of a folding partition between it and the upper grade room. (See pls. 5 and 6.)

### Adding Workrooms

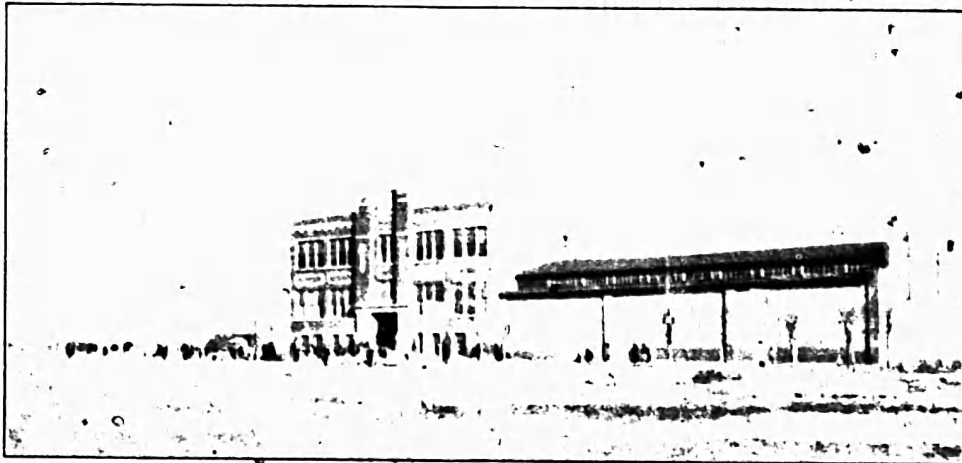
A suggestion of a sample addition of a workroom, separate cloakrooms for boys and girls, and indoor toilets. The workroom would be connected with the main classroom with a clear glass partition, such as is described in the discussion of workrooms in Chapter II. There are unlimited possibilities in making additions to old buildings to include efficient workrooms and libraries. (See figs. 37 and 38.)

### One-Room Addition

A 1-room addition made to the end of an old building. Observe the points of the compass. (See fig. 39.)



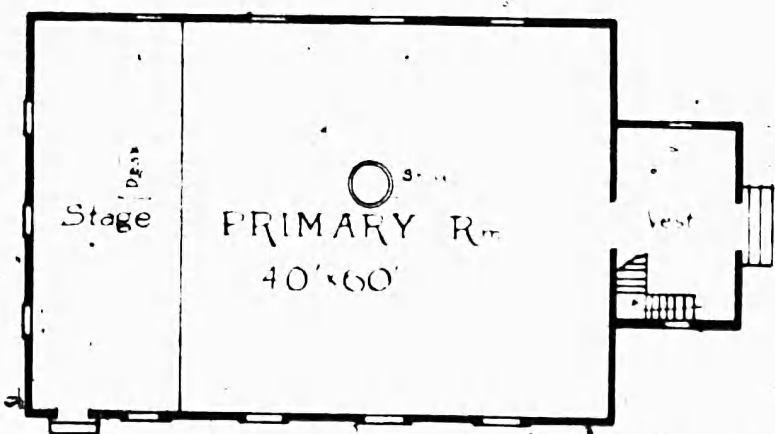
I. OLD 1-ROOM BUILDING LENGTHENED 12 FEET TO ALLOW ADDITIONAL SPACE



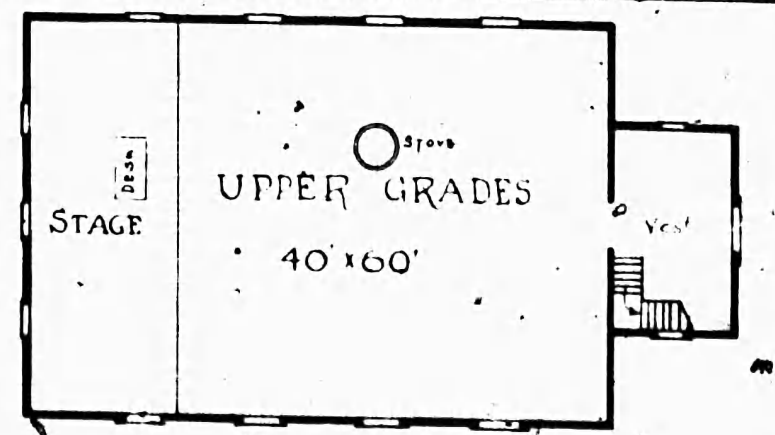
II. BETTER FOR CHILDREN TO PLAY OUT OF DOORS THAN IN AN INCLOSED GYMNASIUM



GRANDVIEW DIST. No. 34  
CHEROKEE COUNTY  
(BEFORE)



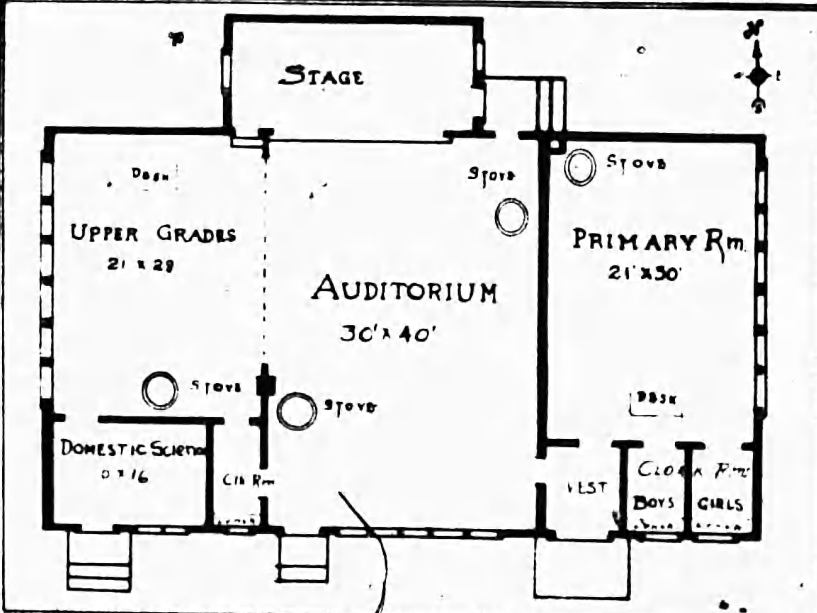
FIRST FLOOR PLAN



SECOND FLOOR

THIS 2-STORY SCHOOL BUILDING REDUCED TO ONE STORY

GRANDVIEW Dist. No. 34  
CHEROKEE COUNTY  
(AFTER)



USE OF FOLDING PARTITION INCREASES USE OF SCHOOL BUILDING.



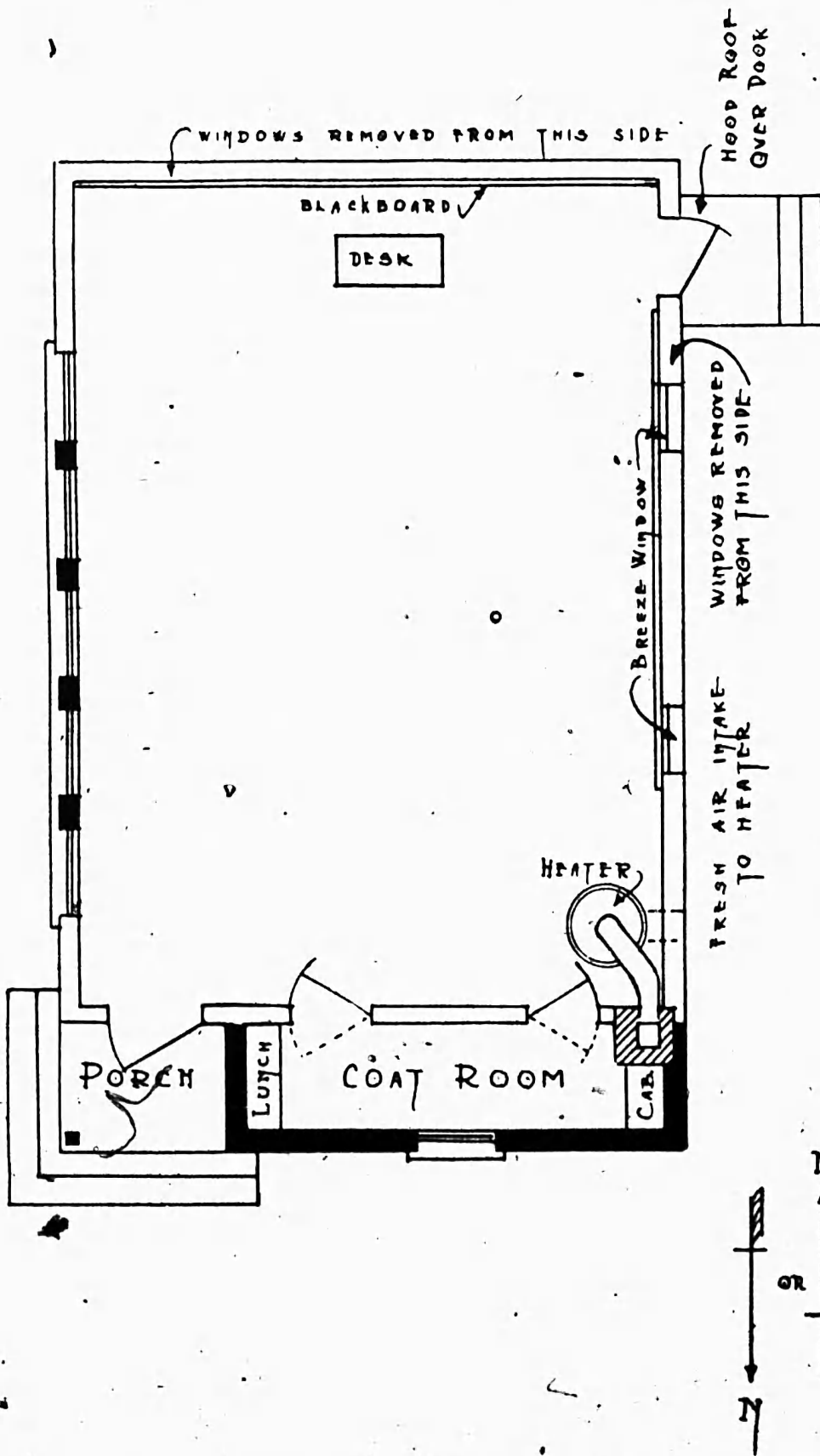


FIGURE 35.—Floor plan showing addition to front of an old school building

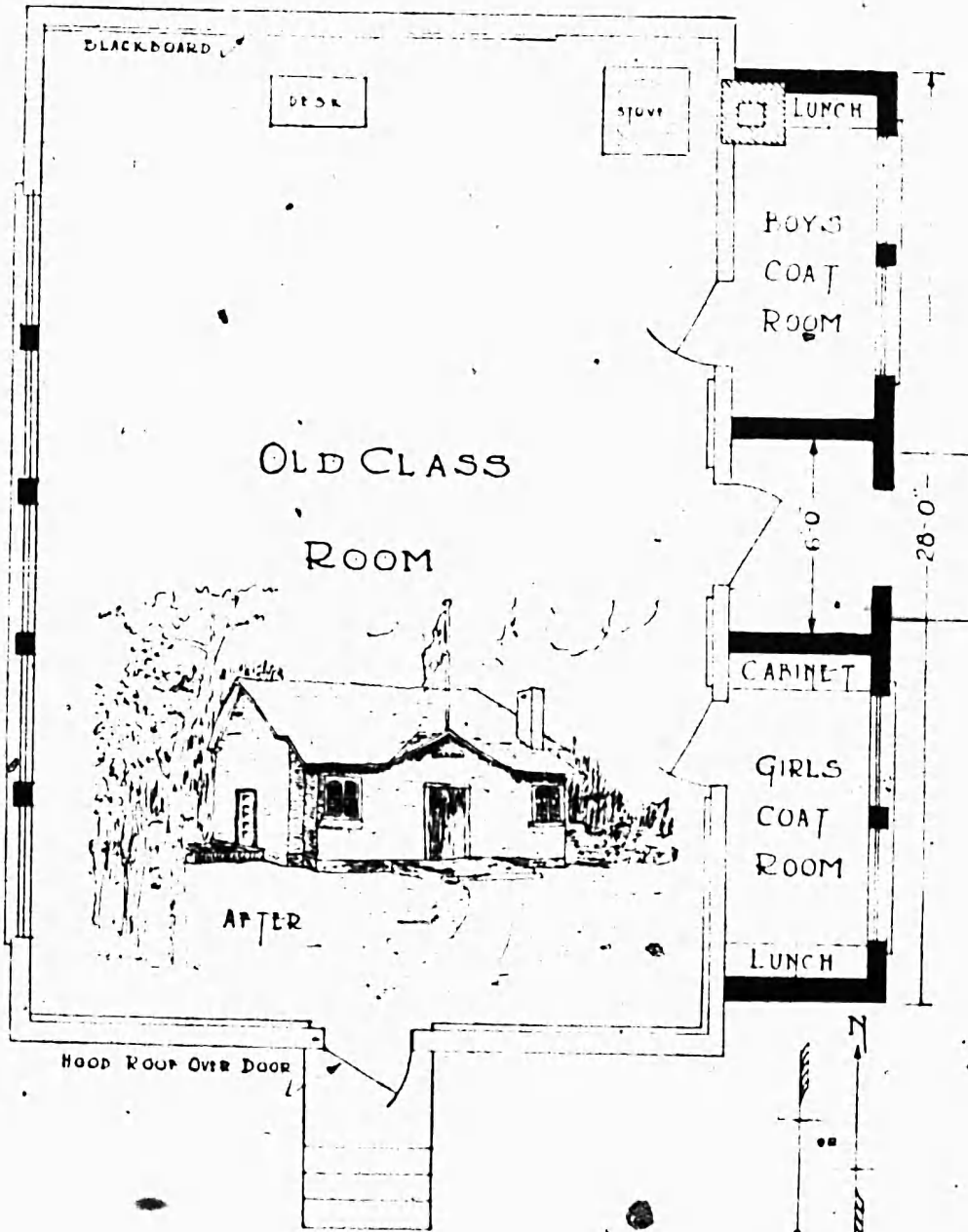


FIGURE 36. Front of school building changed without moving the building



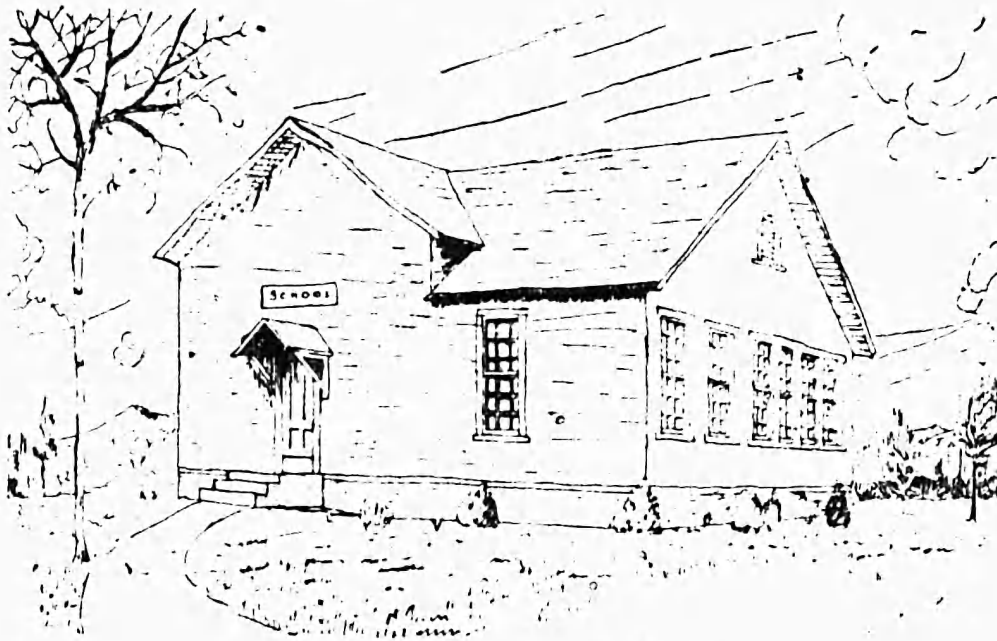


FIGURE 37.—Suggestions for additions

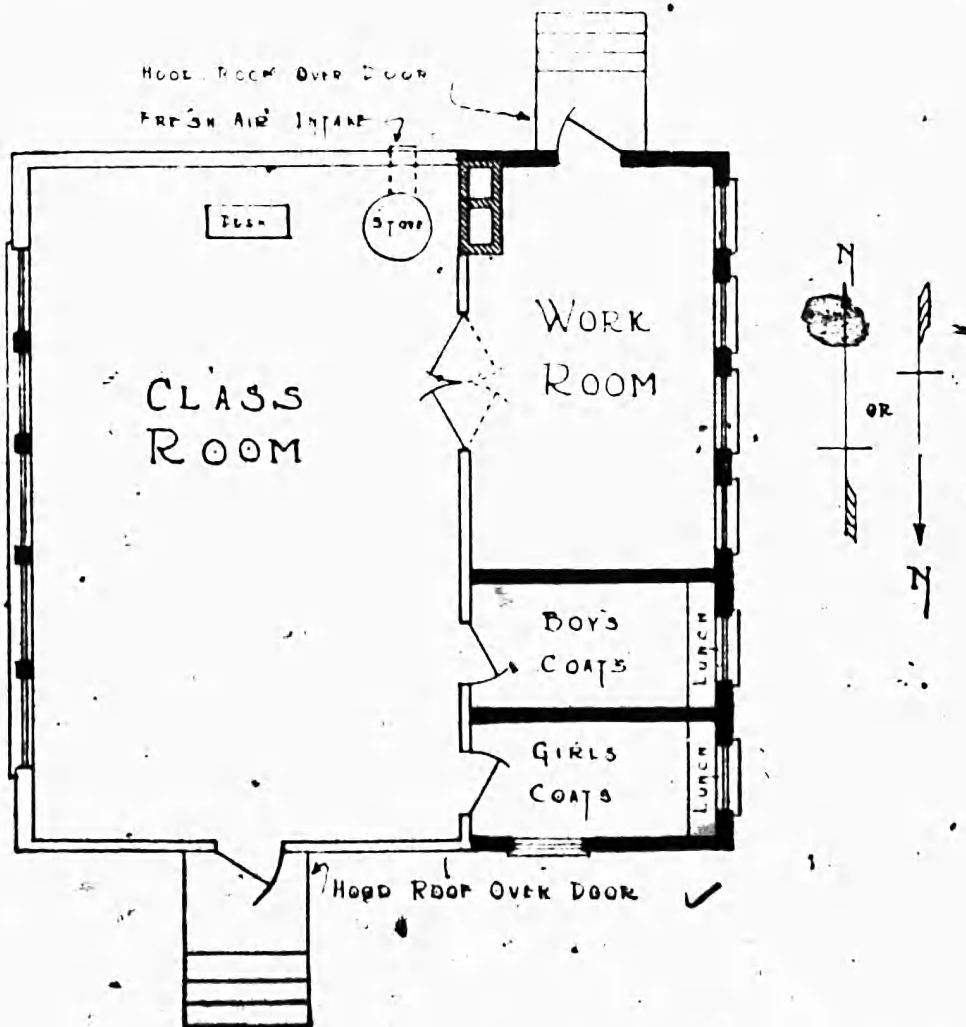


FIGURE 38.—Floor plans of suggestions for additions

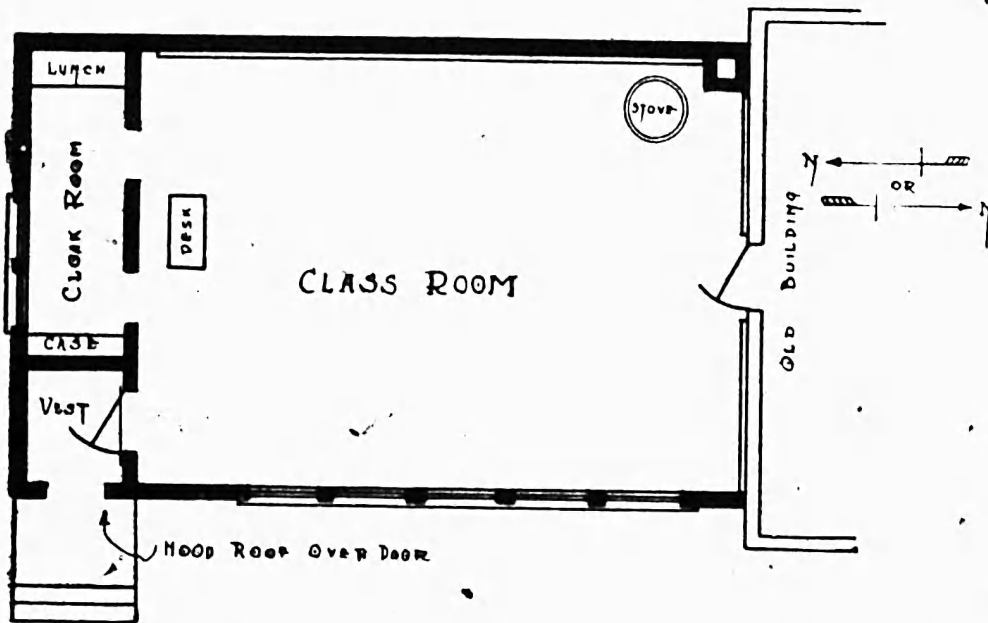


FIGURE 39.—Floor plan for one-room addition made at the end of an old building

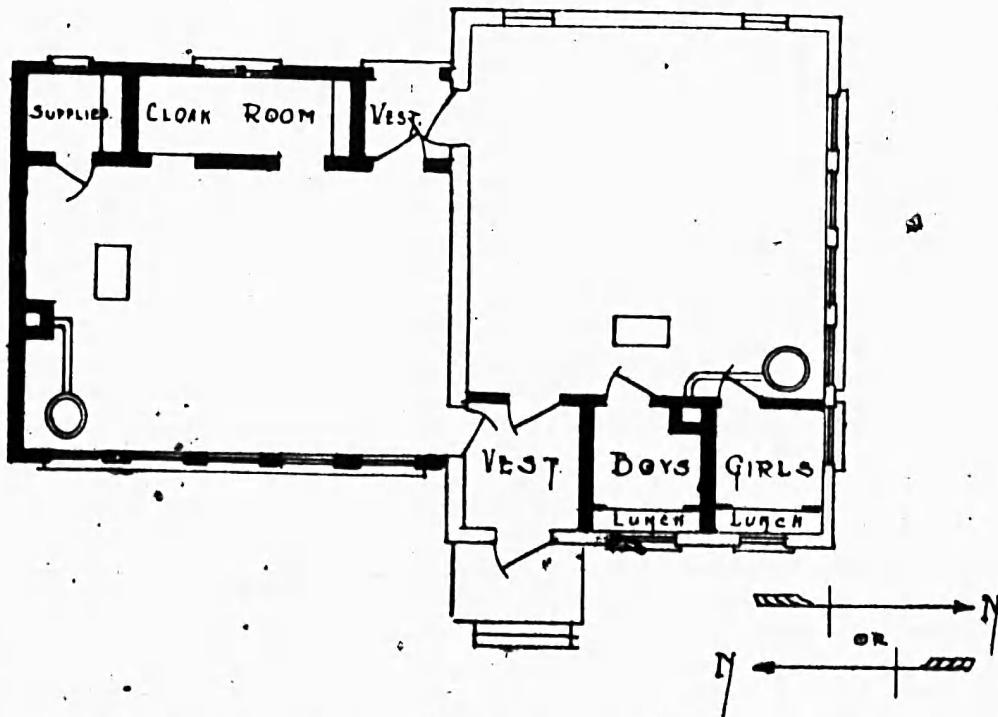


FIGURE 40.—Floor plan of two old rooms run lengthwise north and south



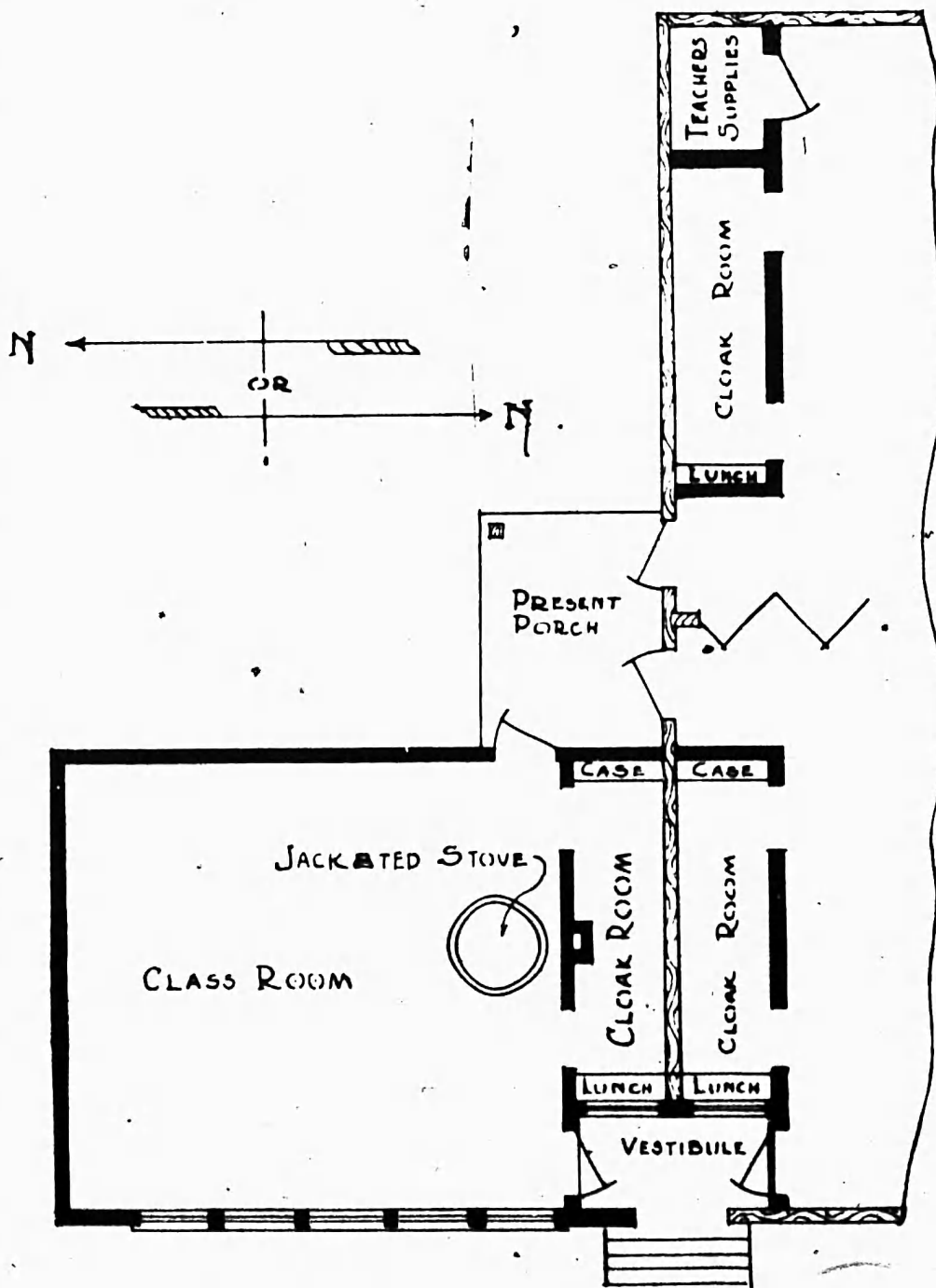


FIGURE 41.—Floor plan of two old rooms run lengthwise east and west

If the old 1-room building faces the east or west, and it is not considered wise to move it from its foundation, a 1-room addition should be added to the side to form an L. In both cases, the cloak-rooms and entrances with protected exterior doors will be conveniently arranged.

### One-Room Addition to Two Rooms

This plan may be used if the two old rooms run lengthwise north and south. If they run lengthwise east and west, the addition might be made as Figure 39. (See fig. 41.)

### Temporary Additions

Sometimes rural school districts find it necessary to provide school-housing facilities for just a few months or possibly one school year until they can get through a financial difficulty or until they can move into new quarters in a consolidated school. Even if this is the case, there is no excuse for poor lighting.

