# MISSISSIPPI
# STATE GEOLOGICAL SURVEY

WILLIAM CLIFFORD MORSE, PH. D.
Director

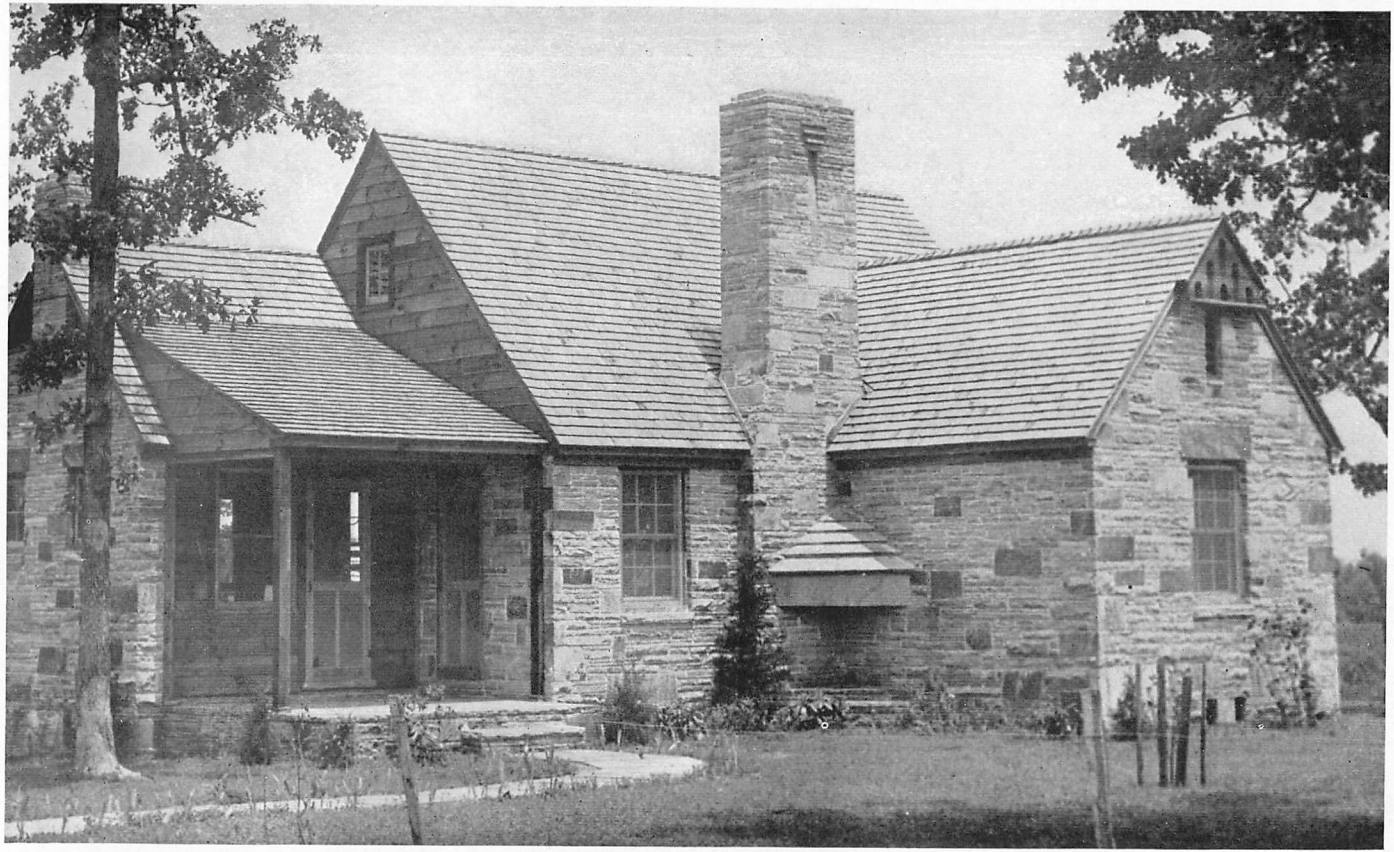



BULLETIN 26

## THE HIGHLAND CHURCH SANDSTONE AS A BUILDING STONE

By
WILLIAM CLIFFORD MORSE, PH. D.

1935



Frontispiece.—A stone house, beautiful and everlasting, constructed by the Subsistence Homesteads Division of the Department of the Interior of local timber and native Crab Orchard stone at Cumberland Homesteads, Crossville, Tennessee, for approximately two thousand dollars ($2,000).--Courtesy of Mr. C. E. Pynchon, General Manager of the Federal Subsistence Homesteads Corporation.

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DR. ALFRED HUME.....CHANCELLOR OF THE UNIVERSITY OF MISSISSIPPI

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## LETTER OF TRANSMITTAL

Office of the Mississippi Geological Survey
University, Mississippi, December 20, 1934

Dr. Alfred Hume, Chancellor
University, Mississippi

Dear Chancellor Hume:

I herewith present the manuscript of a report on the Highland Church sandstone as a building stone to be published, with your approval, as Bulletin 26 by the Mississippi Geological Survey. Although it is the product of my hands after only three months of the directorship, it is, nevertheless, based on my report on the Paleozoic rocks (Bulletin 23), which, in turn, was the fruits of a number of seasons of field work, beginning in 1919. The present Federal activity through the Subsistence Homesteads Division and the Tennessee Valley Authority has made it highly desirable to present this fuller report on this important building stone.

Respectfully submitted,

WILLIAM CLIFFORD MORSE, Director.

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## LIST OF ILLUSTRATIONS—FIGURES

# THE HIGHLAND CHURCH SANDSTONE AS A BUILDING STONE

By
WILLIAM CLIFFORD MORSE, PH. D.

## INTRODUCTION

For more than fifteen years, the writer, as an instructor in geology, has emphasized the need of more durable material in the construction of homes and other buildings in Mississippi, and he has directed attention to the fact that many, perhaps most, of the houses erected lose, through decay, nearly half of their value in ten years and practically all of it in twenty years. To justify the type of construction now prevalent, the plea is made that the people are so poor that they cannot afford to erect better homes. The fact is, however, that this common type of building is the most expensive possible, for surely no type of construction could cost more than the type which leaves, at the end of twenty years, practically nothing to represent the money expended for material and labor. Contrast with it brick and stone buildings, which last for hundreds of years, and which can be handed down from generation to generation, from parents to children, and to children's children, and still be disposed of for much more than their original cost.

Regardless of whose efforts were most influential in bringing about the change, he has, nevertheless, watched, with gratification, the gradual improvement in the types of many of the newer homes, especially those constructed of brick, and he has observed, with equal gratification, the great improvement in the quality of brick manufactured within the state. Whereas some years ago virtually only one plant was producing a worth while product, now a number of plants are producing a more nearly permanent product. In his work on the Paleozoic rocks, he briefly described the Mississippian (Highland Church member of the Forest Grove formation) sandstone as the one extensive durable building stone of the state. And more recently he assigned one of the graduate students (Henry Percy Neal) the problem, "The use of native stone in the construction of small houses", as a thesis for the master's degree.

And now comes the National Government in its most useful endeavor, the Tennessee Valley Authority, and in its other endeavors, with its program of erecting better small houses at Norris Dam and at

Cumberland Homesteads at Crossville, both in Tennessee, and at other localities in other states. Perhaps the most marvelous of such houses is the four-room stone house (Frontispiece) constructed at Crossville of Crab Orchard stone at a cost of two thousand dollars ($2,000). In partly explaining this low cost the Government hastens to state that the stone and the timber were obtained on the spot, and that the homesteader himself contributed, for part cash and part credit, some of his labor in quarrying the stone, but is not this as it should be? In fact, why should not many home builders produce much of the rough stone needed in the construction of their stone houses--produce it at a time when other duties were not pressing?

To aid the citizens of Mississippi, the Federal Government, and especially the Tennessee Valley Authority and the Subsistence Homesteads Division in their better homes programme, the Mississippi Geological Survey has prepared this short Bulletin on the Highland Church sandstone as a building stone, based largely on the author's study in 1919, 1920, 1921, and 1926 and publication in 1930 of the Paleozoic rocks (Mississippi State Geological Survey, Bulletin 23, 212 pp.) in Mississippi. As stated before, the fitness of this sandstone for building purposes was brought out in that bulletin, but the present Federal activity warrants a more comprehensive discussion of the subject.

## THE HIGHLAND CHURCH SANDSTONE

### GEOLOGIC POSITION

The Highland Church sandstone member of the Forest Grove formation surmounts practically the whole of the Paleozoic rocks in Mississippi. Its position is indicated in the following classification and in the generalized section of Plate 1, both of which will help to make clear the remainder of the discussion.

### CLASSIFICATION

- MISSISSIPPIAN SYSTEM:
  - Chester series
    - Forest Grove formation
      - Highland Church sandstone (member)
      - Shale and sandstone
    - Southward Bridge formation
      - Limestone, upper
      - Shale and sandstone
      - Limestone, lower
      - Shale
    - Southward Spring sandstone
    - Southward Pond formation
      - Pond limestone "C"
      - Shale
      - Pond limestone "B"
      - Shale
      - Pond limestone "A"
      - Shale
    - Allsboro sandstone
    - Alsobrook formation
      - Cripple Deer sandstone (or a shale member)
      - Hargett sandstone (or a shale member)
      - Limestone
  - Lower (Iowa) series
    - Iuka terrane (chert)
    - Carmack limestone
- DEVONIAN SYSTEM:
  - Upper series
    - Whetstone Branch shale
  - Oriskanian series
    - Island Hill formation
  - Helderbergian series
    - New Scotland limestone

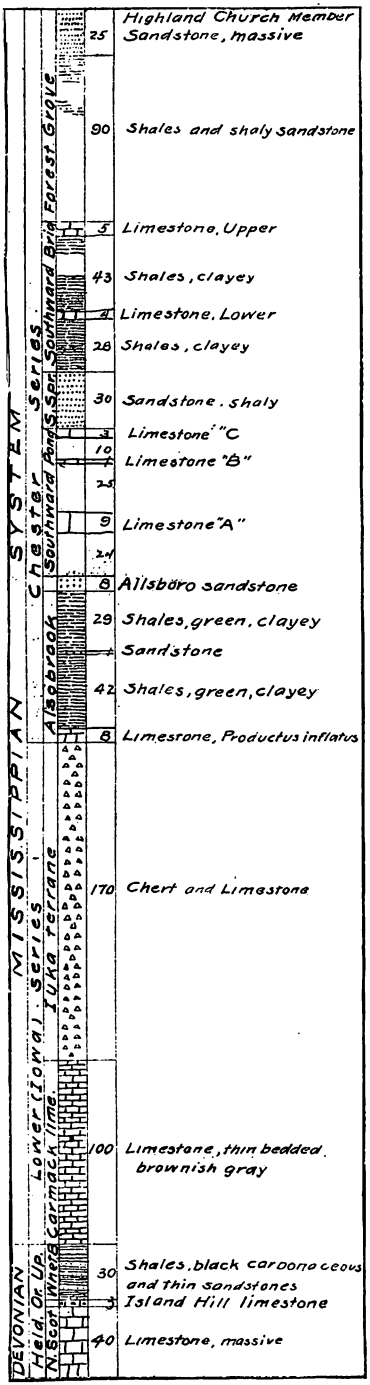


Plate 1.—Generalized section of Paleozoic rocks in Mississippi.

### DISTRIBUTION AND THICKNESS

With the possible exception of about 20 feet of partly exposed overlying beds, the Highland Church sandstone surmounts the Paleozoic column in Mississippi. Accordingly it is the cap or surface rock of the Paleozoic group along Bear Creek and tributaries and along Mackeys Creek and tributaries in the southern third of Tishomingo County (Plate 2). For long distances it forms the top vertical cliffs of these two valleys and their tributaries (Figures 1 and 2 and Plates 3 and 4).

As such cliffs, it extends along Bear Creek from the type locality of the formation, the Forest Grove School (Sec. 36, T. 9 S., R. 11 E.) near old Mingo Village and Southward Bridge and not far from Southward (Cypress) Pond, throughout the great entrenched meander bends of the valley to near the old bridge at Dennis. Along much of this tortuous valley, it is 20, 25, and even 29 feet in thickness (Bulletin 23, pp. 150-170), although it is only 1.3 to 4.0 feet in thickness at a point one mile below old Dennis Bridge. It is especially well developed along the west side of Bear Creek valley, not far (1.5 to 2.5 miles) east of the Illinois Central Railroad tracks between Tishomingo, Neil, and Dennis (Plate 2).

On Cedar Creek, or Little Bear of the Alabama reports, an eastern tributary of Bear Creek, the Highland Church sandstone is exposed along the valley wall as far south and east as the Alabama line (Plate 2). These exposures are, however, not nearly so accessible as those along Bear Creek valley proper.

At the very tips of its headwater tributaries and along Mackeys Creek itself, all part of the Tombigbee River system, the Highland Church sandstone is exposed near Tishomingo, Neil, and Dennis on the Illinois Central Railroad (Plate 2) and especially at the Booneville—Dennis Highway Crossing of Mackeys Creek at Bay Springs (Figure 2 and Plate 4). At many of these places perhaps only a part of the Highland Church sandstone is exposed, but at Bay Springs the whole of the cliff-forming sandstone outcrops in all its beauty and in a maximum known thickness of 30.5 feet.

### STRUCTURE

Throughout much of its area the Highland Church sandstone is a massive bed of stone 15, 20, 25, and 30 feet in thickness without bedding planes. At some localities, oxidation of the small iron content suggests bedding planes, or even cross bedding, but none of these is sufficiently developed to cause the stratum naturally to break up into distinct

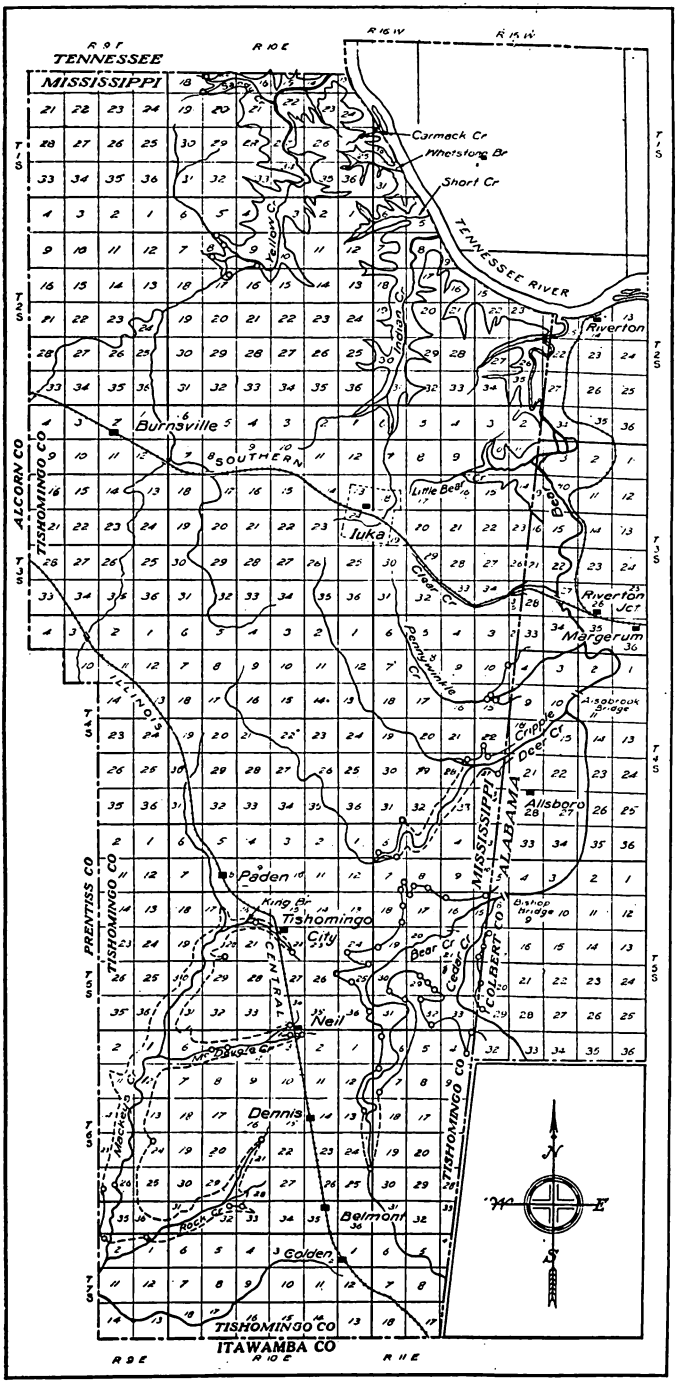


Plate 2.—Distribution of the Paleozoic rocks in Mississippi, which are confined to the stream courses in Tishomingo County. The Highland Church sandstone member outcrops only in the southern third of the county.

Figure 1.—Highland Church sandstone forming the top vertical cliff on the east side of Bear Creek valley, Tishomingo County. Only durable sandstones will thus stand in vertical cliffs through the centuries.

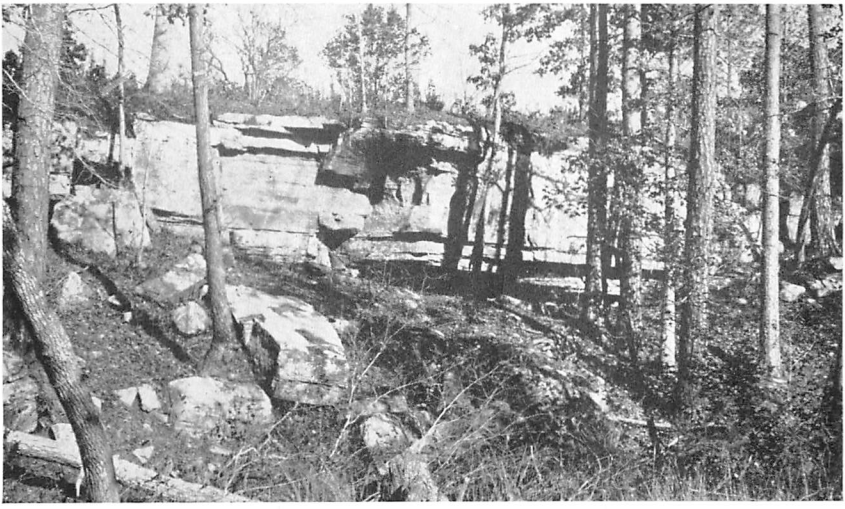

Figure 2.—Highland Church sandstone, a vertical cliff-forming stone, along the west branch of Mackeys Creek at Bay Springs, Tishomingo County. The durability of the stone is attested by these cliffs that have resisted the effects of weathering through the ages.

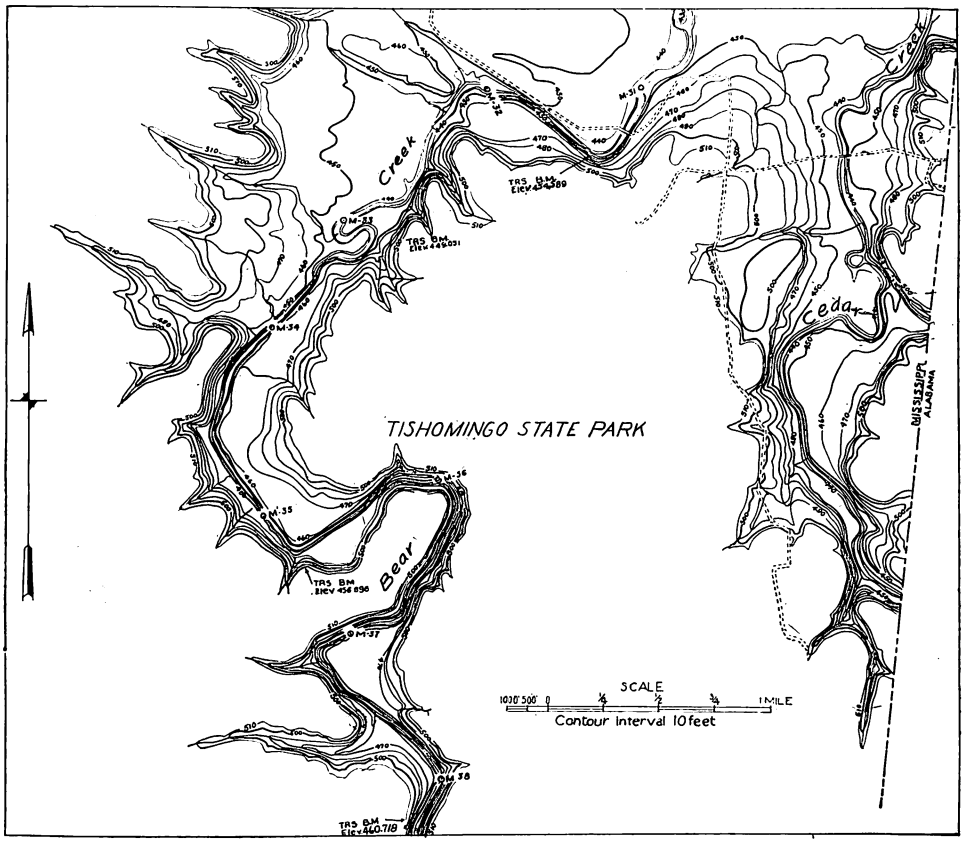


Plate 3.—Contour map of that part of Bear Creek valley along which the Highland Church sandstone outcrops. Contours above 510 feet are not shown.---Courtesy of the Corps of Engineers, United States Army.

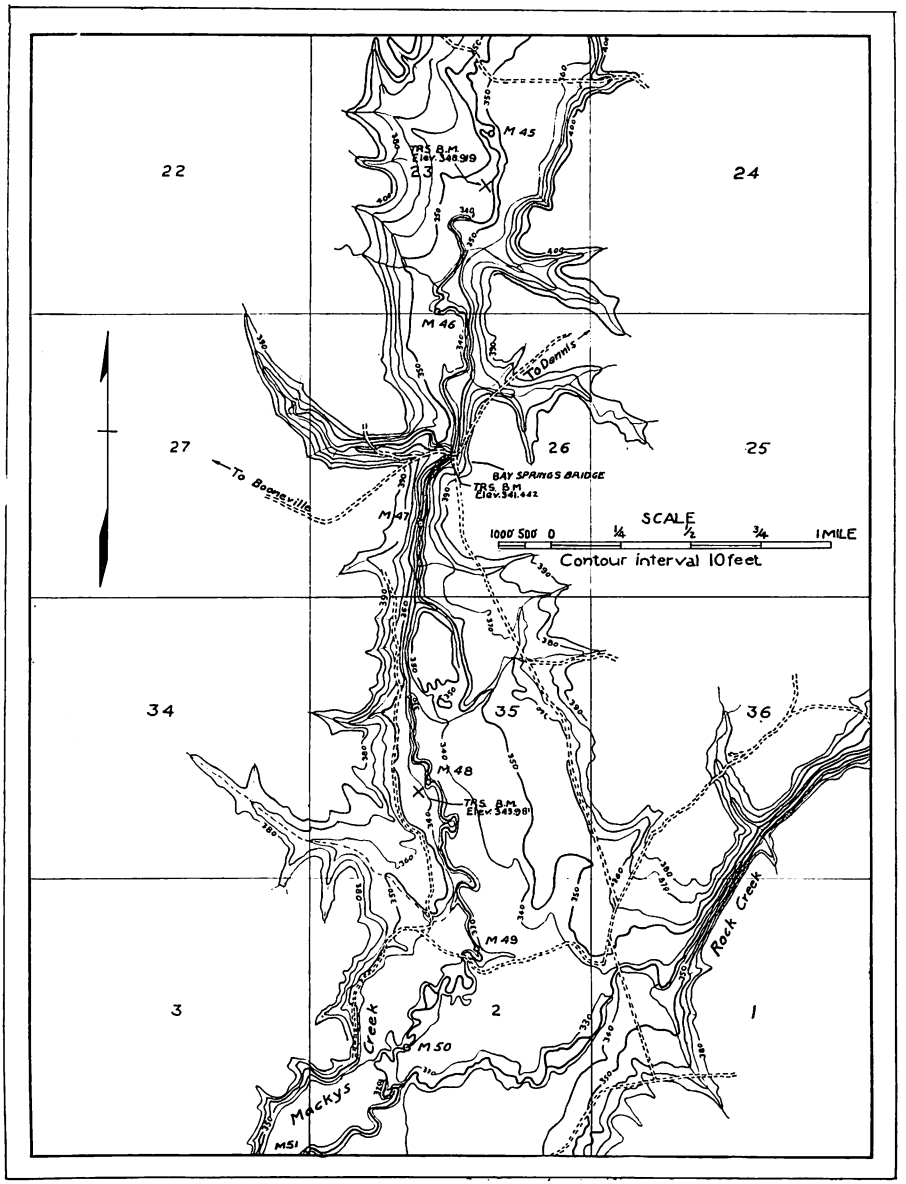


Plate 4.—Contour map of that part of Mackeys Creek along which the Highland Church sandstone outcrops. Contours carried only to elevations between 50 and 60 feet above extreme low water in Mackeys Creek.--Courtesy of the Corps of Engineers, United States Army.

layers. However, the bed is broken vertically by two or more systems of joint planes. At Bay Springs are two: one trending N. 45°W., and the other N. 45°E., the two at right angles to each other. Consequently this thick bed of stone is broken into huge oblong blocks, many as large as an ordinary dwelling room (Figure 3). Because of these

**Figure 3.—Huge blocks of Highland Church sandstone along the east side of Bear Creek valley in Tishomingo County.--Courtesy of H. C. Mitchell, Assistant State Forester.**

vertical systems of joints and because of the more rapid weathering and recession of the underlying sandy shales and shaly sandstones, enormous blocks of this sandstone stratum are set free to creep slowly down the canyon walls. In this manner, the stratum is left outcropping as vertical cliffs or walls, which throughout the ages have lost none of their verticality or angularity.

### TEXTURE AND COLOR

The Highland Church sandstone is, for the most part, a medium-grained quartzose sandstone. Broken masses reveal a color of buff in some pieces, of light yellow in others, and of gray in still others. Perhaps in each case, the color is due to the chemical state of the small content of iron oxide--the more completely oxidized and hydrated the iron ore the deeper yellow the color of the stone. All three of the prevailing colors are very pleasing. The buff and yellow are, perhaps, the more durable, although much of the exposed cliffs is gray, due in part, of course, to the presence of lichens on their surface.

### DURABILITY

The durability of the stone has thus been tested in a natural way through the ages. The very fact that it has stood in vertical walls or cliffs for hundreds, or more correctly for thousands, of years is ample proof of its durability. In view of this fact, if it is properly quarried and properly laid on its bedding surface in any structure, it should likewise prove durable in such structures for hundreds of years.

### WORKABLENESS

It is always desirable, of course, that a building stone be in layers of approximately the same thicknesses as the courses in the structure to be erected. Unfortunately the Highland Church sandstone is a massive stratum, unbroken by bedding planes, and, unfortunately too, no quarry tests have been made to determine whether or not the stone will split into layers of the desired thicknesses. In stone taken from a quarry having sufficient overburden and adequate distance from its outcropping face to assure its freshness, no difficulty should be experienced in splitting it into layers of desirable thickness. But even if the fresh stone should not split readily, recourse can always be had to sawing, as is so extensively practiced in the production of the famous Berea sandstone in Ohio.

### QUARRY SITES—ALONG THE WEST SIDE OF BEAR CREEK VALLEY

In seeking for a quarry site three factors are always important: (1) ease of quarrying operations, (2) ease of handling the quarried product, and (3) transportation facilities. At many places some distance back from the vertical cliffs of the Highland Church sandstone that constitute the west wall of Bear Creek valley, the overburden should not be excessive but should be sufficiently thick to insure fresh stone on quarrying. Back from the cliffs, too, the stone of such quarries could easily be lifted by derrick perhaps directly on to the railroad cars. And, finally, back from the cliff, such quarries should be readily served by short spur tracks from the Illinois Central Railroad, spurs not to exceed 1.5 to 2.5 miles in length and built, along the surface of the uplands east and southeast of Tishomingo, with the minimum amount of grading. Of course these sites would be readily accessible to the trucks, but only for small amounts of the lighter stone, because the trucks could absolutely not compete or be able to handle the heavy stone in large quantities, as could the railroads--not to mention the damage the trucks would occasion the highways and the highway bridges. Then, too, in addition to railroad transportation, would be water transportation, provided the route of the Tennessee-Tombigbee waterway finally selected by the Federal Government passes that way.

QUARRY SITES—AT THE EXTREME TIPS OF MACKEYS CREEK TRIBUTARIES

Sufficient prospecting and pit or quarry testing should be done in the vicinity of the loose blocks of sandstone on the J. H. Bickerstaff land (S. E. ¼, Sec. 22, T. 5 S., R. 10 E.), about one-half mile south of Tishomingo and a like distance from the Illinois Central tracks, to determine whether or not they are really the Highland Church sandstone, or sandstones of the underlying member of the same Forest Grove formation, whether or not sufficient thicknesses of either sandstone member have escaped erosion, and whether or not the overburden be of the proper thickness to warrant quarry operations. If all such prove to be satisfactory, then this location is one of the most accessible to rail transportation of any of the numerous sites. Unfortunately, cursory examination did not reveal the outcropping ledge, and, unfortunately too, the topography seems to indicate that any ledge will be covered by excessive overburden.

"The two prongs of McDougle Creek, tributary of Mackeys Creek, cross the Illinois Central Railroad on each side of Neil station. The Highland Church sandstone outcrops on the west side of the tracks at both prongs and also just east of the tracks at the south prong, where it measures nine feet in thickness and dips directly east five feet in 100 feet" (Bulletin 23, p. 171). Recently a somewhat more detailed examination of these outcrops raised the question as to whether or not the sandstones outcropping west of the tracks at both prongs were parts of the lower, rather than of the upper (Highland Church sandstone) member, of the Forest Grove formation, and whether or not these lower sandstones might also be of building stone grade--that is, whether or not their lack of outcropping cliffs might be due to their thinner beds, to their association with interstratified shales and shaly sandstones, and to their capping of the thick Highland Church cliff-forming stone, rather than to their own lack of durability.

The outcrop east of the tracks, on the contrary, proved to be sufficiently thick to include at least parts of both members of the Forest Grove formation and to reveal the nature of the sandstones of the lower member as well as of the upper (Highland Church) member. Perhaps these members can best be described in the following section:

Section east of the Illinois Central Railroad at the south prong of McDougle Creek--at the three section-houses at Neil station.

| | Feet | Feet |
|---|---|---|
| Tuscaloosa formation | | 15.0 |
| Interval, covered, 15.0 to 30.0 feet. At other places it is composed of sand and gravel | 15.0 | |

Forest Grove formation ..... 17.0

Highland Church sandstone member. The stone is massive bedded, but it does split into thinner beds. It is a compact, medium grained, light yellow sandstone ..... 9.0

Lower sandstone member. The sandstones of this member range from medium bedded to thin bedded and even to shaly bedded. They are compact, somewhat finer grained, and gray in color. They are slightly folded and, on the whole, dip upstream toward the east. To water level, below which is shale or shaly sandstone ..... 8.0

The sandstone of the Highland Church member, here exposed to a thickness of 9.0 feet, is a good building stone as it is also at other localities. The sandstones of the "Lower member" would seem to be as good for building purposes as the Highland Church member or even better than this upper member. Test pits or quarry openings at many other places might reveal sandstones in this upper part of the "Lower member", likewise as good as the Highland Church sandstone or even better than it.

Here at Neil, the topography seems to indicate an overburden ranging from 15.0 to 30.0 feet near the outcrop, which is 1,000 feet, by pacing, from the railroad tracks. Unquestionably this is the most convenient location to railroad transportation, and, for that reason, more overburden could be removed here than at more remote localities.

Just west of the tracks at the south prong of McDougle Creek and on the south side of the valley, two beds of sandstone outcrop beneath an 18-foot covered interval, which extends downward from track level. Both beds seem to belong to the "Lower member" of the Forest Grove formation. The upper bed is 2.0 feet thick; the lower, 1.7 feet. Both are compact, rather fine-grained, gray sandstone that would seem to make a building stone, possibly superior to the Highland Church sandstone. By tracing this ledge down stream a short distance from the tracks, a spur ridge might be found where the stone would not be covered by an excessive overburden.

#### QUARRY SITES—ALONG MACKEYS CREEK AT BAY SPRINGS

Besides the potential quarry sites along the west side of Bear Creek east and southeast of Tishomingo and at the very head of McDougle Creek at Neil station, the other most promising quarry sites of the Highland Church sandstone are along Mackeys Creek proper at Bay

Springs (Plate 4.) Sufficiently far back from the cliffs of the valley are a number of places where the overburden is of sufficient thickness to insure a fresh quarry stone. That the stone is as durable as the same stone along Bear Creek is likewise attested by the vertical angular cliffs along the gorge at this beautiful place (Figure 2). Unfortunately, at the present this location is too remote for rail transportation, but smaller stone and smaller quantities could be transported by truck, and should the Tennessee--Tombigbee waterway eventually be constructed this way, the heavier products as well could be transported far and wide.

## STATE PARKS AND QUARRY SITES

At Bay Springs (Figure 4), a small branch of Mackeys Creek enters the main stream from the west. Both streams flow in gorges twenty feet or more in depth between vertical walls of the Highland Church sandstone member of the Forest Grove formation. For a

**Figure 4.—Bay Springs Bridge across Mackeys Creek, Tishomingo County.**

half mile or farther, the combined waters continue to flow between vertical walls of this sandstone, but here the stream has cut deeper, so that the sandstone surmounts a number of feet of exposed shales and shaly sandstones. Consequently the stream widens its valley faster here by wearing away these less resistant rocks, which process of undercutting causes huge pieces of sandstone, broken into oblong blocks by two systems of vertical joints, to break loose from the parent

stratum and begin their slow creep down the gorge wall. Perhaps no small area in the state is so picturesquely beautiful as this Bay Springs region. For years, in the class room and in the printed page (Bulletin 23, pp. 175, 203), the writer has urged its preservation as one of the State Parks, and now as State Geologist, he is still urging consideration of it for such purpose.

Farther toward the east and north, Bear Creek has cut into and through this same massive Highland Church sandstone. Like Mackeys Creek, Bear Creek flows between vertical cliffs of this sandstone from a point near Dennis to a point opposite Tishomingo or near Southward Bridge. Not only has Bear Creek cut into and through the Highland Church sandstone, but it has cut 10, 20, 40, and even 80 feet into the

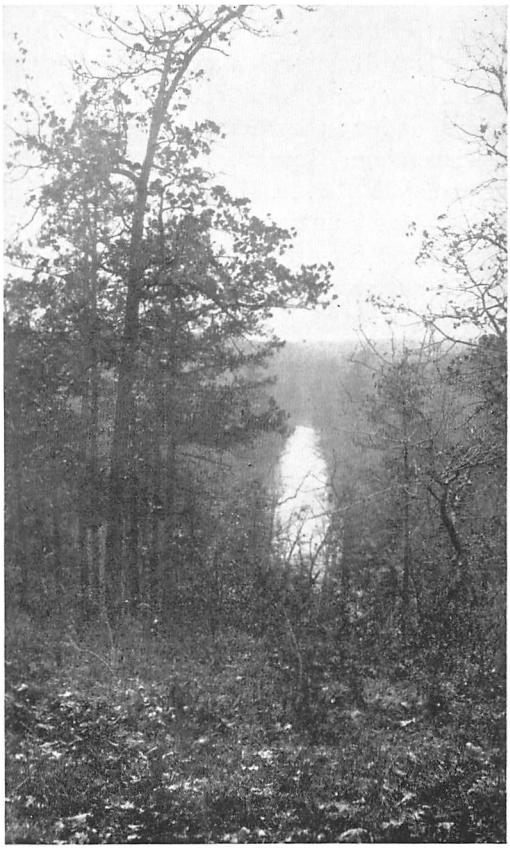

Figure 5.—Looking up Bear Creek. From this height directly above a bend in the valley, the camera portrays the stream as a burst of flame.

underlying sandy shales and shaly sandstones. Consequently Bear Creek valley is a veritable gorge nearly one hundred feet in depth (Figure 5). The same undercutting of the lower sandy shales and shaly sandstones and the same two systems of vertical joints at approximately right angles have allowed huge blocks of Highland Church sandstone--blocks as large as a room of a modern dwelling (Figure 3)-to settle down and begin their slow creep toward the base of the canyon walls. Consequently, the valley has not only vertical walls at the top, but sloping walls beneath that are strewn with these immense blocks of stone. To add further to the ruggedness and wildness of the region, the creek makes a number of enormous bends (Plate 3). Perhaps this region is unsurpassed in ruggedness, wildness, and beauty within the State.

For years, too, the writer has urged that this site should be set aside as a State Park. Fortunately, this autumn he received a sympathetic hearing from Mr. Fred B. Merrill, State Forester, Mr. H. C. Mitchell, Assistant State Forester, and Mr. Webb Mulford, of the National Park Service, as well as from the Hon. J. C. Jourdan and the Board of Supervisors of Tishomingo County, consisting of the Honorables J. B. Storment, Henry Marler, A. B. Long, and C. C. Stephens, who voted enthusiastically and unanimously to purchase 1,500 to 2,000 acres of this rugged land for a State Park. As this bulletin is being prepared, Mr. J. C. Jourdan, Jr. telephones that 1,200 acres are under option and that negotiations are in progress for the purchase of the remainder, now held in one large tract.

It might seem inconsistent to some for the writer to urge at one and the same time in one and the same report, the working of a sandstone for building purposes and the setting aside of the areas in which it is exposed as two State Parks, but such is far from the case.

Everyone familiar with sandstone quarry practices knows that most sandstones do not work well after they have been exposed to air and have thus dried out or seasoned. Rather the fresh stone is quarried and is worked before it has an opportunity thus to season. As a matter of fact many sandstones that are excellent building stones and that work well when green, will not work at all when seasoned. Consequently the stone is quarried where it has a reasonable amount of overburden and where it is sufficiently far from its outcropping edge to insure freshness.

No attempt should be made to quarry the Highland Church sandstones of Mackeys Creek and Bear Creek areas along their line of cliff outcrops. Rather places should be sought back from the cliffs where the overburden is sufficiently thick to insure a fresh stone and

where it is not so thick as to make quarrying prohibitive. Such a system of development would insure success in working the stone and at the same time would preserve the natural beauty of both areas.

Attention has already been directed to the fact that the only unknown element in the development of the Highland Church sandstone for building purposes is its working qualities; namely, how readily it will split in horizontal layers and how well it will break transversely into oblong blocks. But even should it fail to work as well as desired in these respects, the stone could be sawed into blocks of any desired size because of the great thickness of the bed and its freedom from closely-spaced joints and other fractures. But either split or sawed, it is necessary that the stone be fresh.

## TYPES OF STONE STRUCTURES

Although most types of stone structures grade into one another, nevertheless structures of the following types may be readily distinguished:

DRESSED STONE
- Sawed
- Hand cut
- Rock faced
- Hand split and broken

ROUGH STONE
- Flat blocks of field stone
- Irregular blocks of rubble
- Squared rubble

The two most extensive building stones of the United States, the Berea sandstone of Ohio and the Salem (or Bedford) limestone of Indiana, are so massive that they are sawed into dimension stone of the desired thickness. If the stone is durable, regardless of its massive character or of its difficult working qualities, it can always be so prepared. Such stone used in the construction of state houses, court houses, and other massive public or private buildings gives beautiful but rather formal appearance to the structure.

Before the days of improved machinery, such stone was usually split into rough blocks and then dressed by means of various kinds of hand tools. Different and very beautiful faces were thus produced. Needless to say such a process was expensive then, and would be well nigh prohibitive now in times of high wages.

A special treatment of the hand cut stone gives a charming effect. A border about the whole face is hand dressed, and the great medial portion is split off in such a manner as to give a protruding rough or

rock face. Although such treatment produces a beautiful effect on stone in thin and medium courses, it cannot be advantageously employed in stone in thick courses.

Perhaps the most reasonable course stone is obtained from quarries containing stone in layers of the same thicknesses as the desired courses in the building to be constructed. Such layers have only to be broken into blocks of the proper widths and lengths. This treatment produces at one and the same time a stone of the most beautiful rock face and of the most reasonable cost. For small houses, perhaps this is the most desirable of course stone (Frontispiece).

In some of the better working stones of greater thicknesses, a similar effect is obtained by splitting the stone into slabs of the desired thickness and then breaking or "squaring" the pieces. Such stone is somewhat more expensive than that obtained from layers of the desired thickness, but is, nevertheless, a beautiful product.

Needless to say, rough stone, in contradistinction to dressed stone, is in an endless variety of shapes. At one extreme is the flat block; at the other, the thick irregular block. Between are the blocks that fall into neither of these two classes. Perhaps the greatest factor in determining the shape which the stone block will take is the original structure of the stone.

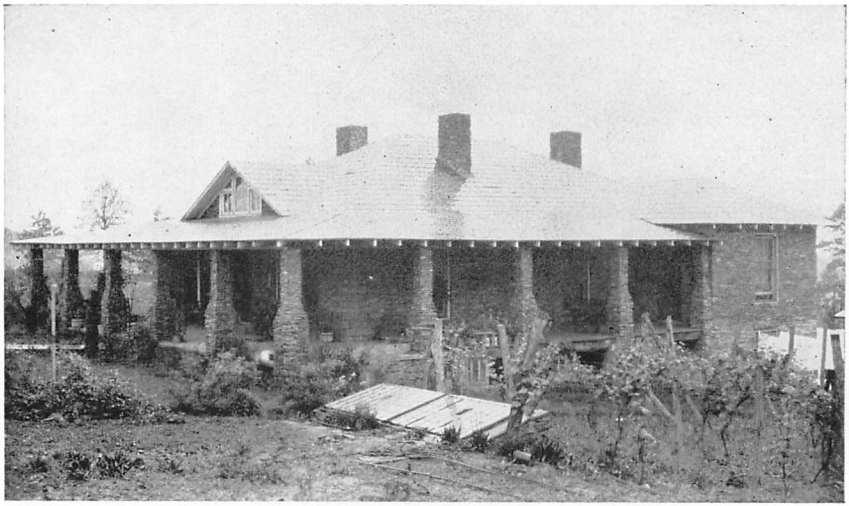

**Figure 6.—"They built homes, beautiful homes" of flat field stone --Henry Perrou home, Valdese, North Carolina.**

Thin bedded limestones, thin bedded sandstones, and thin metamorphic rocks, such as slates, gneisses, and schists, yield, on weathering, flat blocks of various lengths and widths. Such flat field stones are readily laid into thin courses or semi-courses. Undoubtedly they produce one of the most beautiful and most pleasing types of small stone houses.

Thicker bedded stone or stone of the massive type, on the contrary, assumes almost any irregular shape in the residual product. Such irregular blocks are used in the construction of rubble walls, which, by selection, may take an endless variety of patterns. Undoubtedly, the architect and the stone mason have a medium that is almost magic in the beauty and variety of walls that it will produce.

In some cases, these irregular blocks are trimmed in such a manner as to produce blocks roughly rectangular in outline. Such blocks can be laid in walls without regard to courses, or, on the contrary, they can be laid in more or less definite courses. They lend themselves to a variety of patterns in the hands of an artistic architect and a skillful mason.

Perhaps the best examples of flat field stone construction in the United States are buildings erected by immigrants, who came from the Waldensian valleys along the French-Italian border in the Alps, at

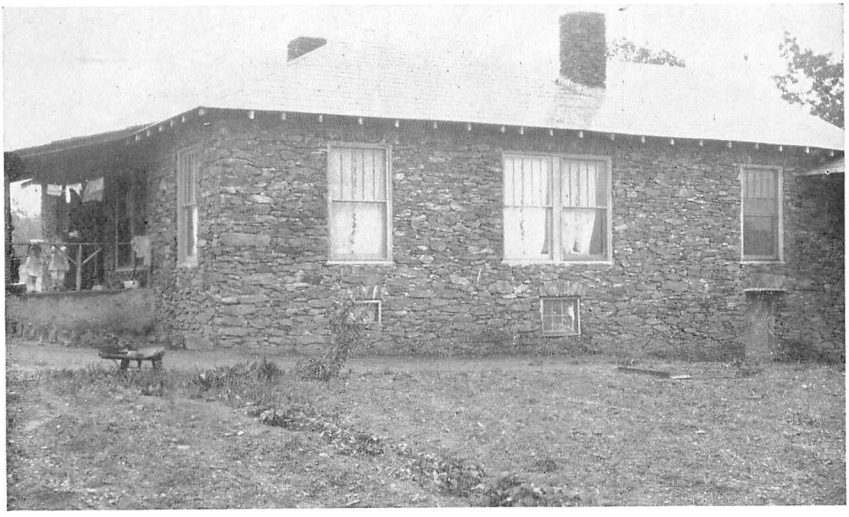

Figure 7.—Home of William Perrou built of flat field stone at Valdese, North Carolina.

Valdese, North Carolina, across the Blue Ridge from Asheville. These flat residual pieces, derived by all the forces of weathering from somewhat thin metamorphic rocks, were gathered from the old fields, which these industrious people purchased for their new colony. Not only was the condition of the fields thus improved, but at the same time a most durable and a most pleasing building stone was obtained simply for the gathering. Of such, these thrifty citizens built structures that command the admiration of all those choice souls gifted with a sense of the beautiful. They built homes, beautiful homes (Figures 6 and 7), that will last through the ages to inspire neighbors and visitors capable of such inspiration. But they were not content with attractive homes alone, they built artistic and enduring churches and schools (Figure 8), business rooms (Figure 9), and filling stations (Figures 10 and 11), and even chicken houses (Figure 12). The beauty of the Franco-Italian Alps is wonderously reflected in their handiwork. May their tribe increase!

In the hands of that master creator of small houses, Ernest Flagg, the irregular blocks of rubble stone became the dream houses of his artistic imagination. Against the outside of the portable forms, he places the flat face of these irregular blocks, and behind them pours concrete and broken stone mix in such a manner as to make an enduring monolith of the whole---and by using the forms over and over again, he materially reduces the cost of these lovely homes. His designs are so beautiful and so unique as to warrant further consideration.


Figure 8.—Valdese High School, built of flat field stone at Valdese, North Carolina, by immigrants from the Franco-Italian Alps.

By eliminating the basement, he is able to construct a novel floor. A six-inch layer of crushed stone is covered with a four-inch layer of rich concrete. Upon this concrete plate is brushed water-proofing asphalt. Upon this in turn is placed one-inch by two-inch strips, and upon these strips is laid the wooden floor.

The 15-inch wall is stopped off at floor level and a one-fourth inch layer of water-proofing asphalt is applied to prevent the rise of ground water in the wall by capillary action. In the case of soapstone blocks, Mr. Flagg was able to plaster directly on the stone. In the case of all other stone, it is necessary to nail furring strips directly to the green cement or to blocks set in the cement. To these in turn are nailed the wood or metal lath for the plaster.

A better method would seem to be in the use of two-inch or three-inch hollow partition tile, rather than the furring strips and lath. To such blocks, grooved on both sides would adhere the concrete on the one side and the plaster on the other. These blocks of tile would form a completely fireproof wall which, because of the dead air space, would make a house that would be warmer in winter and cooler in summer.

By constructing low walls, only 5.5 feet in height on the outside, and by finishing the lower side of the roof, it is possible to eliminate the ceiling and consequently the attic. To prevent excessive heating of

Figure 9.—A business room, safe, solid, substantial, satisfying--built of flat field stone at Valdese, North Carolina, by sons of the Franco-Italian Alps.

such rooms without attics, a special design of dormer window on the ridge of the roof is constructed in pairs opposing each other. These dormer windows and casement wall windows, which are capable of being fully opened, provide adequate ventilation and cooling facilities.

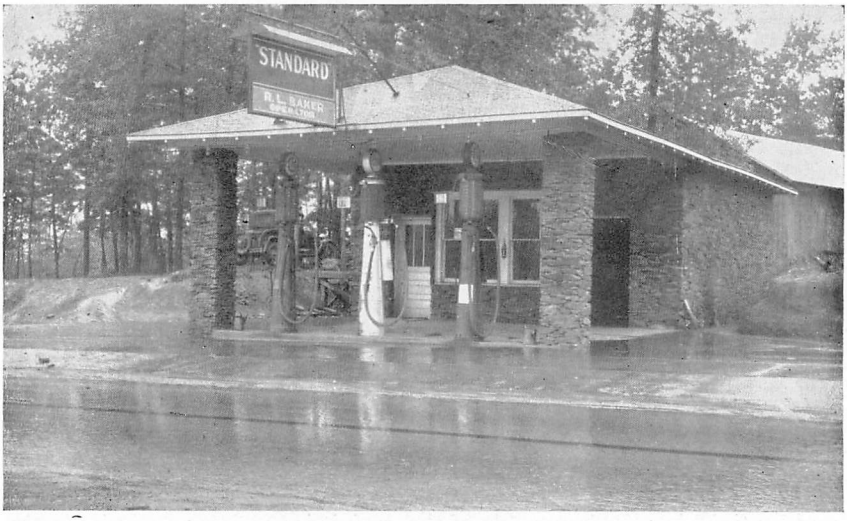


Figure 10.—A filling station, typically American save for the use of the material--beautifully inviting. Valdese, North Carolina.

Figure 11.—Another station, equally attractive and fully as inviting. Valdese, North Carolina.

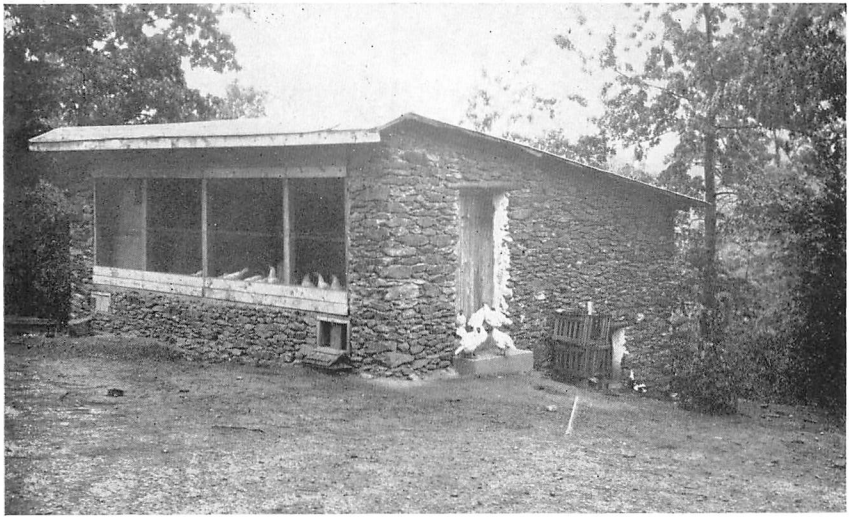

Figure 12.—Chicken house of Albert Bleynot, built of flat field stone at Valdese, North Carolina, by sons of the Franco-Italian Alps.

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