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DEPARTMENT OF REGISTRATION AND EDUCATION
VERA M. BINKS, *Director*

DIVISION OF THE
STATE GEOLOGICAL SURVEY
JOHN C. FRYE, *Chief*
URBANA

REPORT OF INVESTIGATIONS 184

ILLINOIS BUILDING STONES

BY

J. E. LAMAR and H. B. WILLMAN

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ILLINOIS BUILDING STONES

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ABSTRACT

Illinois contains a variety of limestones, dolomites, and sandstones which are being used, have been used, or have possibilities for use as sources of rubble, veneering stone, rough-construction stone, flagstone, ashlar, and stone for other purposes. Colors are chiefly white, gray, buff, brown, and combinations thereof. Some limestone and dolomite deposits may afford cut stone for exterior construction and limestone marble, mostly in shades of white or gray, with a diversity of textures. Some porous dolomite deposits will yield a type of travertine.

Many parts of the State, especially the northern, western, and extreme southern portions, have potential building stone deposits. The building stone industry of Illinois is relatively small, although the State's diverse resources could support a larger industry.

INTRODUCTION

The use of native building stone in Illinois dates back to the early settlers who used stone from nearby sources for foundations for their houses and barns. Later, stone was used in constructing county courthouses, warehouses, business buildings, houses, and bridges. In a few places, stone slabs were used for making fences. More recently, local stone has been used to a limited extent for fruit-vending stands, houses, and other structures. Limestone marble for interior use also has been produced. The building stone resources of Illinois are adequate to encourage a greater use of native stone.

SIGNIFICANCE OF OLD STONE STRUCTURES

The attractiveness of native Illinois building stones is often overlooked because they are judged by the appearance of buildings or structures which have stood for 50 to 100 years without having received attention other than minor repairs to the mortar. The original color often is obscured by the grime of years, although the inherent beauty of some of the stone outlasts even the handicaps of neglect and grime. Durability of the stone also may be underrated because some builders did not adequately protect the stone in older structures from the infiltration of water from roofs and leaky gutters. The stone of many of the old structures, however, has depreciated very little in serviceability, and if cleaned by modern methods could be restored to a nearly new appearance. With proper care the appearance of many building stones improves with age.

Old stone structures are particularly significant because they show the actual performance of a stone in a wall. Although various tests, including strength and soundness tests, are sometimes made to determine the durability of building stones, these are in the main substitutes for records of actual performance. Suggestive, and sometimes definite, performance data are afforded by stone in natural outcrops and in old road and railroad cuts, although these conditions do not duplicate those of stone in a wall.

TYPES OF BUILDING STONE

A variety of terms is used to describe different types of building stone. *Cut stone* is building stone cut to specific dimensions. *Veneering stone* generally refers to relatively thin slabs of stone of irregular shape used for veneering of structures. *Flagging*,

or *flagstone,* is stone slabs used commonly for walks, courtyards, and terraces. *Rubble building stone* may be thicker pieces of irregular stone with one good face. *Ashlar* is applied generally to comparatively small pieces of stone cut in rectangular shapes.

For Illinois building stones, the general category of cut stone may include interior decorative stones, such as marbles or stones suitable for use with a honed finish, and cut stone for exterior construction. *Architectural rough blocks* are large blocks of stone from which various types of cut stone are made.

RELATION OF STONE TYPE TO CHARACTER OF DEPOSIT

Some types of building stones are used as slabs, others in blocks of considerable size. A deposit consisting of layers about 3 inches thick might afford a good source of veneering stone or rubble, but it would not usually be considered a satisfactory source of architectural rough blocks. On the other hand, a deposit comprised of layers 5 to 10 feet thick might yield large blocks suitable for cut stone, but would be a less promising source of veneering stone. In general, thin-bedded stone deposits are more likely to be sources for veneering, flagstone, and rubble, whereas thick-bedded deposits, in ledges roughly three or more feet thick, are the preferred source of decorative stone or exterior cut stone, including "cut blocks." Ashlar can be prepared from either type of deposit.

KINDS OF ILLINOIS BUILDING STONES

The building stones of Illinois are of three major kinds—limestone, dolomite, and sandstone. Dolomite is a magnesian variety of limestone. The distribution of outcrops of these various types of stone is related to the character of the bedrock formations and the amount of surficial materials, such as sand and clay, resting upon them. Geologists have given names to bedrock formations and have mapped their distribution.

BUILDING STONE DEPOSITS

The selection of a deposit to be quarried for building stone depends on many factors, including the type of stone to be produced, the market area to be served and its potential consumption of building stone, transportation available, the size of the contemplated quarry, and the physical character of the deposit. Important factors in evaluation of a deposit are whether (1) the overburden on the deposit can be economically removed; (2) the overburden is an unconsolidated material or consists of rock strata; (3) the top of the stone deposit is relatively even or irregular and thus hard to strip; (4) all the deposit, or only certain beds, is usable stone; (5) the strata part easily along bedding planes; (6) access roads are available or must be built; (7) the quarry will drain naturally or will have to be pumped; (8) electric power is available; (9) areas are available for the disposal of overburden and waste stone. Many of these factors cannot be determined from inspection of outcrops but must be explored by test drilling if building stone production is planned on a considerable scale.

QUARRYING OF BUILDING STONE

In some places the production of building stone in the form of slabs accompanies the quarrying of stone for crushed stone. Those parts of the deposit which are thin bedded and have a suitable color are usually the sources of slabs. In other places the stone is produced from special building stone quarries. The large blocks of stone which are used to make cut stone and decorative stone are ordinarily produced from deposits that have not been subjected to heavy blasting and thus to the possible development of cracks or incipient cracks in the stone.

The quarrying of building stone slabs is commonly done by drilling holes at appropriate places, inserting wedges in the holes, and driving the wedges until the stone breaks free. Some deposits are merely blasted to yield irregular slabs. The pro-

duction of large stone blocks for cut stone is a much more complicated and costly procedure. It may involve the use of channeling machines, wire saws, or closely spaced drill holes coupled with wedging or other procedures to break the blocks free from the parent ledge. Heavy cranes are employed to move the blocks from the quarry.

WEATHER RESISTANCE AND "FACING" OF STONE

The weather resistance of a building stone used for exterior construction depends to a considerable degree on the proper use of the stone. The most destructive force affecting building stone in Illinois is probably the disruptive action of the freezing of water which has penetrated the stone. This action may be considerably influenced by whether the stone has been set "bed-faced" or "edge-faced," and is particularly detrimental to stones which contain partings or have a pronounced banded texture.

A stone in a wall is said to be bed-faced when it is so set that the exposed surface is a natural bedding surface or is parallel to such a surface. An edge-faced stone is set in a wall so that the edges of the bedding planes are exposed, usually in the same horizontal position as in the parent ledge.

In general, building stone splits most easily along the bedding surfaces. In bed-facing, the surface that is likely to flake most easily is exposed to the weather. This surface is usually less permeable, but moisture may enter through poor mortar joints and work into the stone along partings or porous zones. Freezing may then cause splitting or flaking of the stone. This is less likely to occur if the stone is edge-faced.

Many building stones give good service either edge- or bed-faced but others should not be bed-faced.

THE TERMS "MARBLE" AND "TRAVERTINE"

The term *marble* is used commercially to describe metamorphic marbles and those limestones and dolomites which take a good polish and have an attractive appearance. Commonly there is a further implication that the stone has been used commercially as a polished decorative stone. Subsequently a number of limestones and dolomites are referred to as limestone or dolomite marbles. Most of these rocks have not been used commercially as marbles but the term is herein employed for convenience in describing both samples and deposits. No metamorphic marble is found in Illinois.

The term *travertine* similarly is used in the commercial sense to describe highly porous dolomites whose texture resembles true travertine, a porous, usually spring-deposited form of calcium carbonate.

RESOURCES

For convenience in discussing building stone possibilities, the State is divided into five districts (fig. 1). Production of build-

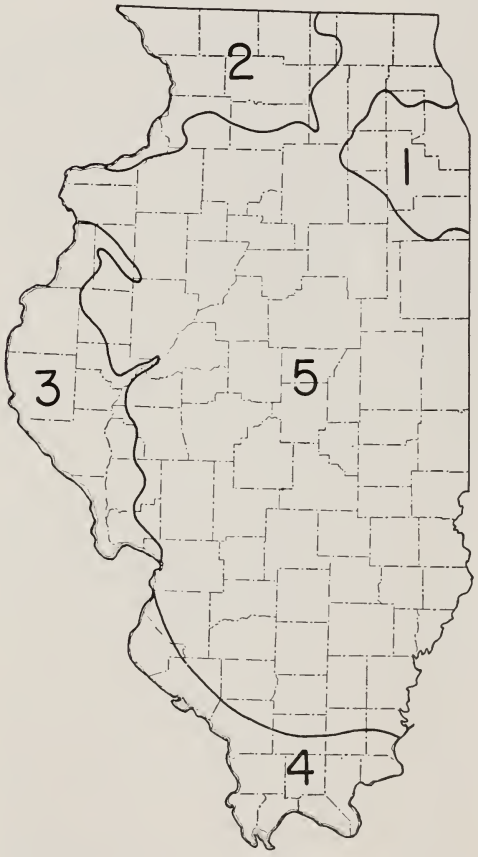

FIG. 1.—Districts discussed in this report.

ing stone that has been reported to this Survey or is known from other sources is noted. However, many deposits provide intermittent supplies of stone for veneering, flagging, or rubble, and some of these probably are not specifically mentioned.

All the districts are believed to include deposits from which some type of building stone could be produced. Only a few can be specifically mentioned in this brief report. Economic considerations relating to commercial production and marketing are too complex to be adequately treated here. Attention is therefore called merely to the kinds of building stone available in various parts of Illinois and the character of deposits. Interested persons may then make a more detailed investigation of specific deposits in the light of general or special market possibilities and other economic factors.

The columnar section of the bedrock formations in Illinois is shown in figure 2, and their distribution in figure 3.

District 1

Building stones in District 1, northeastern Illinois, include gray, buff, and brown dolomite. They have been, or are being, produced commercially at Joliet, Lemont, Kankakee, Bourbonnais, Elgin, Aurora, and probably elsewhere. The stone is obtained chiefly from the Niagaran formation* and underlying formations of Silurian age. A large number of buildings in Chicago and its environs have been built of native dolomite. The old Chicago Water Tower north of the Loop and the courthouse in Joliet are examples of older structures; the postoffice in Kankakee is an example of a recent structure. The use of local stone for facing houses can be observed in almost all communities. Large quantities of stone from the old "Athens marble" quarries near Sag Bridge have been used in recent years by the Cook County Forest Preserve in the construction of shelters, bridges, road guards, and other structures.

Many possible sources for building stone in District 1 are on developed real estate, affording little chance for the opening of new quarries. However, outcrops of stone deposits are relatively common in the west and south parts of the district. Many deposits will yield stone of suitable weather soundness for building stone, but some deposits are cherty or impure and cannot be regarded as normally suitable sources. Most of the stone in the district is gray to white when fresh. In a few places pinkish or greenish dolomite is found. On exposure to the weather, however, much of the stone changes to a yellowish buff as a result of the oxidation of ferrous iron. This change is not ordinarily harmful to the stone. In the upper weathered parts of many deposits, nature has already effected this change and produced colors of buff, brownish yellow, or brown. The thickness of beds varies. Some deposits, especially those composed of "reef rock," a porous type of dolomite formed from ancient reefs of coral and other marine animals, are composed of strata usually 5 or more feet thick. Most of the reef rock weathers gray. Other deposits, generally of denser rock, are well layered, and the beds range from a few inches to several feet in thickness. Some deposits are made up, at least in part, of strata ranging from 2 to 5 inches. The well-bedded rock generally weathers buff.

Deposits of thin dolomite strata of relatively uniform thickness afford sources of veneering stone, rubble, flagstone, rough construction stone, and ashlar. Somewhat thicker layers, as much as 2 feet thick, have been used for ashlar or split for rubble.

In the decorative-stone field, the resources of the district offer considerable possibilities. The thick beds of dense dolomite may be sawed and hone-finished for interior trim. Suitably selected stone is almost white with a darker cloud-like pattern. This stone has been used on the interior of the State Archives Building in Springfield and the Natural Resources Building in Urbana.

* The term "formation" is herein used in the popular sense.

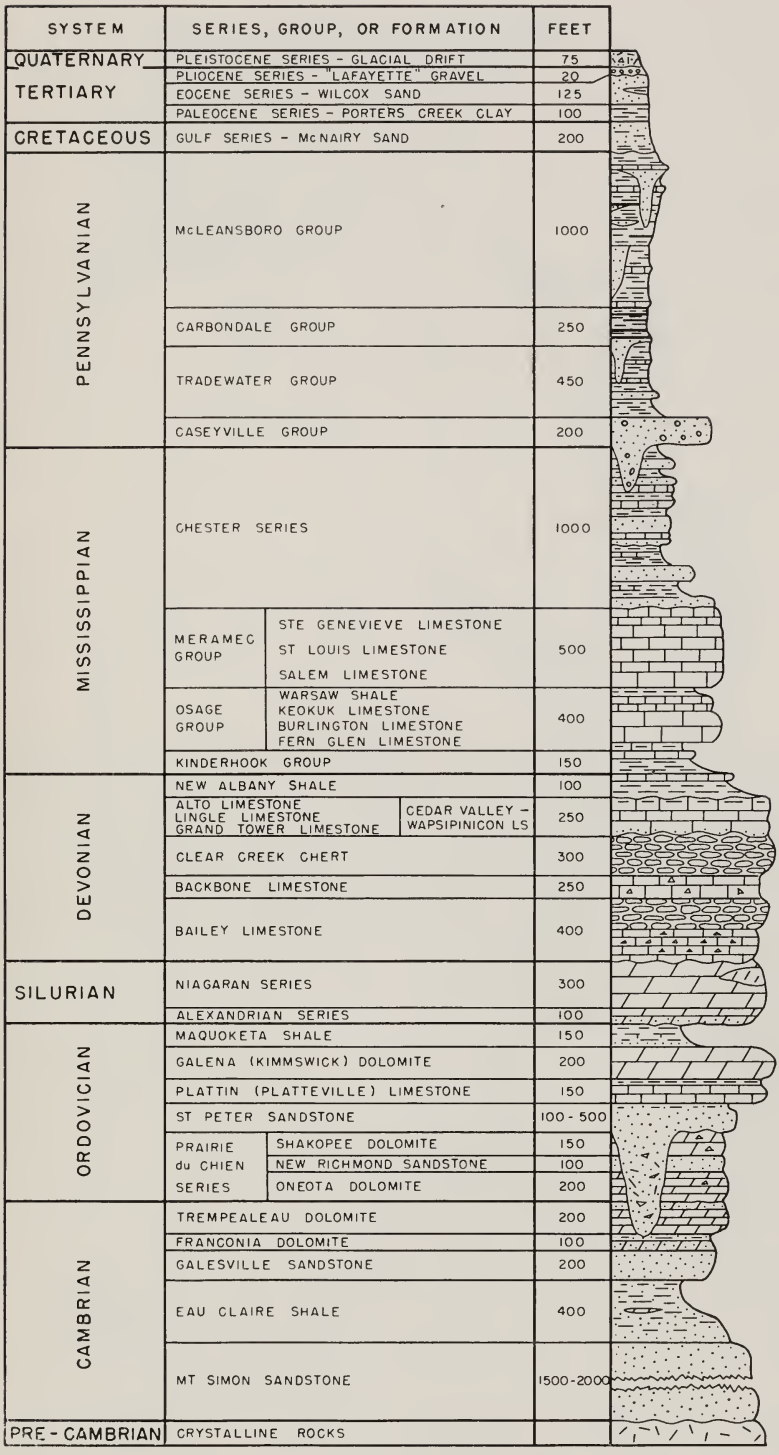

FIG. 2.—Generalized columnar section of the bedrock formations in Illinois. Thickness figures are approximate averages for areas in which the formations form the bedrock surface.

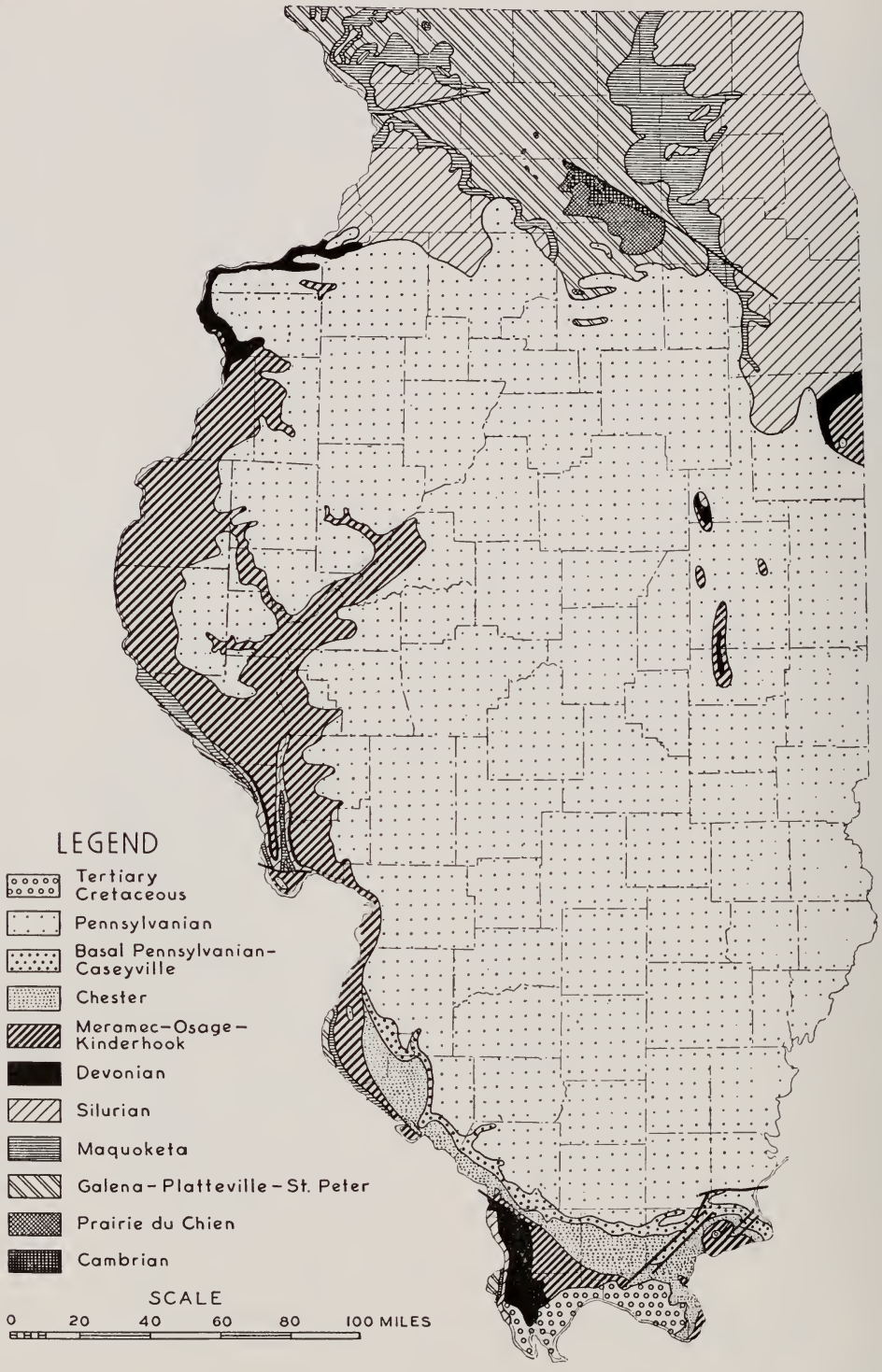

FIG. 3.—Generalized geologic map of Illinois (1945). *From* Horberg, Leland, Bedrock topography of Illinois: Illinois Geol. Survey Bull. 73, fig. 7, 1950.

Some of the thick-bedded deposits of reef-type dolomite may bear investigation for interior trim or for such purposes as washrooms. Samples of the gray variety take a good polish or honed finish and their porous character adds an interesting travertine-like texture (fig. 4). Weathered deposits of this type of rock afford a brown variety of stone. Such deposits are relatively scarce but are most likely to be found in the general vicinity of Kankakee. In some parts of District 1 the pores of the reef-type dolomite contain a black asphaltum which becomes fluid when exposed to the sun. Such rock would not be suitable for most uses of building stone.

District 2

Northwestern Illinois, District 2, is an area wherein stone outcrops are common and have been used at many places in years past as sources of building stone. Stone is now being produced at Garden Prairie and probably at other places. Rockford, Freeport, Dixon, Galena, Fulton, and other towns in the district have buildings in which native stones have been used effectively.

Rocks of four principal geologic formations are capable of supplying building stone in District 2. These are the Platteville (oldest), Galena, Devonian, and Niagaran (youngest) formations. The Platteville formation crops out principally in the general vicinity of Dixon and northwest along Rock River Valley to the State line, and in the north and east parts of Stephenson county. The Galena formation is abundantly exposed throughout all except the extreme southwest part of the district. The Devonian strata occur in the general vicinity of Rock Island. The Niagaran formation and older strata of Silurian age crop out at many places in Whiteside, Carroll, and Jo Daviess counties.

Fig. 4.—Travertine stone from the Niagaran dolomite. The dark spots are holes. Natural size.

FIG. 5.—Travertine stone from the Galena dolomite. Cut at right angles to the bedding. Natural size.

The Platteville formation includes limestone, dolomite, and dolomitic limestone. It is about 100 feet thick. Except for a few massive beds in the upper part and very thin beds near the base, most of the strata are less than 2 feet thick, 4 to 10 inch strata probably being most common. Outcrops of some parts of the formation are "blue gray," other portions are buff or brownish, and still others are light gray with irregular brown mottlings. These bown colorations are not apparent in the unweathered stone. They are dolomite and appear when iron in the dolomite is oxidized by weathering. In general the fresh rock is fine grained and nonporous. Properly chosen deposits of the Platteville would probably yield veneering stone, flagging, rubble, and stone for rough construction. Parts of the formation would be suitable for the preparation of ashlar.

The Galena formation is dolomite about 250 feet thick. Much of the stone is thick bedded; however, deposits with layers 4 to 12 inches thick are not uncommon in some places. Much of the lower half of the formation is cherty. As chert is undesirable in building stone, only the chert-free parts of the formation are generally suitable for use. The Galena dolomite is commonly light

brown to darker brown and is more or less porous. Some of the pores are relatively large and contain small amounts of "sand" composed of dolomite grains. Deposits suitable as sources of rubble, stone for rough construction, ashlar, and possibly veneering stone appear in places. Other deposits with heavy beds can supply rough architectural blocks for cut stone. The porous brown Galena dolomite takes an acceptable polish, hones well, and commercially might be called a brown travertine (fig. 5).

In the general vicinity of Rock Island, Devonian limestone crops out in a relatively limited number of places. The Devonian deposits are about 135 feet thick. The upper 65 feet contains shale and shaly limestone and ordinarily is not a promising source of building stone. Outcrops of the lower 70 feet of stone are uncommon and show only a few feet of the stone. However, it is known from examinations of old quarries, now filled, that the stone is fine-grained limestone in strata ½ to 3½ feet thick, ranging from dark gray to almost white. Some of the limestone is breciated and thus has an interesting "pudding stone" texture. Stone slabs as well as larger blocks which can be sawed into slabs for interior decoration probably can be produced from the lower stone. The federal buildings on Government Island at Rock Island are built of this stone and are good examples of the durability of the stone.

The Niagaran and the underlying formations of Silurian age are dolomite. They have a total thickness of 400 to 500 feet. Some of the dolomite is cherty. Much of it is brown, buff, or brownish gray, but gray and mottled gray rock is also abundant locally, as in the vicinity of Cordova. Some of the dolomite is porous, but dense fine-grained stone is also common. The thickness of strata varies greatly. Parts of the formation are composed of beds 1 to 4 inches thick, others are in 3-to-5-foot layers interbedded with 2-to-6-inch beds, whereas still other deposits are made up of strata 5 to 20 feet thick. The massive beds are generally porous.

The production of a variety of types of building stone seems possible from the Niagaran formation. The thinner-bedded deposits offer possibilities for rubble, flagging, veneering stone, ashlar, and rough construction stone. The massive porous beds can supply large blocks for cut stone purposes. The porous stone polishes acceptably and hones well and probably would be classed commercially as brown travertine.

Outcrops of a few other formations not specifically mentioned are not known to be outstanding, though locally they may serve as sources of stone slabs for various purposes.

The St. Peter sandstone crops out in the vicinity of Dixon, Oregon, and Shirland in the eastern part of the area. The sandstone is rather loosely consolidated, however, and does not appear to be a generally promising source of building stone.

District 3

District 3, western Illinois, contains an abundance of building stone which has been used locally at Alton, Grafton, Quincy, and other towns, but at present no consistent production of building stone is reported. The district includes the Mississippi and Illinois valleys, and outcrops are generally abundant in the bluffs of these and their tributary valleys. Strata of eight major geological formations offer possibilities as building stone, in order of decreasing age, the Joachim, Plattin, Kimmswick, Niagaran, Burlington-Keokuk, Salem, and St. Louis formations.

The Joachim dolomite crops out for a distance of about 2 miles along the Mississippi River in western Calhoun County in the vicinity of Batchtown. It is principally brown or buff, usually fine grained, and thin bedded. The Plattin formation, a dolomitic limestone, crops out for a distance of about 5 miles in the same general area as the Joachim dolomite. The Plattin is generally thin bedded, fine grained, and light gray or light buff. Parts of both formations probably could supply stone slabs for various building purposes.

Lying above the Plattin formation is a formation 10 to 15 feet thick of chocolate-brown thin-bedded brittle limestone in layers up to about 8 inches thick. Its color is derived from an organic material, probably a resin or wax. The limestone strata are separated by thin partings of brown shale. The limestone weathers light gray, and it might be used as a source of slabs. Its brown color and the fact that it takes a reasonably good polish may make it of possible interest, despite its thin beds, for specialties such as lamp and pen-set bases.

The Kimmswick formation crops out for about 7 miles in the bluffs of the Mississippi River and tributary valleys in western Calhoun County near Batchtown, and in a small area in southwestern Jersey County. It is about 90 feet thick. The lower half of the formation is composed of thick, massive beds of coarsely crystalline limestone which is mainly light yellowish or brownish gray, though locally almost white. As the stone takes a good polish it may have possibilities for limestone marble and for other cut stone purposes. The upper half of the Kimmswick formation becomes progressively thinner bedded towards the top and contains some fine-grained strata. The stone is brown or gray. It may have possibilities for a variety of building stone uses.

The Niagaran formation crops out in and near the river bluff at Grafton where it has been used as a building stone. Its use both as exterior and interior building stone is well shown in the attractive buildings in Pere Marquette State Park, west of Grafton. The stone is buff or brown fine- to medium-grained dolomite. The beds are from a few inches to several feet thick. It has possibilities for veneering, rubble, rough construction stone, flagging, and ashlar, and some deposits probably could supply blocks suitable for cut stone. A polished sample of the stone near Grafton had a pleasing color but approached a monotone; it took an attractive honed finish.

Less extensive outcrops of the Niagaran and associated beds are found in the east bluffs of the Illinois River in southwestern Jersey County and in the bluffs of central and northwestern Calhoun County. They are chiefly brown or gray dolomite, limestone, or dolomitic limestone. The strata vary from thin to massive bedded. Probably some deposits can supply slabs for various purposes.

Extensive outcrops of the Burlington-Keokuk limestone are found at many places in the Mississippi River bluffs and tributaries from Warsaw south to south-central Calhoun County, and in the bluffs of the Illinois River from south-central Calhoun County north into Pike and Scott counties. The thickness of the formation ranges between 150 and 200 feet. The Burlington-Keokuk formation is almost exclusively limestone, much of which is coarsely crystalline. It occurs in beds ranging from thin to massive, and is usually white to light gray in color, though in a few places it is yellowish or brown. The upper part of the formation is finer grained and thinner bedded.

Except for the lower 10 to 30 feet, the Burlington-Keokuk formation is cherty, though the amount of chert varies. As a rule chert does not withstand well the action of the weather, and consequently it is normally regarded as undesirable in building stone for exterior use. It is also a hard substance which is avoided in cut stone. Potential production of building stone from the Burlington-Keokuk formation, therefore, is restricted to the basal chert-free unit or to higher strata which are locally chert-free.

Burlington-Keokuk limestone has been used as building stone in the vicinity of Quincy and elsewhere. The formation is capable of supplying rough construction stone, rubble, ashlar, flagstone, and probably veneering stone. The coarsely crystalline thick beds, especially those in the lower chert-free unit, are light gray to white, take a good polish, and have a finely mottled texture with relatively abundant "crows-feet," or stylolites. They have possibilities as limestone marble for interior decoration and for exterior construction (fig. 6).

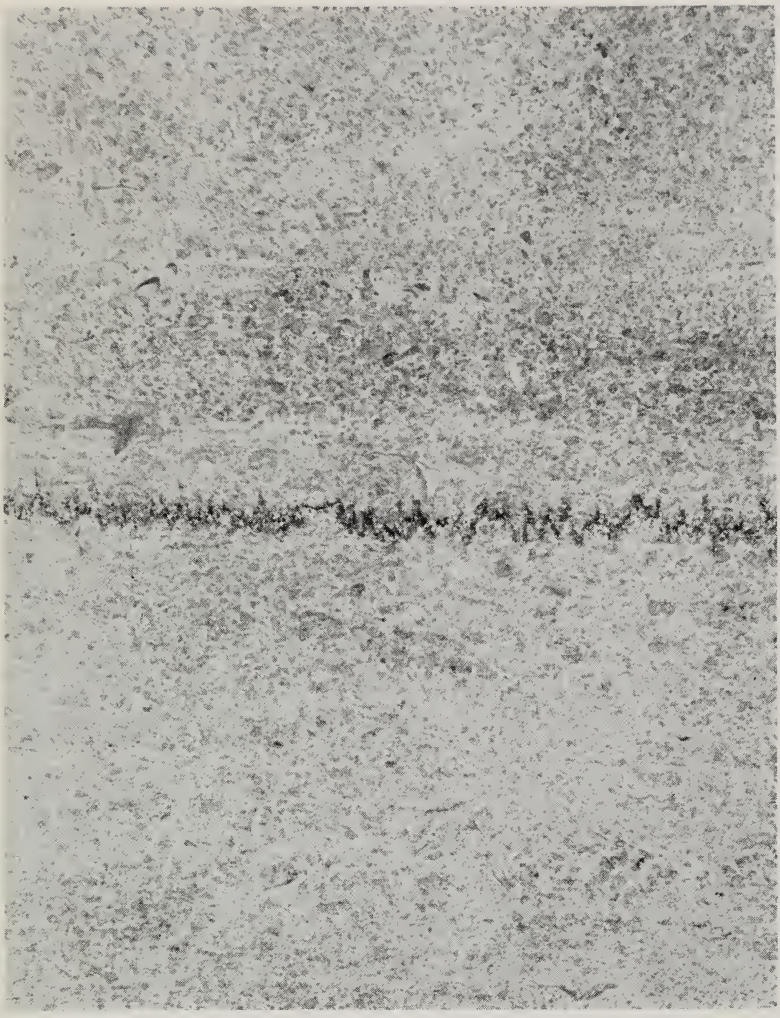

FIG. 6.—Limestone marble from the Burlington formation near Quincy. Cut at right angles to the bedding. Natural size.

The St. Louis limestone and to a lesser extent the Salem limestone are exposed at many places in District 3. Areas where outcrops are relatively numerous include those around Alton, central Jersey County, southern Calhoun County, western Adams County, and Hancock County. Fewer outcrops are found in parts of McDonough, Schuyler, Brown, and Scott counties. The Salem formation is about 75 feet thick and includes limestone and dolomite. Among the varieties of limestone are oolitic stone, stone composed largely of fossil detritus, fine- to medium-grained stone, and earthy limestone. Some deposits are cherty. Colors are mainly shades of gray to almost white. The dolomite is generally fine grained and brown or buff, some of it relatively soft. Stone slabs for various purposes probably are obtainable from selected deposits. Some of the oolite and other thick-bedded strata may serve as sources of cut stone for interior decoration and exterior construction.

The St. Louis limestone has been used extensively at Alton as an exterior building stone. The formation is 170 to 240 feet thick. It is largely fine-grained limestone in strata less than about 3 feet thick. The color is principally medium or light gray,

although some almost white stone is found locally. Parts of the formation are made up of a very fine-grained almost lithographic limestone which makes an attractive exterior building stone. Chert is abundant in parts of the formation. Many deposits of St. Louis could supply rough construction stone, veneering stone, rubble, flagging, and stone for making ashlar. The formation contains beds of conglomerate several feet thick which have an interesting mottled or blotched texture when polished.

Several other comparatively thin limestone formations of generally limited areal extent may afford local sources of stone for exterior construction. They include the Denovian limestone in Calhoun County, Chouteau dolomitic limestone in Calhoun and Jersey counties, and the McCraney and Louisiana limestones in northwestern Pike County and southwestern Adams County. Some of the limestones, and possibly sandstones, in the Pennsylvanian, or "Coal Measures," deposits in the east and central parts of the district may afford building stone locally.

District 4

District 4, southern Illinois, contains a variety of limestones and sandstones suitable for building stone. Limestone rubble, and flagstone are produced in the East St. Louis area; flagging, rough construction stone, and architectural rough blocks near Columbia; rough construction stone at Hecker and Shetlerville; and architectural rough blocks and other types of stone near Jonesboro. Many other limestone deposits have been used at one time or another as sources of building stone.

Sandstones have been quarried at many places in southern Illinois. Structures reputedly built from sandstone obtained locally include churches and buildings in Carbondale, the city buildings at Grand Tower and Golconda, and houses and fruit stands at various places. Recent pro-

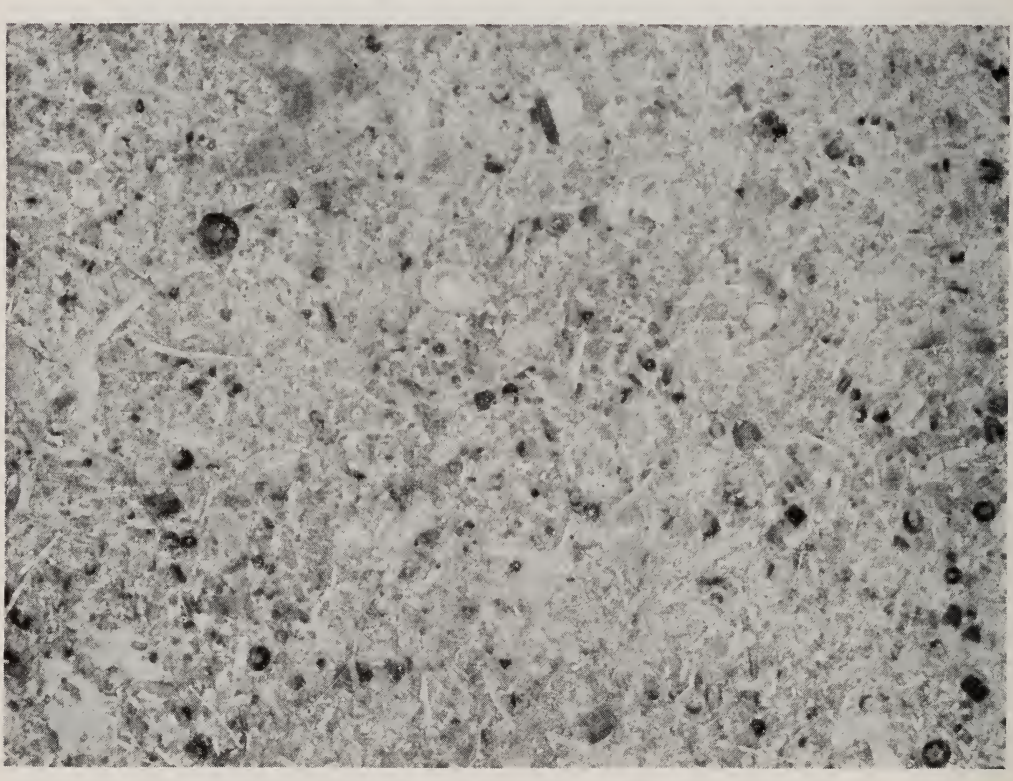

Fig. 7.—Limestone marble from the Kimmswick formation. Natural size.

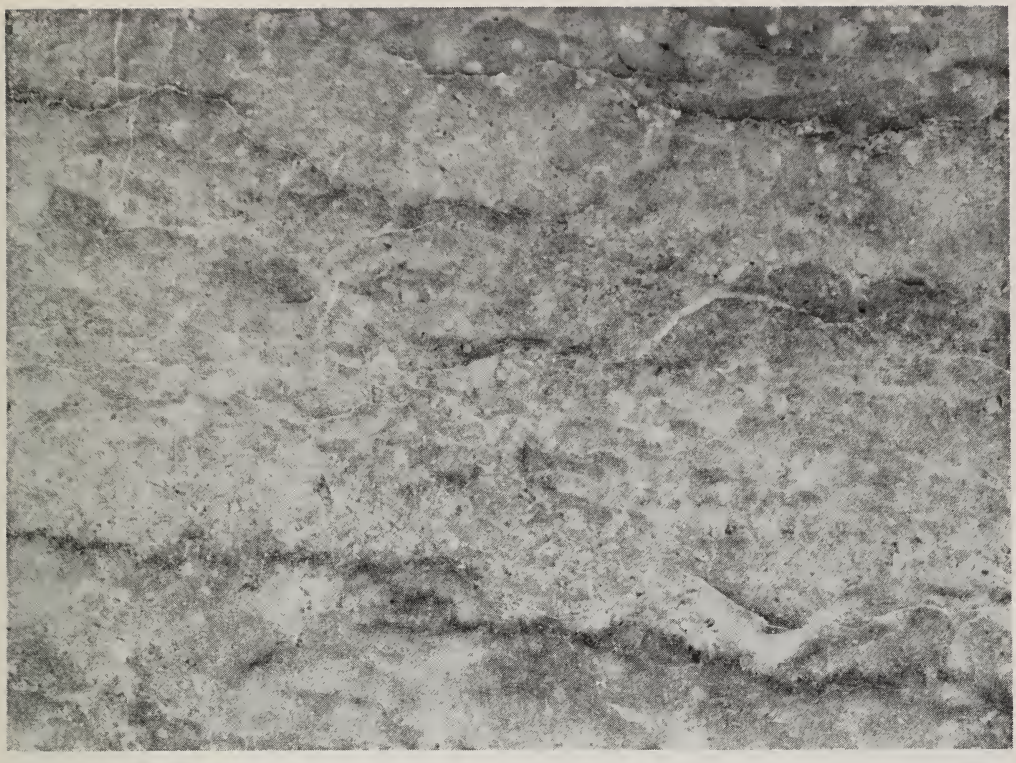

FIG. 8.—Limestone marble from the Devonian limestone, Hutchins Creek, Union Co. Cut at right angles to the bedding. Natural size.

duction of sandstone has been intermittent. Small amounts of "creek stone" have been used as rough construction stone.

Many geological formations are exposed in District 4 that offer possibilities for building stone. Those believed to be of major significance are listed below:

Pennsylvanian sandstone (youngest)
Chester sandstones and limestones
Ste. Genevieve limestone
St. Louis limestone
Salem limestone
Devonian limestone
Bainbridge limestone
Girardeau limestone
Thebes sandstone
Kimmswick limestone (oldest)

LIMESTONES

The Kimmswick limestone, which is about 100 feet thick, crops out at intervals in the bluff of the Mississippi River for a distance of about a mile south of Thebes in Alexander County, and also in the vicinity of Valmeyer in Monroe County. Much of the formation is thick bedded, coarsely crystalline, and takes a good polish. Some of the stone is pinkish, some brownish, and some of it light gray to almost white with a mottled texture (fig. 7). It has possibilities as a limestone marble as well as for other uses.

The Girardeau limestone crops out in the Mississippi bluff south of Thebes and in tributary valleys. It is well exposed in Rock Springs Hollow about 2 miles south of the town. It is 35 to 40 feet thick. The beds of the formation range between 2 and 6 inches or more in thickness, and commonly are separated by thin shale partings. The limestone is uniformly medium to dark gray. It is very fine grained, hard, brittle, and contains a few scattered nodules of chert. It may have possibilities for the production of rough building stone, rubble, veneering stone, flagstone, and ashlar.

The Bainbridge limestone is generally an impure dull red stone containing clay and clay partings, but in places, as east of

McClure in northern Alexander County, the lower 10 to 25 feet of the formation is made up of beds 2 to 4 feet thick which are reasonably pure, take a fair to good polish, and show a speckled, mottled, or streaked texture combining greenish gray or gray with red. This part of the formation may have possibilities as a limestone marble for interior decoration.

The Devonian limestones include strata of several formations, exposed principally at Grand Tower in Jackson County, in Union County, in Alexander County, and in a small area in Hardin County. In Union and Alexander counties most of the Devonian limestone is cherty, but outcrops along Hutchins Creek, north and east of Wolf Lake, and near Mountain Glen are chert-free. The cherty limestones are not regarded as promising sources of building stone, but the other limestone formations may provide slabs for various purposes. The limestone along Hutchins Creek and at some other places is well crystallized, nearly white, and takes a good polish. It has an attractive light-gray cloudy texture and may be of interest as a limestone marble (fig. 8).

The Salem formation is one of the most interesting formations of southern Illinois from the standpoint of building stone possibilities. It crops out in St. Clair, Monroe, Randolph, and Union counties, and to a lesser extent in Hardin County. It is quarried at several places for crushed stone. The formation varies but the upper part commonly includes thick strata of limestone composed of dark-gray or brownish-gray grains of calcite, which are actually pieces of fossil material (principally crinoid stems) enclosed in a lighter gray to almost white matrix. The matrix consists of finely divided fossil fragments (mainly bryozoa). The size of the granular particles varies, some being as much as ⅛ inch in diameter. In some deposits the stone is coarse grained,

Fig. 9.—Limestone marble from the Salem formation. Cut at right angles to the bedding. Natural size.

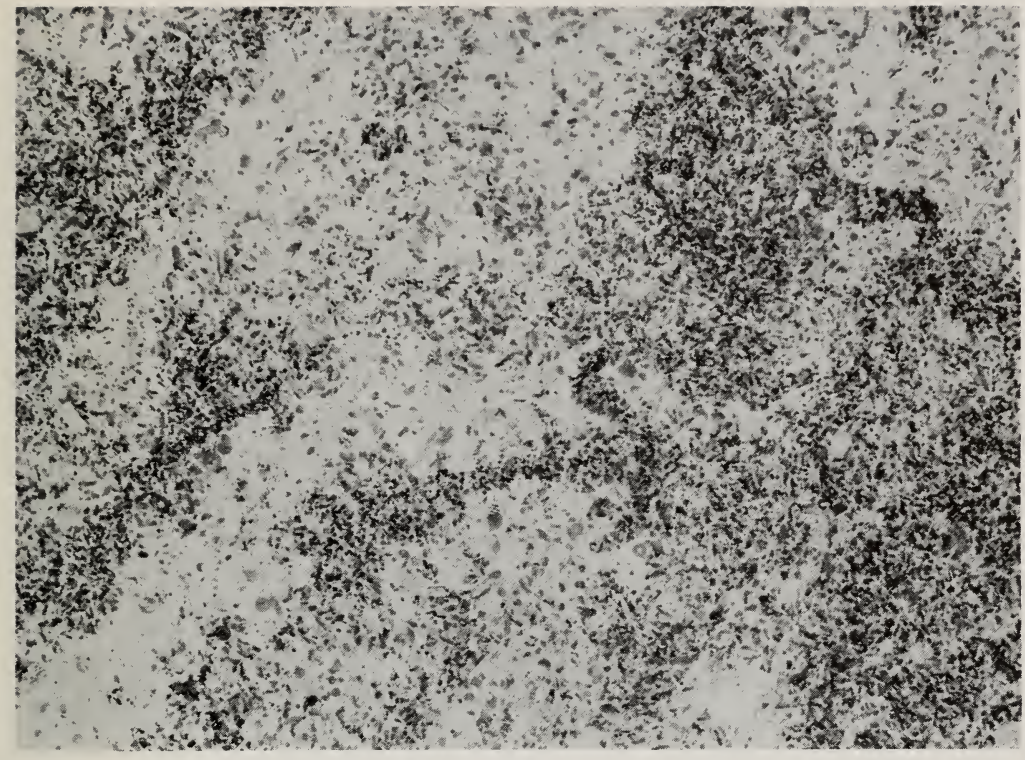

FIG. 10.—Limestone marble from the Salem formation. Cut parallel to the bedding. Natural size.

whereas in others it is medium grained. The coarser grains are arranged in bands or layers. If the stone is cut at right angles to the bedding, an interesting streaked or banded texture is evident (fig. 9). "Crowsfeet," or stylolites, are relatively abundant and further diversify the texture. Limestone cut parallel to the bedding has an irregular, spotted, and blotched pattern (fig. 10).

The Salem limestone is being worked for architectural rough blocks and other uses near the village of Mill Creek, south of Jonesboro. Marble from this area is reported to have been used for interior decoration of the Jefferson Hotel lobby in St. Louis as well as for other commercial work. Some of the stone used for exterior construction in old structures in Union County has given good service, particularly when edge-faced.

The Mill Creek type of Salem limestone is relatively soft and easy to work. In some respects it is similar to some of the well-known Bedford limestone of Indiana. The same type of stone has been noted near Prairie du Rocher, Columbia, and other places. The stone may be somewhat finer grained in the more northerly deposits than in those in the extreme southern part of Illinois.

The Salem limestone in the buffs on the Mississippi River in Monroe County locally contains a bed of light gray to almost white oolite which has a maximum thickness of about 15 feet. It occurs in thick beds and may be a source of various types of building stone, but at most places would probably have to be mined underground.

The Salem formation also contains other types of gray or dark-gray limestone which locally may be sources of building stone.

The St. Louis formation is exposed in St. Clair, Monroe, Randolph, Union, and Hardin counties. It is quarried at several places for crushed stone. Most of the stone

is fine grained, thin- to medium-bedded, and gray to light gray. Part of the formation is cherty; some portions are clayey limestone or dolomitic limestone. Some beds are very fine grained and almost lithographic. Near East St. Louis, beds of limestone conglomerate or breccia several feet thick have a "pudding stone" appearance. Other strata composed principally of fossil algal material have a gnarled appearance. These stones take a good polish and may be a source of limestone marble. Parts of the St. Louis limestone are almost black in Hardin County north of Rosiclare, and probably at other places. The beds of black stone rarely exceed 2 feet in thickness and are generally associated with lighter colored stone. They take a good polish and may serve as sources of very dark-colored limestone marble.

Stone from the St. Louis limestone has been used for exterior construction. Old structures and outcrops indicate that it gives satisfactory service provided stone that is impure, dolomitic, or shows a laminated structure is not used.

The Ste. Genevieve limestone crops out in roughly the same general areas as the St. Louis limestone with additional outcrops in Johnson and Massac counties. It is characteristically an oolite which varies from almost white through gray to dark gray and is commonly a moderately hard to hard stone. The oolitic nature of the stone is most evident in the lighter colored strata. Parts of the Ste. Genevieve formation contain chert, but some deposits are chert-free or nearly chert-free. Parts of some deposits are thin to medium bedded. The stone from the Ste. Genevieve formation has been used in a limited way for exterior construction, and appears to give satisfactory service if properly selected and used.

Most of the oolite in the Ste. Genevieve formation takes a good polish. It has a "dotted" texture, and "crowsfeet," or stylolites, provide variation (fig. 11). It has possibilities as limestone marble.

In some places at the top of the Ste. Genevieve formation, there is a sandstone formation as much as 25 feet thick which is locally suitable for the production of stone slabs. Although it is normally comparatively soft and locally clayey, it is said to have been used in a small way for flagstone and rough construction stone.

The rocks comprising the Chester series include limestone, sandstone, and shale. They crop out in Monroe, Randolph, and Jackson counties and in a band roughly 5 to 15 miles wide across extreme southern Illinois. Most of the Chester series is an alternation of limestone and sandstone formations varying in thickness from a few feet to over 100 feet. Some shale occurs in both types of formations. The limestones are commonly fine to medium grained, range from light to dark gray, and are mostly thin to medium bedded. Some of the upper Chester limestones contain strata which are almost black with a slightly brownish cast. Stone slabs for various purposes are available from some of the Chester limestone formations. The almost black limestone, and perhaps some of the gray stone, may be of use as limestone marble for interior decoration.

SANDSTONES

The Chester rocks include seven sandstone formations. Some of these are composed largely of strata 2 inches to over 4 feet thick which may provide stone for ashlar and various types of slabs. Parts of most formations, however, are comprised of beds 2 to 8 inches thick which offer possibilities for stone slabs for veneering, rough construction, flagstones, and ashlar. The Cypress formation has been used at several places as a source of building stone. A considerable amount of flagstone for sidewalks and curbing is reported to have been produced many years ago from a deposit of Cypress sandstone near Anna. Cypress sandstone has been quarried more recently near Golconda for rubble, veneering stone, and probably other uses. The city building at Golconda is said to have been built from this stone. Other formations also have been quarried for local construction purposes.

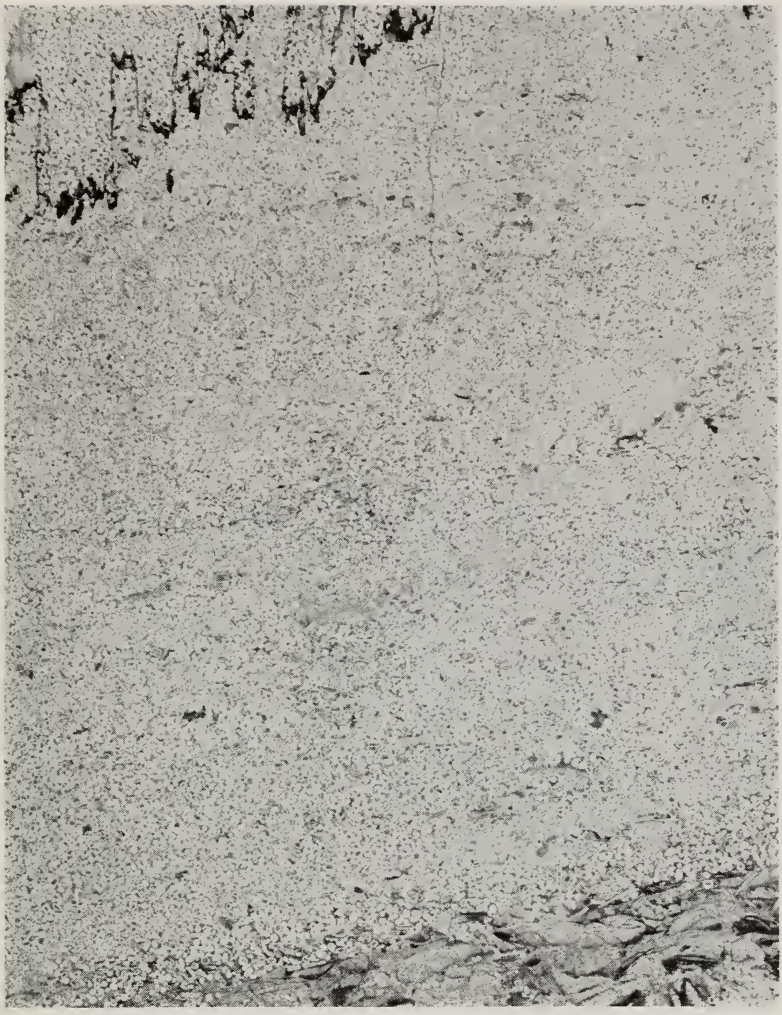

FIG. 11.—Limestone marble from the Ste. Genevieve formation. Cut at right angles to the bedding. Natural size.

The Chester sandstones generally are fine to medium grained. The cementation varies from relatively loose to firm, some of the sandstones being almost quartzitic. Colors include white, buff, gray, brown, and combinations thereof. Some deposits contain red or yellow sandstone but these colors are less common than the others. It would seem that the attractive colors afforded by selected deposits and the availability of the deposits would warrant a greater commercial development of the Chester sandstones.

Pennsylvanian, or "Coal Measures" strata are found along the eastern and northern margins of District 4. They are comprised of alternating formations of sandstone, sandy shale, and shale. Some of the sandstone formations are 100 feet or more thick. Thin limestone formations are present at a few places. The sandstones have been used considerably as building stone. An important producing center was located at Bosky Dell, about 4 miles south of Carbondale, where an appreciable tonnage of sandstone was quarried years ago. Churches and other buildings in Carbondale are constructed from sandstone said to have come from these quarries. Pennsylvanian sandstones probably have been quar-

ried at many other localities. Creek stone believed to have come from the Pennsylvanian sandstone has been used in a limited way for the construction of fruit stands and similar structures in some parts of southern Illinois.

Some deposits of Pennsylvanian sandstone are made up of strata a few inches to about 10 inches thick. Others are thick-bedded, and still others are comprised of layers 10 feet or more thick. The sandstones are white, gray, buff, brown, and combinations of these colors. A dark-red sandstone with a purplish cast occurs locally, as in the Bosky Dell quarries. Grain size varies but is generally fine to medium although beds of coarse-grained conglomeratic sandstone are present in some places. Most of the sandstones are moderately to well cemented, and some of them may be useful for rubble, rough construction stone, flagging, veneering stone, ashlar, and other purposes.

The Thebes sandstone crops out only in the vicinity of Thebes and Gale in Alexander County. It is mainly fine grained to very fine grained, gray when fresh, but brown when weathered. Parts of the formation weather to layers 1 inch or less thick; other portions are in thick layers. Some parts of the Thebes sandstone probably could be used as building stone, but care should be exercised to select stone from deposits known to have good weather resistance as indicated by actual use or from the character of outcrops.

District 5

In this District, which is mainly central Illinois, the outcropping rocks are of Pennsylvanian or "Coal Measures" age, except in the vicinity of Ottawa and LaSalle where older formations are exposed. The Pennsylvanian rocks consist principally of shale and sandstone with lesser thicknesses of limestone and coal. The limestone formations rarely exceed 25 feet in thickness and are commonly 15 feet or less thick. Many deposits of Pennsylvanian limestone are quarried for agricultural limestone and road rock. Production of flagging has been reported in recent years in the vicinity of Princeville, and rubble, veneering stone, rough building stone, and flagstone may have been produced at other places.

Most of the Pennsylvanian limestones are shades of gray. The beds range from a few inches to about 18 inches in thickness, but locally, as in the vicinity of Casey, Marshall, and LaSalle, thicker strata are present. Some of the stone at Casey and Marshall is medium to dark gray with a gnarled or mottled texture (fig. 12). At LaSalle the limestone is light gray, flecked with masses of crystalline calcite, and contains irregular, relatively large pores which give it an attractive texture. Both types of stone take a good polish. A roughly similar stone is believed present in the vicinity of Pontiac and probably in other parts of the State.

Suitable deposits of Pennsylvanian limestone could supply stone slabs for a variety of uses. Some of the thick limestone beds may be sources of decorative limestone marble.

District 5 contains outcrops of Pennsylvanian sandstones as much as 25 feet thick at a number of places. These sandstones have been used to a limited degree as sources of building stone. In general the sandstones are too soft and contain too much clay to be considered as a highly durable stone for exterior construction, but some deposits may provide usable material. The colors are principally buff and brown.

In LaSalle County in northern Illinois, the Shakopee dolomite, Galena-Platteville dolomite, and the St. Peter sandstone crop out in several places. The St. Peter sandstone is usually too loosely consolidated to be an acceptable building stone. Exposures of the Shakopee formation occur near Utica and Sheridan. The dolomite is mainly in beds 1 to 12 inches thick and is light gray. Some of the Shakopee dolomite is sandy, other strata are cherty or otherwise impure, but other beds are relatively pure. A satisfactory building stone can probably be obtained by the selection of suitable strata.

The Galena-Platteville dolomite crops out near Lowell, Troy Grove, and in lim-

ited areas southwest of Ottawa. The stone is thin to medium bedded, and buff to brown. Some of the Galena-Platteville formation is limestone with irregular branching masses of dolomite distributed through it. The fresh stone is generally a medium gray, but weathering turns the dolomite brown and produces a blotched and mottled pattern. Suitably chosen deposits should provide stone slabs for a variety of uses.

Field Stone

The distribution of field stone bears little relation to the districts in figure 1, and this discussion relates to the State as a whole. The term *field stone* is here used for cobbles and boulders, generally of igneous rock such as granite, which may be picked up from fields and along many creeks. Such stone has been used to build houses, porches, and garden structures in the northeastern part of the State, and less frequently for chimneys, interior fireplaces, and similar structures.

The field-stone boulders are not native to Illinois. They were brought into the State from the north by glaciers which spread as far south as Carbondale and Har-

Fig. 12.—Limestone marble from Pennsylvanian limestone. Cut at right angles to the bedding. Natural size.

risburg. Commercial concentrations of field stone are relatively rare, but in many areas boulders are still common on the borders of cultivated fields and along stream channels. Boulders are common in the gravels of northeastern Illinois and locally are a by-product of gravel-producing operations.

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