

**GEORGIA**  
**STATE DIVISION OF CONSERVATION**

**DEPARTMENT OF MINES, MINING AND GEOLOGY**  
**GARLAND PEYTON, Director**

**THE GEOLOGICAL SURVEY**  
**Information Circular 12**

**THE FLAGSTONE INDUSTRY**  
**OF**  
**GEORGIA**

**By**  
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# THE FLAGSTONE INDUSTRY OF GEORGIA

by A. S. Furcron

## INTRODUCTION

There is much opportunity for the development of the flagstone industry in Georgia. Flagstone is quarried locally but the producers are not able to satisfy the demands of the State. This is because quarries are operated on a small scale, and because the industry is not organized. Small producers do not maintain stockpiles to meet demands of architects, and available supplies are not on hand in Atlanta. For such reasons, much of the flagstone used in Atlanta is imported from Tennessee; yet this same type of stone could be quarried in Georgia. Our all-year good climate and styles of architecture naturally demand much flagstone in building and in landscape work. The stone is in demand also in Florida where there is no flagstone; it could be sold in other adjoining states. South Georgia is a good natural market.

### Definition:

The new uses for flagstone have made some changes in the definition of that type of rock. At present, flagstone may be defined as composing all stone slabs between three-quarters and six inches in thickness which are separated from each other by a natural bedding plane (if sedimentary rock) or along a well-defined plane of rock cleavage (if metamorphic rock). A wide variety of rocks may be used as flagstone: they include slate, thin bedded quartzite, beds of quartzite intercalated with schists, slably thin-bedded gneiss of various types (finely or coarsely crystalline) or granite slabs. Most flagstone in current use in the south-eastern states is sandstone, or various types of gneiss and quartzite.

Architects disagree on the value of various types of flagstone in use. Some dislike a micaceous stone. They say that a spangled micaceous surface produces glare and some believe that mica in a rock, if wet, causes the rock to be unsafe under foot. For many purposes, however, a micaceous flagstone is desirable. Few flagstones lack mica. The few types in which mica is absent lend themselves to a definite use, but the presence of mica adds variety which many architects and consumers desire.

The use of slate as flagstone is relatively new. In all slate quarries, large blocks of slate must be quarried from time to time, which lie close to overburden. This type of slate will not split into fine, hard, discolored and long-lasting roofing slate but, when split into slabs of required thickness, is excellent flagstone. The general decline of the slate industry in recent years has discouraged this additional use for slate.

### Uses:

Flagstone was first used in laying walks. Later, it came into use in landscape work and in stone

furniture for gardens and points of interest. Recently it became prominent as a building stone and has accessory uses with brick, granite and sandstone. Where used with other standardized building materials it tends to soften their formal styles; thus its use does not discourage the sale of stone or wood. Its use as building stone has outgrown all other uses.

As building stone, it is laid (1) as rock face ashlar in dwellings or as strip rubble in walls or dwellings; (2) "Strata" or seam-face ashlar. Where laid as in (1), the flagging layer goes back into the wall 5" to 12" depending on the height and load of the wall. In fireplaces, it runs back 3" to 6". Combinations of seam face and rock face ashlar are popular in the construction of residences. Combinations of this type are very popular about the entrances of dwellings in North Atlanta, where the warm colors of the flagstone give an added touch of hospitality.

Among interior uses the following are common.

Step treads, flooring and wainscoting, base and border trim, hearths, fireplace facings, and mantel pieces.

The following exterior uses may be listed:

Terraces, exterior step treads and buttresses, walks, borders and cappings for swimming pools, springs and streams, bathhouse floors, summer houses, strip rubble walls, chimney hips, columns, benches, tables, grills, outdoor bars, pedestals, and "stone rugs."

## GEOLOGY

The following formations in Georgia contain marketable flagstone but only some have been used:

### Pennsylvanian:

The Pottsville sandstones of Lookout and Sand Mountains in northwest Georgia (thick to thin-bedded); these are similar in age and composition to the Crab Orchard stone of Cumberland County, Tennessee.

### Paleozoic:

Certain beds in the Murphy series of unknown age are used or may be used as flagstone; also Weisner quartzite of supposed Lower Cambian age.

### Precambrian:

Graywacke and arkosic quartzite beds of several types; biotite-muscovite quartzites or graywackies, biotite mica-garnet gneisses; above types as layers separated by thin micaceous bands; quartzite beds included in biotite schists and gneisses and kyanitic quartzites. Quartzites which

mantle the older metasedimentary biotite hornblende gneisses and migmatites are common over much of the Piedmont and have been used locally as flagstone or where soft and weathered for treating soil roads.

These will be described in the order of their geologic age, the oldest first.

**Precambrian**—Flagstone quarries may be opened locally in metasedimentary gneisses over much of the crystalline area of the State. Because of deep weathering, the most likely locations are near large streams or rivers. Deposits of good flagstone are well-exposed in the valley walls of Chattahoochee River in Fulton County where the stone is quarried within the city limits of Atlanta. The beds of gneiss dip southeastward where they are best exposed in high cliffs on the southeast side of the river.

A quarry of this stone was opened upon the property of C. H. Collins, Land Lot 212, 17th District of Fulton County. The ledges of gneiss dip 35° S. 40° E. and they are cut by a prominent joint direction which strikes N. 70° W. This jointing facilitates quarry operations and also produces a brown colored straight-edge to the blocks. The beds contain a few thin quartz stringers and some small lenses and eyes of pegmatite. The rock is coarse to fine in grain and biotite gneiss and biotite-garnet gneiss in composition. Many colors may be obtained, from greenish-gray color of the fresh rock to various shades and patterns in brown produced by oxidation. This stone is sold in Atlanta.

Quarries in flagstone have been opened in biotite graywacke in other localities, especially in Fulton and Cobb Counties. It is quarried locally within the city limits of Atlanta. Colonel Roscoe Tucker once operated three flagstone quarries near Dawsonville, Dawson County.

Quartzite beds in metasedimentary gneiss was quarried on Land Lot 16, 17th District of Fulton County, near intersection of Dunwoody with Johnson's Ferry Road, and used in residences in Atlanta. The stone breaks into blocks which are reasonably flat but of irregular shape. The joint directions (N. 40° E. and N. 40° W.) facilitate quarry operations. The stone is a muscovite quartzite, white in color when fresh. The quarry stone is usually some shade of pink or brown; it case hardens after quarrying.

Quartzite beds of considerable thickness are common in Forsyth County, and in the northern part of Fulton County north of Atlanta. Beds of this type compose a ridge on the Terrell property in Hall County, several miles northeast of Gainesville. Thin-bedded quartzites, suitable for use as flagstone, occur on the D. Greenfield property, Land Lot 11, 13th District, 1st. Section and Land Lot 1218, 12th District, 1st Section of Lumpkin County. Where this type of stone is closely jointed it will not prove satisfactory as flagstone. Ky-anitic quartzites are common in north Fulton County.

Thick and thin-bedded quartzites (see "Geolo-

gy" above) if not too weathered may be quarried in the Pine Mountain area and locally over much of the Piedmont. A quarry near Conley southwest of Atlanta has supplied a flaggy quartzite with a pink shade.

Pickens, Gilmer, Fannin and eastern Gordon counties have and may produce flagstone which is usually thick to thin straight-banded, micaceous quartzite. Much flagstone of this type is quarried east and west of Jasper. It is well-exposed east of Jasper on State Highway 108 to Ellijay.

About 12 miles north of Cartersville and east of U.S. 411 just north of Bartow County line flagstone is well exposed on a branch from Dripping Spring all of the way down to its junction with Salacoa Creek. The lower portions of the outcrops are owned by Frank S. Erwin of Cedar Rapids, Iowa and Miss Genelle Erwin of Charlotte, N.C. The adjoining lot 150 (Bartow County) upstream from the Erwin property is owned by Mrs. Clara G. Hightower of Fairmount, Georgia. Above that on the branch it is owned by Mr. C. T. Fowler, Rt. 2, Fairmount, Georgia and by Mrs. Fowler. At Dripping Spring Mr. Fowler has opened a small quarry. These quartzite beds resemble those quarried in the vicinity of Jasper.

**Paleozoic—The Murphy Series** known best for its marble contains flaggy formations which can and have been used. This belt is conspicuous from the general vicinity of Tate, Talking Rock, Jasper, Ellijay, Blue Ridge and Mineral Bluff.

Highway operations west of Jasper indicate that its basal formation the Nantahala slate will produce a rough very dark gray to black flag of pleasing appearance where it is not too thin-bedded or closely jointed. It was used from a large quarry near the railroad and Cole Crossing where it was crushed for road stone.

Glenn Allen of Mineral Bluff operated a flagstone quarry in the Murphy series in the town of Mineral Bluff near the Louisville and Nashville Railroad. The stone is slaty green but varicolored with brown. This variety of flag also could be broken and used after the manner of quarry tile.

**Weisner quartzite** has been quarried on the east side of U.S. 411 about 12.5 miles north of the city limits of Cartersville. A quarry was opened by the Upshaw brothers in hard quartzite, fine grained with colorful brown and yellow staining. Flagstone has been quarried at this locality since slave days. The stone is adapted to veneering, ornamental walks, terrazzos, etc. It has been used in Atlanta, Copper Hill, etc.

**Pottsville formation.**—Sandstone of this age is widespread and thick in the Lookout Mountain section of Dade, Walker, and Chattooga counties. Although some flagstone has been quarried near Cloudland and in Chattooga County, the possibilities of this area are practically unexplored to date. Stone of similar character and geologic age is quarried on a large scale in Tennessee. Considerable flag of the Crab Orchard type has been quarried at the northeast corner of Lot 100, 11th

District of Walker County. This stone was quarried for years and was used to make walks at Rock City. A good bluish-colored flag could be quarried on Lot 66 of the same county.

### QUARRY METHODS

Flagstone quarries are opened in valleys or upon the steep slopes of valley walls. This is because fresh, strong slabs cannot be taken from upland areas where weathering is deep. Valley walls, although less accessible, offer opportunity for high quarry face with minimum overburden. Strong, firm slabs which range in thickness between one and six inches are required.

Most flagstone used will range between an inch and two inches thick. If set in concrete base, good flagstone need not be thicker than an inch. Where set in earth, it should be around two inches thick. Oxidation patterns on the surface of the stone will increase value and extends its use. Good, clean jointing is favorable, since it produces natural straight edges, but joints should not be closely spaced.

Quarry methods now in use are simple, for most of the work is done by hand. The stone is loosened and lifted from the quarry by using wedges, crowbars, 2 to 18 pound hammers, and 60% dynamite. The stone is allowed to dry after it is quarried. The jasper stone is said to split better when dry. In all cases, it should be cured for a day or more before sales, in order to eliminate flawed slabs. Overburden rock may be blasted with dynamite in hand drilled holes. Flagstone cannot be blasted out, because careless use of dynamite will ruin a quarry. Wedges, often hand-made from auto and truck springs, are much used, but call for considerable skill and experience. They range from one thirty-second to three inches thick averaging between one-eighth and one-quarter inch thick.

When stone is quarried under lease, it is customary to pay the owner one cent a square foot, which amounts to about 10% royalty. One producer in the Jasper area estimated (in 1940) the total cost of production at 5¢ a square foot. The quarrying of flagstone, unlike many other types of mining, does not injure forest or agricultural land. Rock which will not satisfy one order is laid aside to await another.

There need be no waste in a flagstone quarry for there is a job for every type of stone which is taken out. Stone which fails to satisfy other markets may be sold as rubble. Jasper stone is too hard to saw. Finished edges are made with a three-quarter inch chisel and two-pound rock hammers.

### PRICES\*

The stone is usually sold in random shapes and colors. Tennessee producers state that rubble stone sold for veneer competes very favorably with a good grade face brick. Peculiarly shaped pieces, or pieces of unusual colors, are especially valued in landscape work, thus bringing special prices. Prices for random stone range between 8c and 25c a square foot delivered, but when cut to specifications, prices are higher. Stone is sold according to thickness and general quality. The average price current in Atlanta is about 10c a square foot. About 140 square feet of one-inch Jasper stone will weigh a ton and at current prices is worth delivered about \$14.00. The rock is sometimes bought by the "perch" (2¼ tons of stone). Orders calling for bids from 6,000 to 12,000 feet are regarded as good jobs. Fifteen per cent extra stone is added when flag is laid in cement because of waste in construction.

### CONCLUSIONS

It is apparent from this brief outline that Georgia has ample supplies of various types of commercial flagstone. Much flagstone is used in Atlanta, which has a large and rapidly growing residential district. Markets could be developed in other cities in the State as well as in adjoining states yet, at present, much of the flagstone used as building stone is obtained from other states.

The rock is quarried at present on too small a scale; quarry methods should also be improved. Because of limited production, producers are not able at times to bid on large jobs; at other times, the stone is quarried after the order is taken, in which cases bad weather may interfere with delivery. Quarrying on a large scale should be supplemented by maintenance of adequate supplies at a central storage yard in Atlanta or other key cities. This would standardize the market for the stone, permit selection to meet special needs, and so insure quick delivery.

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\*These are 1940 prices. Very little flagstone is produced now because hand labor is difficult and expensive to obtain. It might be profitable to blast, and then remove the stone with large dozers. This, under favorable conditions, should produce great amounts of useful flag which could be salvaged from the rubble and thus make the industry profitable.

# USE OF FLAGSTONE IN GEORGIA

by A. S. Furcron

Flagstone has become an important building stone in the South. It is still used for laying walks for which purpose no other type of stone has been able to supersede it. Lately it has been much used in landscape work and in the preparation of stone furniture for gardens and cozy spots about the lawn. Recently it has come into prominence as a building stone where it competes with many other types of dimension stone. Where used with other standard building material it tends to soften their formal styles.

As a building stone, it is laid (1) as rock face ashlar in dwellings or as strip rubble in walls or dwellings; (2) "Strata" or seam face ashlar. When laid as in (1), the flagging layer goes back into the wall 5 inches to 12 inches depending on the height and load of the wall. In fireplaces it runs



A strip rubble wall. The Street Marker also is of slate.

back 3 inches to 6 inches. Combinations of seam face and rock face ashlar are popular in the construction of residences. Combinations of this type are very popular about the entrances of dwellings in North Atlanta, where the warm colors of the flagstone give an added touch of hospitality.

Among interior uses the following are common:

Step treads, interior flooring and wainscoting, base and border trim, hearths, fireplace facings and mantel pieces.

The following exterior uses may be listed:

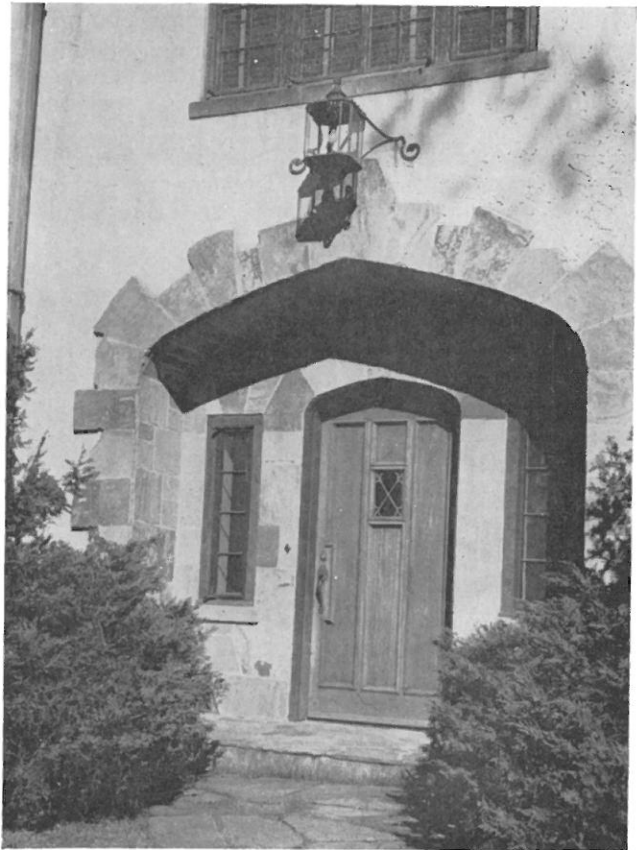
Terraces; exterior step treads and buttresses; walks, borders and cappings for swimming pools, springs, and streams; bath house floors, summer houses, strip rubble walls, chimney hips, columns, benches, tables, grills, outdoor bars, pedestals and "stone" rugs.

At present, the flagstone industry is much undeveloped in the South. There are various reasons for this: Although much flagstone is now used as a building stone, quarriers have not been de-

veloped to keep pace with the demand. In Georgia, flagstone quarries are still operated on a small scale so that a considerable amount of flagstone is imported into the State from Tennessee, although flagstone similar to the Tennessee type could be quarried in Georgia. The use of flagstone in building and landscape work demands considerable artistry and at times it is difficult to find workmen who are sufficiently well trained to follow the architect's plans. It is entirely possible that a producer could quarry and cut his flagstone to specifications as do marble and granite producers, although at present this is not done.

The use of flagstone in building and in landscape work is particularly suitable to the South. Our all-year good climate and less formal styles of architecture naturally require a considerable amount of flagstone.

Flagstone may be defined as composing all stone slabs between 3/4 inch and six inches in thickness which are separated from each other by a natural bedding plane (if sedimentary rock) or along a well-defined plane or rock cleavage (if metamor-



Georgia flagstone used as facing around entrance of stately residence in Atlanta.

phic rock). True slate and granite slabs are not regarded as flagstone. Many types of flagstone occur but only a few have come into use thus far.

The well-known "Crab Orchard" stone of Tennessee is quarried extensively in that State and has been quarried to some extent in the Lookout Mountain region in Georgia where it is abundant. This stone is a sandstone or quartzite delicately colored in various patterns by ferric oxide. The stone lacks mica thus, for some uses, is preferred to some other types of flagstone.

In the ancient pre-Cambrian gneisses of Georgia many types of flagstone are present. Between Mineral Bluff and Jasper, and particularly around the town of Jasper, Georgia, much graywacke or micaceous quartzite is quarried. This stone is taken out in slabs of almost any size, the beds possessing great uniformity in thickness. Most of this stone is sold in Georgia, Florida and in other states where it sometimes goes under the name of "Cherokee" flagstone. Where fresh, the stone is blue-gray in color but all varieties of coloration may be obtained where beds have undergone some oxidation.

In the Carolina gneiss there are possibilities of flagstone. In this formation, there occur quartzite slabs which possess a peculiar pink color. Kyanitic quartzites occur north of Atlanta in Fulton County. Biotite-muscovite gneiss and biotite-muscovite-garnet gneiss have been quarried and successfully used in Atlanta and other sections.

Much flagstone is now used in the construction of new residences, particularly in the northern part of the city of Atlanta. Atlanta has one of the finest residential sections of any city in the country and the use of flagstone in the newer buildings is adding much pleasing variety to construction.

Flagstone quarries are opened in valleys or upon the steep slopes of valley walls. This is because fresh, strong slabs cannot be taken from upland areas where weathering is deep. Valley walls, although less accessible, offer opportunity for high quarry face with minimum overburden. Strong, firm slabs which range between one and six inches are required.

Most flagstone used will range between an inch and two inches thick. If set in concrete base, good flagstone need not be thicker than an inch. Where set in earth, it should be around two inches thick. Oxidation patterns on the surface of the stone will increase value and extend its use. Good, clean jointing is favorable, since it produces natural straight edges, but joints should not be closely spaced.

Quarry methods now in use are simple for most of the work is done by hand with negro labor. The stone is loosened and lifted from the quarry by using wedges, crowbars, 2 to 18 pound hammers, and 60 percent dynamite. The stone is allowed to dry after it is quarried. The Jasper stone is said to split better when dry. In all cases, it should be cured for a day or more in order to bring out flaws before meeting specifications in orders.

Holes for blasting are hand drilled. Flagstone cannot be blasted out, thus careless use of dyna-

mite will ruin a quarry. Thick layers over the flag or overburden may be blasted.

Wedges, often hand-made from auto and truck springs, are much used; their use calls for considerable practice and experience. These wedges range from 1/32 to 3 inches thick, although the average wedge in use is between 1/8 to 1/4 inch thick. Negroes employed in the quarry have a personal name for each wedge: "Aunt Ella" and "Ol' Mis' Mary" refer to wedges of different but definite thickness.

When stone is quarried under lease, it is customary to pay the owner one cent a square foot, which amounts to about 10 percent royalty. The quarrying of flagstone, unlike many other types of mining, does not injure forest or agricultural land. One producer in the Jasper area estimates the total cost of production at 5c a square foot. Rock



House in seam or strata face ashlar finished off with wood shingles of similar color.

not used to fill the order is laid aside. There need be no waste in a flagstone quarry for there is a job for every type of stone which is taken out. Stone which fails to meet orders may be sold as rubble. Jasper stone is too hard to saw. Finished edges are made with a 3/4-inch chisel and two-pound rock hammers.

The stone is usually sold in random shapes and colors. Tennessee producers state that rubble stone sold for veneer competes very favorably with a good grade face brick. Peculiarly shaped pieces or pieces of unusual colors are especially valued in landscape work, thus bringing special prices. Prices for random stone range between 8c and 25c a square foot delivered but, when cut to specifications, prices are higher. Stone is sold according to thickness and general quality. The average price current in Atlanta is about 10c a square foot. About 140 square feet of one-inch Jasper stone will weigh a ton and, at current prices, is worth delivered about \$14.00. The rock is sometimes bought by the perch which requires 2 1/4 tons of stone. Bids of from 6,000 to 12,000 feet are regarded as good jobs. Fifteen percent extra stone is added when flag is laid in cement because of waste in construction.

For current producers of flagstone, consult most recent issue of Directory of Georgia Mineral Producers, Circular 2, of the Georgia Department of Mines, Mining and Geology.