A REPORT UPON THE VARIOUS STONES USED FOR BUILDING PURPOSES, AND FOUND IN INDIANA.

In submitting the following report I feel it necessary to state that throughout its preparation I have kept in view the practical rather than the technical aim. The object of such a report seemed to me to be, in the first place, the development of quarrying and kindred industries in the State. A strictly scientific geological report would require a minute detailed survey of the whole area considered, and a long and exhaustive study of the facts. The survey made by me, while it has been close and comprehensive, has been for the purpose mainly of describing and of comparing the practical value of stones suited to the various architectural and engineering demands of a great and growing population.

While I do not claim that the report is exhaustive, I feel sure that it will serve to call larger attention to the quarry wealth of our State.

While the aim of the Legislature in establishing a geological department of the State had in view the advancement of natural science, it also was intended that every mineral, in fact every physical resource of Indiana should be examined and reported upon with a view to commercial progress and the advancement of every desirable line of internal development. With this in mind I have made my examinations of the building stones of Indiana, and have chosen to make my report in terms that will render it perfectly comprehensible to the ordinary reader, and yet I have attempted to give all that is at present known on the geological as well as the commercial side of the subject.

The study of limestones and sandstones has been particularly careful, and upon these the report will be found much the fullest that has yet been made.

Architects, engineers, contractors, quarry owners, operatives and masons are constantly searching our State reports for information, and it is to give this information that I have labored. Some years of experience as a civil and mining engineer have enabled me to know about what should be given in a sketch of this kind, and I hope I have not failed to embody the main facts in an intelligible form.

Not only have I examined the principal outcroppings of building stones in this State, but, in order to bring all the useful facts of other men's discovery into my report, I have gone all over the State reports and have taken out such matter from them as seemed most useful for my purpose.

This report, then, may be safely taken and relied upon as embodying everything at present known upon the subjects treated, in so far as commercial building stone is concerned.

MAURICE THOMPSON.

INDIANA BUILDING STONE.

BY MAURICE THOMPSON.

The value of building stone is not yet properly appreciated by the American people, especially in the Middle, Western and Southern States, where timber is still plentiful and comparatively cheap. In the older countries, throughout historic times, it has been different, and the consequence has been that American architecture compares very disadvantageously with that of Europe; indeed, architecture as an art, and building on a permanent plan, have never found just honor in the ambition of Americans. We have but few public or private buildings that for beauty or symmetry of design or for solidity and strength of construction can compare with the ancient or modern buildings of Europe. It can not be said that this is due wholly or in the larger part to our want of artistic instinct, or yet to poverty, for Americans have shown no lack of art in other directions, and certainly we have grown rich faster than any other people ever did.

It has been said that the monuments of architectural skill have ever been the index of civilization, and that the true standard of a people's character is evidenced by the buildings erected by that people for public or private purposes. Doubtless the extreme rapidity of our growth as a nation from a few poor and weak colonies along the Atlantic coast to a first-class power in political, military and financial significance, has of itself necessitated the neglect of many of what are called the ornamental acquirements; but, no matter how furious our rush after wealth, no matter how swiftly has swelled our tide of numerical increase, no matter how startling and brilliant have been our achievements in war, politics and finance, if we have failed to appreciate the durable part of art and have neglected setting in permanent form the peculiarities of our imagination, we have fallen short of just that which will tell to future ages in the most unmistakable language the true history of our national life.

For durability under all conditions there is no material for building purposes equal to stone. Bronze is too costly; iron oxidizes and is subject to great changes in volume under the exigencies of temperature; brick are too apt to crush under great weight and are unequal in strength, to say nothing of the objectionable amount of mortar that must be used in laying them; all kinds of concrete fail in one essential or another, and wood is the great generator of conflagration. Granite, limestone and sandstone are the three perfect materials for the architect and the artist. It is of these that all eternal monuments of man's genius must be built. The perfect statues of the Greeks were cut in limestone, and modern sculpture has used the same incomparable material. The pyramids, the temples, the cathedrals, the palaces, all are of stone, and the remarkable ruins of forgotten cities found in Egypt and in Asia have been left to us by Time, the great destroyer, because they were built of the only material that can not be destroyed by the ordinary chemistry of nature.

Building stone is extremely plentiful in nearly all of our States, and much of it is unsurpassed in beauty, workability and strength. No European granite really surpasses, even if it equals, that of our Eastern and Southern States, and our sandstones are of every variety of color, texture and quality. As for our limestone, it is unquestionably the best in the world.

It is a subject of interesting and instructive inquiry, and it may be of value here to take a swift glance at the causes that have operated to hinder Americans in coming to the general use of building stone in the construction of public and private edifices. Undoubtedly one of the chief objections commonly arising to the use of stone is the cost of procuring it. We are, and have been from the first, a widely scattered people; our cities and towns are far apart, and we have not been a nation of road builders, railroads excepted. Our common highways will compare unfavorably with the meanest in Europe. The transportation of stone requires solid and durable highways. On account of the weight of the material, this transportation is necessarily slow and its operations exceedingly laborious. Then, until recently, the cost of quarrying was great, even under most favorable conditions. When the stone had to be drilled by hand and blasted with powder, hoisted with rude derricks and loaded upon common wagons, to be drawn long distances by oxen or horses, it was indeed a vast undertaking to supply the material for an arched bridge or for a considerable church, to say nothing of larger structures. Still the very poorest of our modern appliances for handling stone have been probably far more efficient than were possessed by the ancients who built those marvels of architecture and hoisted to their places those stupendous blocks which would appear to us absolutely unmanageable with all our boasted improvements in machinery and knowledge of mechanics. Mere cost, then, has not been the sole cause of our neglect of stone. Hurry has, perhaps, fixed upon us the natural result of haste. We have been home-builders, content with any home that could be had quickly. So, in business life, any structure has been deemed sufficient if it would temporarily serve the purposes of business. Towns and cities have been erected as if by a species of magic, rising out of our prairies or in our forests like the trick pictures in a kaleidoscope. No sooner were these places built than they were thronged with an energetic, restless populace, bent upon trade and commerce. There has been given small thought to the distant future—everything has been constructed to meet a sudden present need. The burning of Chicago was no lesson for Seattle, nor has the recent destruction of the latter city been sufficient warning to other rapidly growing places. Haste to build and to reach the fruits of trade at the earliest moment, so as to forestall, in the greatest possible degree, that competition which gradually depresses business and shortens profits, has outweighed every consideration of permanency, and every thought connected with a long commercial perspective. But all this bustle and slipshod hurry, while it has, in a way, pushed forward a certain order of prosperity, has left us with few lasting improvements in the best sense of the phrase. Doubtless there has been, quite recently, the beginning of a change, and we shall soon feel the effect of a general impulse toward that permanency which has always been the best foundation of civilization. Stone structures are the indices of well-founded wealth, and as this wealth comes the structures must follow. Fire-proof cities and towns, noble piles of solid and enduring architecture and homes that shall become hereditary abiding places, are not incompatible with the republic in its highest and freest form. Indeed, the republic is the foster-mother of the true home and all that home should signify.

Geology is but a dry and useless science, fit only for the crooning of the hermit, specialist and the dusty-brained theorist, if it can not afford practical aid to the masses of the people. Of what use is all this study of the rocks if it be but to satisfy curiosity or to furnish links in idle theories? The highest aim of every science should be the permanent betterment of human life. Geology is not without this aim, and it has contributed and will continue to contribute to the store-house of practical human benefits by informing the people upon subjects that lie close to their material prosperity, while at the same time it has never, and it never must, let go the other strand of its usefulness which attaches to the purely scientific study of the Earth's contents. Pure science, in its last refinement, is pure common sense applied to the investigation of nature; if it is not this it is not worth having. With this view of the purposes and objects of geology, the following report upon the building stones found in Indiana has been made after a careful survey, and in the light of all the facts obtainable. To set this building stone before the world, as it should be set, with simple truth to the facts as they are, is the chief purpose of the report. In order to make it as nearly exhaustive as possible, it has been thought best to examine the different stones in their order, to-wit:

First. Granite and its kindred formations.

Second. Sandstone.

Third. Limestones in general.

Fourth. The Oolitic Limestone.

Before taking up this order, however, it will be necessary, especially in the interest of the reader not versed in geology and its cognate sciences, to give a concise description of the geological formations, so far as they are known, in Indiana.

So far as understanding the nature and position of the available building stones of the State is concerned, we need not consider any but outcropping rocks. In the geological sense, rock is a term used to designate any earthy or stone formation, and it includes clays, shales, chalks, sands and marls, as well as stones proper. Thus when we speak of a rock formation we do not necessarily mean that the formation is composed wholly or, perhaps, even in part, of solid stone. For instance, the Niagara rock of the Upper Silurian formation often is a soft, dirty shale, and the clays found in the Carboniferous formation are as much rock as the hardest limestone.

The stratified rocks outcropping in places in Indiana belong to one or another of three great geological ages: the Silurian, the Devonian or the Carboniferous.

The Silurian formation is divided into two easily distinguishable parts called, respectively, the Upper Silurian and the Lower Silurian. The Lower Silurian is the lowest and, therefore, the oldest formation outcropping in the State. Beginning with this as the base, a general section of Indiana's stratified rocks would show the following series:

Lower Silurian.

Upper Silurian.

Devonian.

Carboniferous.

Above the carboniferous rocks over a large part of their area lie the Drift and alluvial deposits.

What are known as the Hudson River limestones and shales compose the greater part of the outcropping Lower Silurian formation in this State, and these outcrop chiefly in the southeastern counties, and appear as far north as the vicinity of Richmond, in Wayne County, their greatest western exposure being on the Ohio River, in Clark County.

The Upper Silurian formation is chiefly Niagara shales and limestones, and for the purposes of their study we need consider only the limestones.

The Devonian rocks in this State are the Genesee black shales and the Corniferous limestone, the latter being the only stone worthy of the builder's notice, and is not of the best.

The Carboniferous formations are numerous and exceedingly interesting, as they include all our coal and all our best building stone.

The following section, beginning with the lowest group of rocks in the Carboniferous, and running up to and including the highest, will serve as a guide to the unlearned reader:

GENERAL SECTION OF THE CARBONIFEROUS ROCKS IN INDIANA.

Knobstone.
Keokuk.
St. Louis.
Chester.
Coal Measures.

Each of the above divisions is a group of varying stratified rocks with characteristic fossils and other peculiar features by which the geologist may easily distinguish it.

The sandstones, to be considered at the proper place, are mostly found in the Chester group and in the various divisions of the Coal Measures. The best limestones, for building purposes, are found in the St. Louis group, the "Oolitic" being the very best limestone ever yet discovered in America.

The only granite or other primary rock found in Indiana is in the form of bowlders, many of them very large, transported hither during the Drift period, by glacial forces, from Canada. It is, therefore, scarcely worth while to give much space to a discussion of this the most durable of all stones. Many of our magnificent bowlders, however, are worthy of being cut and set in our public buildings. Ofttimes they are of exceeding beauty, showing a grain and a coloring equal to the finest specimens of Scotch or New Hampshire stone. Where they are plentiful, cumbering (as they do in some places) the surface of the ground, they can be made available for foundations and for rustic monuments, for the curbing of wells, and for various ornamental purposes. By breaking them up they can be turned to excellent account for making rubble walls, and various forms of rough masonry, both picturesque and indestructible. As bases for the posts of iron fences, for the ornamental walls of fountains, even for building small rustic out-houses, there can be no more suitable material. Especially in prairie countries no bowlder of granite, greenstone or compact gneiss should ever be destroyed, but should be kept for use.

Before passing to the consideration of our sandstones and limestones in the order already indicated, it will be useful to examine the question of building-stones in general, so as to be able to distinguish between those that are most valuable and those suited only to certain purposes.

It has already been said that granite is the best of all building stones when once it has been cut and set; but it has many objectionable features, not the least of which are its hardness and its remoteness from a large part of our country. Very difficult to quarry and extremely hard and expensive to cut into shape, it must always be beyond the reach of the ordinary builder, who must look for material at once fire-proof, durable and comparatively inexpensive.

Brick, the commonest sort of artificial stone, have long served the purposes of architecture in lieu of natural stone, but, as has been noted, the amount of mortar necessary to laying them, the inequality of their strength and their inadequacy to withstand a very great crushing force, render them by no means perfect building material, especially where the structure into which they go is one of great weight. Moreover, after long years of exposure, most brick walls will show the effect of cold, heat, dampness, atmospheric forces and the results of unequal distribution of pressure. And even while the structure retains its general integrity, its beauty will be greatly marred by these and other causes incident to the imperfection of the materials. This has led to the adoption of stone facings for the fronts of many of our more pretentious city buildings. Indeed, more and more every year we are creeping on toward the "Stone age" of American architecture. Iron structures may prevail for a time, especially where very tall structures are desired, but nothing can ever set aside the final demand for a cheap and perfect building stone. Concretes have been tried and have utterly failed. In short, it would appear that nothing but the natural stone quarried from the rocks of the earth can be wholly relied upon for the best architectural results.

The qualities necessary to the best possible building stone are: Workability, durability and beauty. It must also be cheap.

Workability includes in its meaning accessibility, a ready yielding to quarrying operations, the absence of refractory qualities under the hammer and chisel, and a texture and grain that will hold decorative finish.

Stone that can not be quarried readily has the disadvantage of great cost to begin with. If the "raw material" is expensive, the finished product must be costly. On the other hand, if nature has so deposited her stores that the stone is easily taken from the quarry, still if the material is refractory in the final cutting and finishing, no matter what may be its other qualities, it can not be a very cheap material for the builder, as it will demand an over amount of expense and delay in preparation. Still less will it be desirable if it obstinately refuse to hold finish or decoration. Stone that comes from the quarry soft and yet somewhat tough, but hardening after a time, has the finest quality of workability. This renders it easy to quarry, very responsive to the tools of the cutter, and capable of taking easily and holding permanently the finish and decorative designs of the architect's specifications. It must be kept in mind, however, in examining stone, that if it comes from the quarry wet, and for that reason easily workable, it may again take up water after drying, which would be most objectionable; but if in the process of drying in the first place it pass through a chemical change which will render it ever afterward impervious to water, the quality is just what should be wished for in this regard. Usually an examination of the out-cropping surfaces of the stone in place will give a safe knowledge of its value as regards workability. Next after the character of the stone regard must be had touching the conditions of its deposit. Too much overlying matter, whether stone or earth, will usually make the quarry work very heavy and expensive. This overlying matter, technically called "stripping," is, as a rule, quite worthless, and must be entirely removed before the stone can be worked with steam channelers or other quarrying appliances, hence the necessity of a careful examination to determine its nature and extent in each case before opening a quarry.

Durability, as applied to building stone, includes every quality tending to make the material lasting and unchangeable after it is laid in a structure. These qualities are many and often seemingly conflicting in their nature. Hardness, elasticity, tensile strength, power to resist the greatest crushing force, imperviousness to water and invulnerability to the attacks of air and its corrosive and disintegrative burdens are some of the qualities, but not all. Evenness and homogeneity of composition, unity of substance, so to speak, and the power to resist extremes of heat and cold are quite as necessary. It will be seen at once that chemical analysis must be relied on to insure the best knowledge of some of these requirements. Some otherwise good and durable limestones will become corroded and discolored and have their integrity destroyed by the effect of sulphurous smoke from the burning of impure coals; others will be injuriously affected by the action of rain-water, and still others by the oxidizing power of the air. Some sandstones bear too much iron in their composition, others lack sufficient cohesion of the particles, whilst others yet are clayey or unequal in grain or texture. Every test of practical science should be given to stone before it is used in any building intended to be a permanent structure. As a rule, if the outcropping ledges are found to be infiltrated with water, which makes the outer surface constantly damp, the stone will not be good, for this would indicate that it would take up too much moisture in the wall. Still, it is often the case that an apparently over-hydrous stone will dry out permanently after it is quarried and cut. Many of the sandstones, notably the better qualities of conglomerate, are of this character, and so soft when first taken out that they may be cut to any rough shape with a common ax or hatchet, but hardening after a few days' exposure so that water will not affect them.

The elasticity of stone may be tested by sawing it into long, slender strips, say two inches square and three feet long, when, if it be quite perceptibly flexible, its elasticity is good. If such a bar be suspended so as to hang free by a string and is struck a light blow with a hammer, its evenness and solidity of fiber will be attested by a clear, sweet, metalic note, not unlike that of a fine bell, or that of a well-tempered steel bar. As a rule the best stone will break with a direct line of fracture; but it may be conchoidal or otherwise indirect and still be unobjectionable. Parallel lines of cleavage or of stratification are always favorable indications where other features are promising.

Resistance to crushing weight may be pretty safely inferred from solidity of texture and evenness of grain; but it is always necessary before a final acceptance to submit the material to the severest tests of an apparatus for that purpose. This will be described in the proper place.

In examining sandstone, with a view to building purposes, the outcropping, if there be any, should be carefully scanned with a view to discovering what effect long exposure to the atmosphere and the rigors of winter may have had upon it. If the stone has "weathered" badly this will be shown by one or another sign of disintegration or demolition, and a talus of fragments and sand will be found formed at or near the base of the outcropping cliff. Often the substance of the rock will show unmistakable evidence of inequalities of structural composition, such as horizontal cavities caused by the weathering out of seams or streaks that, on account of bearing too much iron, have oxidized and crumbled away. Such stone, if used in a building, would prove worthless and, therefore, dangerous. It is often the case, as I have observed during a long experience in civil engineering, that public bridges erected by counties are rendered unsafe by having their piers and abutments constructed of this kind of stone, and that, too, in places where most excellent material lay near at hand, and which a little knowledge of the nature of stone would have pointed out to the superintendent. Too frequently it happens that appearances of the most untrustworthy kind are relied upon where an ignorant person is set to do work which ought to be in charge of a skilled and well-informed engineer.

In judging of the probable durability of limestone, before subjecting it to any test of science, the same observations should be made as in the case of sandstone, with a view to ascertaining its weathering qualities. Any unequal discoloration of the face of the exposed ledge should be scrutinized carefully. Usually these are caused by the presence of iron in the composition of the rock. But limestones are much more injuriously affected by hidden faults of composition than are sandstones, and for this reason they demand a much more careful examination before any extensive quarries are opened. It is often the case that iron in limestone will do no more than discolor the outer surface on exposure to the action of air and rainwater; but even this is a serious defect when the stone is to be used in any structure wherein beauty is a chief object. For the rough masonry of ordinary bridges, and for the hidden foundations of buildings, a cheap and durable stone is what is most wanted, and in these discoloration is not a fatal fault.

Beauty, when applied to any building material, includes all the good qualities already enumerated with the added value of a pleasing color, or combination of colors, and a general effectiveness of appearance when the structure in which it is used has been completed. The variegated granites undoubtedly are the most beautiful of all building materials. Next to granite, the red and brown sandstones are most pleasing to the eye; but the white, gray and blue limestones are very effective, and they have the advantage over granite in that they work much more easily in ornamentation, while they take figures in relief with far more clearness of outline than do the sandstones as a rule. Architects have long since discovered the pleasing effects to be produced by using different kinds of stone in the same building, placing each where its particular qualities will best serve the general motive of the design.

As a rule, all else being equal, the stone which holds its native color best will be most beautiful in a building, and of the stones which change color, that will be most desirable which changes least and evenly. Some of the gray sandstones, however, change color unevenly and give a striking and ofttimes picturesque cloudiness to the surface, which adds to its effectiveness of color in a wall. The nearly white limestones that take on by exposure a dark cream-brown hue, if they do not contain too much magnesia, hold that tint very well and are quite beautiful. As a rule the presence of many large animal remains in a stone is objectionable on account of the tendency of such a composition to crumble; but where fossiliferous rock is durable it will usually be found very beautiful when cut, the organic remains bossing it over with variegations that greatly heighten its appearance. Stone which contains large fossils is not, however, the best for receiving raised ornamentations, such as figures in relief, no matter how durable and beautiful it may be, for the animal form will interfere with nicety of cutting and polish, as well as with the regularity of the figures. Fossils will usually be found harder than the matrix in which they are set, but this is not always the case, for quite often the form is that of a hollow cast or impress, filled in with material which crumbles easily. As a rule fossils, though very hard, are but loosely set in sandstone, and often they are very large and rough forms of plants, extremely silicious and refractory. Blocks containing these are to be avoided as probably worthless for building purposes, however valuable and interesting they may be from a scientific point of view.

Many very beautiful stones that are not durable when exposed to the weather are very valuable for the inside finishing of buildings, where they will last for ages, holding the finest tints of their coloring without perceptible change.

From what has been said above it will be seen that every owner of stone beds should, before going to the expense of opening quarries, have his rock beds examined by an expert, whose report should show all the defects as well as all the good qualities of the material. Usually this can be done without any great outlay of labor or money, for the experienced geologist or engineer can quickly discover from the stone and its surroundings the nature of the deposit, and very simple chemical and mechanical tests will settle the question of strength and durability. There are beds of magnificent building stone lying undeveloped in many places, simply for the reason that the owners are not aware of the treasure they possess. In other places quarries are being industriously worked and the stone used in the erection of costly buildings, where in fact the material is wholly unfit for use on account of its lack of durability. I have examined many extensive structures whose stone was fast crumbling away. True, a few years will not show much decay, but in the long future the result will certainly be disastrous. The constant action of the atmosphere, the expansion and contraction consequent upon extremes of heat and cold, and the disintegrating effect of rain-water slowly but surely tell upon the integrity of the exposed parts.

GRANITE AND OTHER BOWLDERS.

During the Drift period immense quantities of granite, gneiss, quartzite, greenstone and other igneous and metamorphic rocks were borne down by the glaciers from far northern areas and distributed over a large part of Indiana. The form in which the rocks are usually found is that of worn and polished bowlders, ranging in size from small pebbles to large masses weighing many tons. Many of these heavier bowlders are found lying on the surface or but slighlty buried in the clay of the drift, and could be utilized with very little trouble or expense. In some places vast fields of them appear in scattered or huddled groups, at others they are heaped in huge piles mixed with sand, gravel and clay. Much study has been given to these ice-worn wayfarers from the cold North, and much yet remains for science to do before the mystery of their situation shall be fully cleared up. Geologists are agreed in assigning to ice the power that brought them hither, but it is not yet established how the glaciers were formed or in just what way they acted. No mountain heights appear to have existed from which they could have crept down to our plains, as the glaciers are now doing among the Alpine regions of the world, nor is it easy to imagine the conditions that could have borne the almost incalculable mass of drift matter to its present resting place. Formulate any theory that we may, there is always some inexplicable obstacle to its final demonstration. To this problem many of the best equipped men of science have devoted years of the most patient and enlightened study and observation, and while the result of adequate solution has not yet been reached, discoveries have been made fixing beyond dispute the existence of a vast glacial period in the remote past, when, in some way or other, the action of immense masses of ice compelled the movement of all this drift matter in a generally southern direction from its original bed to the area now occupied by it. A rough calculation would show that in Indiana alone the granite of the drift mass would of itself, if drawn together, be sufficient to build a mountain of large dimensions. Indeed, in many places the bowlder clay is composed almost wholly of comminuted granite, gneiss and schist, the per cent. of calcareous matter being very small. At other points, however, lime is one of the chief substances of the clay.

The drift bowlders, as has already been said, are of greatly varying composition and quality. Almost every color is represented, from pure red, shading off into yellow and brown, to dark green, which runs through every lighter tint into a pale olive or a delicate celadon. The ordinary "pepper and salt" granite and the gray gneiss are very common. Many beautiful specimens of mica schist are found, especially in the northern areas of the drift. Immense bowlders of quartzite, white and almost translucent, lie here and there among their coarser fellows, looking like rough petrifactions of ancient ice fragments broken from the departed glaciers.

In Cass County, near Logansport; in Clinton County, a few miles south and west of Frankfort; in Tippecanoe County, near Lafayette; in Montgomery County, northeast of Crawfordsville, and at numerous other places in Indiana, vast "flocks and huddles" of these imperishable bowlders are lying exposed, ready-quarried for the hammer and chisel of the artist in stone. Many of these are as good as the best imported granite, and even more beautiful for monumental purposes, though they have, as yet, been very little used. It is not uncommon to find these polished fragments shot through with dykes of quartz and feldspar, and loaded with crystals of hornblende and pink mica. Occasionally clusters of regular quartz crystals appear in cavities of the stone shining like jewels in a rough but picturesque setting. Many of the bright yellowish particles, often seen in schistose rocks, have been brought to me by persons who were quite sure that they had found a bowlder of gold. The veins and dykes above mentioned usually run entirely through a bowlder, sometimes checkering the surface in a most odd and fantastic manner, the filling of the dykes being ordinarily of a different color from the rest of the stone. A close-grained, gray-blue granite bowlder, which I examined in Parke County, had dykes of pink quartz running in one direction, and at nearly right angles to these were others of a pearly white, beautifully spangled with crystals. The white veins were much more compact than were the pink ones, though both were very hard. When the stone is properly cut and polished, these irregular veins show in curious and beautiful contrast to the rest of the surface. If those who, year by year, are making our public cemeteries hideous with marble of ghastly white, and with unbearable, ugly artificial monuments of metal, would look about them they would find in the lovely granite bowlders of our fields the most enduring and far the most pleasing of all materials for marking, with taste and becoming dignity, the resting places of the dead. Any expert stonecutter can select, "upon sight," the most desirable specimens, and ofttimes the cost of removing a valuable bowlder to the place where it is to be worked will be much less than a moiety of the expense of transportation from the New England quarries. Very beautiful and strikingly picturesque monuments may be made of large bowlders by a very small amount of cutting, and their appearance in a cemetery is unique and striking, giving the effect of rugged strength and durability combined, with an attractiveness never found in the sleek and balanced shafts of the conventional monuments.

For the foundations of buildings, whose superstructure is to be of wood, nothing is better than rubble walls or pillars of bowlders; and even if the structure is to be of stone or brick, a very little cutting will serve to render these blocks of imperishable granite quite as valuable as the best product of the quarries. In some parts of our State the bowlders on many of the farms would furnish the material for a fence entirely around them, and it would, when once built, last forever. The time is probably not far off when our people will accept the lesson long since learned in older countries, and turn to best account all the available material at hand.

INDIANA SANDSTONES.

Sandstones, of one form or another, appear in nearly all the formations of our State, but often they are wholly worthless for building purposes, being soft, shaley, or unequal in texture. Indeed, in many instances, they are but sandy seams or thin layers between the limestone or shale deposits.

In order to have an intelligent understanding of our great wealth of exceedingly beautiful and durable sandstone, it will be necessary to take a comprehensive glance over the subject from a geologic as well as an economic point of view. Most of the best building sandstones of Indiana are found in the Carboniferous or Sub-Carboniferous rocks; and, as these outcrop over a very large area, we have many varieties of this valuable material easily accessible to thoroughfares of transportation. As was said in the Fifteenth Report of this department: The Lower Coal Measures of Indiana are rich in sandstones perfectly adapted to building purposes, though at this time their value appears to be, in a large degree, overlooked, though the quarrying interest is gradually increasing. The

Conglomerate sandstone is a deposit pretty evenly and uniformly distributed throughout the base of the Coal Measures proper; and, wherever its grain is fine, it is usually a brown, buff, pinkish or gray massive sandstone, homogenous, non-cleaving, and exceedingly strong in all directions. It comes very soft from the quarry, which makes it remarkably easy to cut; afterward it dries quickly, takes on a lively glow, and holds its color perfectly. In the court-house walls of Rockville, in Parke County, may be seen some fine blocks of a pinkish colored sandstone, whose quality is equal to the best in the world. In the southwestern part of Montgomery County, near Williamsport, in Warren County, and in Fountain County, are inexhaustible quarries of this beautiful stone. Indeed, it may be looked for, and, as a rule, has been found in nearly every county in the State where the Lower Coal Measure rocks are outcropping. Along the line between the areas of the coal fields and the Sub-Carboniferous deposits the Conglomerate will usually be found forming the bluffs of the streams and the escarpments of the hills. It is not always a building stone, however, as in many places it takes the form of a coarse, pebbly, highly ferruginous mass, which weathers badly.

The best sandstones are composed of quartz particles of nearly uniform size, compactly cemented. They break ordinarily with a smooth (direct) fracture, in the direction of the force applied, and present a surface which, although beautifully even, has a finely cutting grit or "tooth" somewhat coarser than that of the fine grindstone grit. They are perfectly fireproof and capable of withstanding all the changes of atmospheric temperature.

The resistance or crushing weight is very great in some of our sandstones—remarkably great, indeed, considering their softness when first quarried. Blocks hewn into any desired shape, as may be done readily with a common ax, will harden upon exposure to the air for a few days to such a degree that, upon being struck with a hammer, they will give forth a clear, metallic sound and emit sparks, like flint.

Professor Cox, formerly State Geologist of Indiana, made very extensive examinations of the Conglomerate sandstone, and in his report frequently called attention to its economic value. Professor Collett, also, has been enthusiastic in recommending it to builders. Geologically it is the equivalent of the "Millstone grit" of the older geologist, and it lies at the base of our Coal Measures, with rarely seams of coal below it. These seams, when found, however, are usually mere traces, never persistent for any great distance, and are shaley and without economic importance. In some places the Conglomerate comes directly in contact with the sandstone of the Chester group, and it is difficult to distinguish the dividing line. This is notably the case in the banks of Sugar Creek, in Montgomery County, where the shales and sandstones appear to run together in confused masses at some points, while at others the lines of separation are clearly traceable.

The general area of the Carboniferous and Sub-Carboniferous sandstones is contained in the following counties, in so far as the survey has developed it: Clay, Crawford, Dubois, Fountain, Greene, Parke, Putnam, Montgomery, Owen, Orange, Pike, Martin, Perry, Harrison and Warren, with a few outcroppings in Tippecanoe. Of course, sandstones are present in all the Coal Measure area, but often they are not visible, and are discoverable only by boring.

Although the quarrying of sandstone has not as yet come to be of that importance in Indiana which the value of the deposits demands, still it has been increasing yearly, and must soon take its place among our greatest industries. We shall not always go to far Northern and Eastern regions to import a material which lies at our feet ready for use. The best modern architects have long made use of sandstone similar to ours in the most costly and extensive structures of European cities. In due time we will imitate their example.

GEOLOGY OF THE SANDSTONES OF INDIANA.

This is not the place for a technical treatise on the geology of our sandstones, but it is necessary, to a full understanding of the economic value of the material, that we shall sketch, in a way clear to the common understanding, the more important facts and conditions of the rock formations in which this excellent building stone is found.

Any person of ordinary intelligence, who has visited the shore of any sea or large lake, has observed that, as a rule, almost pure silicious sand is being constantly thrown out by the tides, currents or surf. Often this sand is formed into a compact floor or beach of beautiful evenness and solidity. Such a beach is a sandstone in embryo, so to speak, and if it were subjected to the pressure of hundreds or thousands of feet of superincumbent rock, it would, in the course of a long age of time, perhaps, become a firm, compact and durable building stone. The process of cementing together the silicious particles might be due partly to the action of heat, or of water creeping down into the mass from above and bearing with it the salts of iron, manganese or other mineral substances, or it might be due to chemical action generated by the presence of elements already in the sand. Not all has yet been discovered touching the operations of Nature's great underground laboratory, nor is it at all probable that all ever will be discovered; still we know enough of the secrets of chemical forces to understand, at least in a general way, the mighty effects they have wrought in building the solid rocks of the earth. The effect, for instance, of hot water upon the most obdurate substances of the rocks is disclosed by the geysers and warm springs of many countries. So the action of rain-water throughout long periods of time has been the cause of most wonderful results. The dissolution of one sort of rock has ended in the building of another and different deposit. Granite has been destroyed and its silicious constituents formed into sand, which in turn has become a sandstone; or the silicious and aluminous materials of a stone have been degraded into kaolin. Here the precipitation of pure silica has resulted in regular, translucent crystals of quartz; yonder some fortuitous conditions have deposited carbon in the form of most precious diamonds, while at other places the carbon is merely graphite. Under massive sandstones in many places we find beds of iron oxide leached, so to speak, from the body of the rock, while at other places in the same relation we see beds of pure flint deposited by a like action of rain-water. Limestones often present curious evidences of change or metamorphosis caused by the action of heat or by dissolution and rearrangement of their substances. The sandstones of Indiana, however, appear to have been deposited just as they are now found, mostly in heavy masses, by the action of sea currents, and often the ripple marks are still beautifully preserved in the surface of the rock.

The lowest sandstones of the Sub-Carboniferous age are found in the "Kinderhook group," which, in Indiana, is represented by the "Knobstone" formation, lying, as a rule, upon the Devonian black shale. Passing thence upward, we find beds of more or less massive sandstone in all the rocks to and including the Upper Coal Measures. In the Sub-Carboniferous rocks the best sandstones are in the Knobstone and Chester groups, the latter often closely resembling the Conglomerate in both stratification and substance. The fossils of the sandstones of Indiana are mostly of vegetable forms, some of them immense in size, though many are exceedingly slight and obscure. At some places the larger remains are heaped together, as if marking an old shore line where the waves had stranded floating drifts of plants and buried them under the incoming sand. Most of these are of the species of *Lepidodendron*, *Sigillaria*, *Calamites*, *Conifers*, of various kinds, and *Ferns*. Animal remains are scarce in the massive sandstones, though many species have been found.

In the Chester sandstones, of Indiana, I have observed the following:

Lepidodendron forulatum,
Lepidodendron aculeatum,
Lepidodendron diplostegioïdes,

and other species, probably, whose structure was too much obscured to be certainly made out. Usually, the *Calamites* are mere impressions or casts not clear in anything but the form, the markings being but vagely indicated. This is largely true of the *Cordaites* and many other forms.

In the sandstones of the Coal Measures the fossils are more abundant, but even there they are rarely well preserved. Some of the forms of *Sigillaria* and *Stigmaria*, and of the larger *Equiseta*, are fairly well kept in some of the non-ferruginous sandstones, where I have found *Calamites* whose joints and longitudinal markings were perfectly shown. The rule is, however, that neither animals nor plants are well preserved in our massive sandstones, and we must depend largely upon the contiguous limestone, shale or clay strata for identification of the rocks. Fossils often give place to cavities, and these, in turn, are frequently found filled with silicious, calcareous or earthy matter, or the combinations of substances deposited by water filtered through the rock, especially when the latter is porous like most of the coarser sandstones and coarser limestones. Beautiful crystal concretions are often thus formed, likewise nodules similar to geodes. In many places where large fossils have been destroyed by the action of water, the cavity will be found filled, or partly filled, with iron oxide, in one condition or another, mixed usually with fine sand or other silicious or calcareous sediment. Very rarely the impress of the fossil will be sufficient to identify it. I have found well preserved fossils where a cavity had formed around the body and had been filled with ferruginous matter which had taken the condition of a solid concretion inclosing it, but still firmly fixed in the rock. In other instances the fossil has been found lying loose in the cavity.

While it is generally true that in the sandstones of Indiana fossils are very scarce, this is not to be regretted by the prospector for building stone, however much the paleontologist may grumble, for the presence of fossils, especially if they be large, is an objectionable feature in quarry rock.

The following notes, showing the chief points in the State where sandstone out-crop, are taken from all the Indiana Reports up to date and here digested for the convenience of persons interested in the subject. I have thought that by thus condensing and sifting the matter scattered throughout the reports all the information relating to building stones could be so arranged as to be of immediate and permanent value to investigators of this important part of our State's material wealth. The notes represent the labors and discoveries of Professors Owen, Cox, Collett and Gorby, with the aid of their able assistants during many years. To these notes I have added my own researches which have been prosecuted all over most of the areas described.

In the twelfth report of the department of Geology and Natural History, Prof. Collett says: "The sandstones of Indiana occur in a broad belt from the Illinois line, in Warren County, south and southeast through the counties of Fountain, Vermillion, Montgomery, Parke, Putnam, Clay, Owen, Greene, Martin, Pike, Dubois, Orange, Perry, Crawford and Harrison, to the Ohio River. This is the conglomerate sand-rock, forming the base of the Coal Measures, and the same as the sandstones so famous in Scotch and English architecture; and, although irregular in color and physical characteristics to some extent, presents a great bed of building material, frost, fire, and water proof, and of practical value for permanence and solidity. In these beds, in Warren, Orange, Lawrence, Crawford, and Harrison Counties, are found extensive and valuable bands of grit stones, of great utility for grindstones, as well as quarries of the "Hindoostan" whetstones, so favorably known in all the markets of the civilized world.

"The sandstones of the Coal Measure proper, while not fully up to the above, are yet extensively used for foundations, piers and hammered masonry. In the Sub-Carboniferous formation, the sandstones of the Chester and Knobstone groups are well developed, easily accessible, and merit the local favor and reputation they sustain."

The Conglomerate, however, is often too coarse and porous for building purposes, and sometimes it is soft and clayey.

In Clay County the sand-rock, which forms the rim and base of the Coal measures, makes the best of fire-proof and weather-proof stone for foundations, piers, and hammered masonry.

This stone is of a bluish white color and is a hard, coarse-grained sandstone which presents a fine appearance in buildings. On South Otter Creek in quite a number of places, also in other parts of this county, there are a number of exposures of this valuable stone.

In Raccoon Valley, Parke County, in place of the seam of coal number three, there is a seam of sandstone forty feet deep. Although in this ravine there is but a ten or fifteen foot exposure, a short distance south it is exposed the full forty feet. This is a good building stone and can be quarried in convenient size and shape, and will dress well under the chisel.

There is a fine exposure of Carboniferous sandstone or mill-stone grit at Roseville.

There is also at Roseville, a large showing of the Conglomerate sandstone. This stone comes soft from the quarry, but hardens on exposure, thus making it a very desirable building stone. Some of this sandstone is of a beautiful pink-brown color; other specimens show a striking variegation of soft brown and gray tints. In Fountain County, there is an inexhaustible supply, almost, of superior quality of building sandstone. Great bluffs of this stone are at the narrows of Mill Creek, again on Clifty Creek, near the northern margin of Scott's Prairie, it out-crops, but it develops into high bluffs on the east fork of Coal Creek at Hillsboro. Again at Dry Run (sec. 33, town. 19, range 17), and at Stone Bluff (sec. 8, town. 20, range 8). Again after a disappearance of five miles it appears in Shawnee Creek near the junction of Little Shawnee and extends to the mouth of the creek.

The calciferous sandstone, which is exposed along the streams of Davis Township, will make a reliable building material. In sec. 33, town. 22, range 7, an out-crop of a coarse-grained light gray sandstone, apparently very good in quality, was observed. This stone is soft at the quarry, but is hardened by exposure; it has both a horizontal and a vertical line of cleavage, and splits readily into blocks of convenient size and shape for building purposes. It is especially adapted for heavy masonry, foundations, etc.

The high bluffs of Shawnee Creek in Shawnee Township offer an almost inexhaustible supply of a very fine quality of building stone.

The rock forming the lower strata of the conglomerate sandstone is a pure white, caused by it being composed of pure quartz grains, and is indestructible on exposure, though owing to these particles lying loosely cemented in the quarry, it is mostly rendered unfit for use when quarried by blasting; it would be far better quarried by the use of steel wedges. This stone embraces some six or seven strata of from two to three feet in thickness. This stone also, owing to its being so easily crushed when fresh from the quarry, would possibly make good glass.

The out-crop of conglomerate sandstone on Dry Run, in the extreme northern part of sec. 33, town. 20, range 8, also the out-crop at Stone Bluff, sec. 10, same town. and range, would make a durable building material. (Van Buren Township).

On the river face of Silver Island sandstone of good quality is found, though some of it has a blue tinge; this should not be used in exposed places. The lighter colored strata is a good reliable stone. Thus we see that in Fountain County there is a wealth of inexhaustible sandstone suitable for every purpose as a building stone, both in color and grain. We would call the especial attention of prospectors to these deposits.

In Warren County the sandstone which overlies the Sub-Carboniferous group is a massive, coarse-grained, ferruginous, micaceous, Conglomerate, admirably workable. Beginning in the northwestern portion of the county, this fine stone extends in a westerly direction with a slight dip to the west bank of Pine Creek, where the dip to the west and southwest suddenly drops at a rate of from twenty to thirty feet per mile. There are fine exposures of this stone along both sides of Pine Creek, on Kickapoo, at Williamsport and in the bluffs near the mouth of Redwood Creek. The stone of this county presents a most beautiful variety of colors; gray or brown on Redwood Creek; gray to yellow or straw color at Williamsport; white, gray, red, "bar stripe" and "bleeding-stone" on Pine Creek, and black, red or yellow near Milford. Most of this stone is soft in the quarry, but hardens on exposure, and will last for ages, making in every way a desirable building stone.

In Owen County the Conglomerate runs in a broad belt across the county from the northwest to the southeast corners. This stone is massive bedded, soft in the quarry, splits easily into blocks of any desirable size, dresses readily, hardens on exposure and is altogether a durable fire and water-proof building stone. In color it is a buff or brown.

There is no scarcity of good building stone in Greene County. The strata of this stone is from six to thirty-six inches thick. In color it is a brownish-gray or cream-color and is fine or moderately fine-grained, and can be split into blocks of any convenient size.

Vermillion County has no lack of building stone. There are some rather heavily bedded, slightly ferruginous sandstone in the hill between the mouth of Brouillet's Creek and Clinton. Along the little Vermillion, below White's Mill there is an exposure of fine building sandstone. This exposure is from four to nine feet in thickness, though some of the accompaning layers, while they appear solid in the quarry, are worthless on exposure.

Some of the stone in the beds of "Millstone grit" contain mica in such quantities as to make it appear as if it would make good furnace hearths.

There is a massive sandstone overlying the coal bed in the hills north of Washington, in Daviess County. This stone will probably make a good building stone for some purposes. It is, some of it, of a reddish-brown color, marked with spots of a deeper red; other parts of it are of a uniform chocolate color. Sandstone of excellent quality is also found in Martin County. This Conglomerate sandstone, where it is free from iron and pebbles, is an excellent and durable stone, which may be quarried in blocks of any convenient size with but little expense after the quarry is opened.

There is in Putnam County a light-gray, fine-grained sandstone, which is easily worked and is a durable and beautiful stone, but as to the quantity I am unable to state, since it has not been fully developed. It closely resembles the deposit in Parke County.

In Vigo County the sandstone which is found above and below the Coal Measures is of sufficient thickness and durability to make foundations, though it is not strictly a reliable stone. In the bluffs along Coal Creek, in Fayette Township, there is, however, a thin layer of good, durable sandstone. It is a bluish-gray, fine-grained stone, which rings when struck, and will present a fine appearance in a building.

The sandstone of Pike County spreads out in every direction from Pikesville. This stone furnishes the best of material for masonry. The outcrops show that the stone will withstand the air and moisture. It is a fire-stone, and will make good hearths for furnaces and ovens.

At Merom there is an outcrop of "Merom sandstone." This stone here seems to weather much better than it usually does. The stone-work in the Christian College on Merom Hill is made from stone quarried from the ledges north of town.

Perry County is indeed fortunate in the amount of its good building material, which may be so readily quarried and sent to market. The high bluff of sandstone along the Ohio River front, which reaches from Cannelton to Rock Island, is formed in a series of layers, two of which, averaging from twenty to forty feet in thickness, will furnish excellent building stone. Blocks of any thickness may be quarried from these layers. The upper layer of stone is much superior in quality to the lower, which is apt to have imperfections. The Catholic Church and other buildings at Cannelton were built from this stone. In color this stone is light brown; it is easily worked, being soft in the quarry but hardening on exposure. This stone has been used in a number of important places, and wherever used has given entire satisfaction.

In Lawrence County the sandstone in the eastern and western parts is only of fairly good quality. It is fire and weather-proof and will make excellent foundations and heavy masonry. This stone is in beds of from 50 to 120 feet in thickness.

In Knox County there are beds of red sandstone west of Wolf Hills and on the east of Pyramid Mound which is suitable for foundations and rough masonry; but in section 35, township 2, range 8, there is an unlimited quantity of good brown sandstone, suitable for hammered masonry. There is an abundance of sandstone suitable for building purposes in Brown County. This stone resembles the Waverly freestone of Ohio. In color it is buff or gray; it is easily quarried in blocks of convenient size, cuts readily into form for capitals, mouldings, etc. It is very durable and is fire-proof. Generally this stone is a sharp grit, is close-grained, homogeneous, and would make good grindstones or whetstones.

In the western and southwestern portions of Harrison County is found the Chester sandstone. The great beds which are exposed in the outcrop along the Blue River and the Ohio in Washington and Scott Townships contain stone which is excellent for foundations in exposed places. Though in some places in the outcrops huge masses fall down the cliffs, it is frost and weather-proof, the falling being due to the unstability of the underlying strata. There are extensive beds of sandstone in Crawford County which is an excellent stone for foundations and rough masonry.

The lower Chester sandstone in Orange County is in some places good quarry stone. The stone is a light tea-green in color. The upper strata make a good flagging stone, the lower make a good building stone. It is easily quarried and worked.

In Vanderburgh County sandstone is found in several parts of the county in layers of sufficient thickness to be quarried. It is well suited for foundations, etc.

From the northwest to the southeast corners of Owen County there is a belt of Conglomerate sandstone of from three to six miles in width. This stone is a heavy bedded or massive stone, which splits and dresses readily, being soft in the quarry but hardening on exposure; is a fire and water-proof stone of superior quality for fire-proof buildings, bridge abutments and foundations. In color it is a buff or brown, sometimes prettily variegated.

At Taylor Hill, in Bartholomew County, there is an outcrop of beautiful freestone which has an even, sharp angled fracture and splits well. This stone will make a superior water-proof building stone. Wall Ridge would furnish an abundance of good stone for building purposes.

About three or four miles southeast of Rensselaer, in Jasper County, section 33, township 29 north, range 6 west, there is a bed of coarse grit which is adapted to piers and heavy masonry.

In Morgan County nearly the whole county is underlaid with the Knob sandstone. The upper member of this formation is stratified clearly. In the highest member of this stone we find a bed of fine-grained sandstone from one to five feet in thickness. This stone is quite soft in the quarry, but when it loses its original softness it becomes quite hard and waterproof. The lower members of this stone are of a blue color, owing to the mixture of clay. Though in the quarry this stone is much more solid, yet it and all other members of this stone which show a blue color must be strictly avoided, as it is worthless when exposed. Occasionally small flecks of oxide of iron are observed in this stone, and may cause stains to appear when in a building. In quarrying this even the moderate blast will shatter the stone for a distance of fifteen or twenty feet, so as to practically ruin the stone. Outcrops of this stone appear on the southeast bank of the river from the mouth of Bluff Creek to Martinsville. In color the stone is generally gray, drab, or occasionally buff.

The sandstone outcropping along the banks of Stony Creek, in Hamilton County, is a most excellent stone for rough masonry. Over fifty years ago there was a quarry of this stone opened, and the exposure of all this time has not affected this stone in the least. This stone appears in the bed of White River above Strawtown, but owing to the difficulty of getting to it I was unable to test it. This same Pendleton sandstone appears at the falls of Fall Creek, in Madison County. This is very durable building rock, but is hard to quarry, as it is composed of quartz crystals, which make grit that soon turns the edges of the tools, and on the other hand these crystals are held together in such a loose way that blasting should not be attempted.

In Tippecanoe County there are but two exposures of Conglomerate sandstone. These two outcrops appear in deep hollows forming perpendicular walls forty feet high. These two exposures are about one mile apart. In quality and color these exposures are the same, both being fine-grained and firm, soft in the quarry, dressing into any desired shape. Both these exposures are near the Warren County line and are of the quality of the stone at Williamsport. These beds are too far away from transportation facilities to be quarried with profit at present.

The sandstones of Washington County are of good quality, but with such a wealth of the finest quality of limestone surrounding it, as is the case in this county, it can never have any great commercial value.

Montgomery County has in its western portion a magnificent display of massive heavy-bedded sandstone. The stone comes from the quarry soft and is easily shaped into blocks of any convenient size and shape. Some of the beds contain grits suitable for grindstones.

With the above notes to direct him any person interested in the quarrying of building stone will be able to find all the points where sandstone of good quality is likely to be found.

THE LIMESTONES OF INDIANA.

We come now to consider by far the most valuable material for building purposes to be found in very large quantities in Indiana.

I have already stated that limestones are found in all the solid rock formations of the State, from the lowest outcrop of the Lower Silurian to the uppermost deposits of the Coal Measures.

From the nature of its formation limestone is less apt to have gross impurities in it than is the sandstone, though vast beds of clayey, silicious or ferruginous limestones are found everywhere so weakened by the presence of the matters indicated as to be worthless for building purposes.

Carbonate of lime is the substance of which the ideally perfect limestone should be formed; but this perfect purity is never found. In some specimens of our so-called oolitic limestone, however, the foreign substances amount to but about three per cent. of the whole!

Limestones bearing a considerable portion of the carbonate of magnesia have proved, in many instances, to be excellent building stones. They blacken, however, and are somewhat disintegrated superficially by exposure to the smoke of burning coal bearing sulphurous exhalations.

The finest form of limestone is marble, which may be of any color from pure white to a perfect black. Marble usually has a specific gravity of about 2.7 and its texture is more or less granular with a crystalline appearance on the edge of its fractures.

Next to marble in both beauty and susceptibility to perfect finish as regards application to architecture, comes the close-grained oolitic stone, so-called. I qualify the name "oolitic," because in fact there is no genuine oolitic limestone in our State. The appellation properly belongs to the oolite, a stone formed of minute balls or rolls of lime carbonate gathered about a small particle of a different substance. The oolite of Great Britain is found in a very different formation from that in which our celebrated limestone appears and its composition, although somewhat similar at a casual glance, is by no means the same. The name is good enough, nevertheless, and I see no objection to retaining it.

A careful examination of our oölitic limestone shows that, while it varies greatly in the nature and arrangement of its particles, its more striking characteristics are general and persistent. Shells, more or less minute

—scarcely discernible with the naked eye—and fragments of shells cemented by carbonate of lime, make up the entire mass. Indeed so meagre is the cementing substance that it is scarcely observable even with the aid of an ordinary pocket glass. This structure of the stone gives it the oolitic appearance, hence the name.

So far, very little attention has been given to studying the fossils brought to view by microscopic examination of this beautiful and durable limestone. My own work has been confined more particularly to an examination of the stratigraphic and structural conditions of the rock and to the economic aspects of the various outcrops of its deposit. It belongs geologically to the St. Louis division of the Sub-Carboniferous formation, and, as will appear when I come to speak of it more fully further on, it would seem to owe its most interesting peculiarities to the special conditions under which it was deposited.

The Devonian limestones of Indiana fit for building purposes are largely confined to the so-called Corniferous beds, though here again the name is misleading. Much of this stone is a friable, refractory sort of limestone, cherty and unequal in texture; but in many places it is workable and turns out a really admirable product of the quarry, especially for rough masonry.

The Upper Silurian formation, the Niagara limestone particularly, furnishes beautiful flag-stones, and a great deal of very hard and durable material for building. The Lower Silurian, too, affords excellent stone.

The limestones of the Coal Measures are not, as a rule, good for fine masonry, being crammed with fossils and often heavily loaded with iron. Moreover, they rarely persist over large areas, and are seldom so situated as to be worked to advantage even when they are of comparatively good quality.

It would be scarcely profitable to take the time and space necessary to a detailed description of the many hundreds of points in Indiana where limestone of more or less value for masonry is to be found. I have thought it best to confine myself to a study of the areas and outcrops which, so far as we now know, present the most certainly profitable materials.

The line of outcrop of any formation—the Lower or Upper Silurian, Devonian, Sub-Carboniferous or Coal Measures, for instance—is always the index which should guide us in our explorations. It is along this line of outcrop that we may easily discover the true nature of the deposit in any stratified formation, and thus determine the value of any particular part of it. In those counties where the Lower Silurian rocks put forth, we may easily learn the nature of the strata; and so of any other formation. Beginning, then, in the extreme southeastern corner of the State and working our way westward and northward, we shall find the outcrops of limestone in the following order:

1. Lower Silurian (Hudson River).

2. Upper Silurian (Niagara).
3. Devonian (Corniferous).
4. Sub-Carboniferous (chiefly the Oolitic).
5. Coal Measures (unclassified).

These formations come to the surface, one after the other, in the order mentioned, as we proceed.

I do not consider the Lower Silurian limestones of Indiana first-class building material for public buildings or for ornamental structures, but this must be taken as a general statement, to be modified wherever a special exception may arise. A great deal of good stone is quarried from this formation, and many more fine quarries will yet be opened with profit. Still, the large fact is that most of the limestone of our Hudson River rock is hard, refractory and unreliable for architectural purposes, save in foundations, rough walls, abutments, piers and the like, where it serves excellently. Dark gray, bluish and drab are the colors most common to this rock, though some of it has a creamy tinge. When it is good it cuts very well, hard as it is, and its appearance is beautiful.

The Upper Silurian presents in the Niagara limestone a large area of very valuable stone. No finer flag-stones can be found anywhere than are taken from this formation in many places. Excellent building stone for rough masonry appears wherever large areas of the Niagara are outcropping. A good deal of it is magnesian and may change color in weathering; not a little of it crumbles under the action of frost. Still, the well-informed quarry-master will be easily able to distinguish the reliable outcrops by the appearance of the exposed stone, which if good will retain its angles sharp and clear and show no discolorations. Wherever the Niagara is the surface rock good flag and rough building stone may be confidently looked for.

The Corniferous limestone of the Devonian formation is, as has been said, too often cherty and full of snarls and hollows to be relied upon, as a rule, for first-class material; but in many places intelligent examination will discover areas of thoroughly good stone for ordinary rough building purposes, and some of it is very beautiful indeed.

The foregoing three groups of limestone may be considered together in any general estimate of the building materials furnished by the rocks of our State, as they fall under much the same general description. They are not pure limestones as a rule, but often their impurities are not of a nature to destroy their value, merely restricting it and limiting the uses to which the material can be applied. Save in the foundations these stones should not be used in important buildings without the strictest tests to determine their qualities. Undoubtedly they are often found durable in the highest degree, but this excellence is not generally supplemented by other necessary qualities, to-wit, beauty of color, responsiveness to the cutter's tools, and tractability in quarrying.

It is when we reach the Sub-Carboniferous area that we discover the true wealth of Indiana's limestone. Here, indeed, the most wonderful and beautiful of the State's calcareous deposits lie almost uncovered and ready for the appliances of the quarry-master's trade. Its fame has already gone abroad over the world and the business of placing it upon the market is enlisting a large amount of capital, energy and skill. Year by year this industry is growing into importance second only to that of agriculture.

THE OOLITIC LIMESTONE OF INDIANA.

The formation known as the St. Louis division or "group" of the Sub-Carboniferous deposits covers a large area in Indiana; but it is the surface rock of a much smaller space. Great interest has attached to it among collectors and students of paleontology owing to the numerous fossil beds it contains and to the variety and interest of the organic forms found therein. The St. Louis limestone is a general name given to the calcareous rocks of this division without reference to any particular quality of the deposit beyond the fact that it is limestone. No rock shows greater or more striking variations of composition and structure than this limestone. In one place it will be a "cavernous limestone," breaking up into crevices and caves, "sink-holes" and "pots;" at another place it will crop out in the form of a marly rotten stone full of fossils, while at still another place great vertical cliffs will prove it to be a solid, sharp-angled, durable building stone. All over its area, however, it shows a persistence of certain general features that render it not only interesting but easy to identify. Its fossils are so numerous and so well known that they are recognizable wherever seen.

The area in Indiana over which the St. Louis group certainly furnishes the surface rock may be roughly outlined thus:

Parts of Putnam County, Morgan, Owen, nearly all of Monroe and Lawrence, a large part of Orange and Washington, Floyd and Harrison. In Montgomery County there are a few outcrops. It may be looked for anywhere between the outcrops of the Conglomerate and Chester sandstones on the west, and the appearance of Keokuk and Knobstone formations on the east. In Montgomery County the Chester sandstones appear to lie directly over the St. Louis limestone, under which are found the crinoidal shales and limestones of the Keokuk. In Washington County, Professor Gorby, State Geologist, found a well-defined trace of the Burlington deposits, to which he called my attention during my own occupancy of the office. I have since had the pleasure of re-examining the ground and of tracing the discovery still further.

Along the line of the St. Louis outcrop from Putnamville southward to near the Ohio River is found the widely famous oolitic limestone. It lies in a narrow strip of country running somewhat diagonally from a northwesterly to a southeasterly direction, say from Greencastle in Putnam County to Salem in Washington County, a distance of about a hundred miles as the crow flies. The width of this strip varies, being from three to fifteen miles throughout its length. It lies on the eastern slope of the Wabash Valley until it enters Washington County, where the waters begin to flow directly into the Ohio. All the way along its western margin it is extremely difficult to trace the contact with superior formations and on the east the same difficulty attends any effort to outline exactly the contour of its area. The country is rolling and in many places quite abruptly broken. Outliers of superior strata crown the higher points and the weathering and tumbling down of great shelves which have been subsequently covered with residuary soil have rendered surface study very uncertain work. Along the bluffs that border the narrow valley of White River in the neighborhood of Gosport is an excellent region for studying some interesting features of the lower St. Louis rocks, and here the oolitic begins to show itself in perhaps its most instructive stage of progress from the compact and fine-grained gray and hard limestone of the northermost outcrops, to the creamy white, soft, even-grained, almost absolutely pure carbonate of lime which characterizes the outcrop farther south. All the way along the route of the L., N. A. & C. R. R. from Greencastle to Louisville this limestone frequently appears at the surface or protrudes in staunch cliffs from the hill-sides. The O. & M. and the I. & V. railroads cut this rich field across from east to west.

Every indication seems to be that the oolitic limestone has been deposited in deep sea water filling a basin whose shores are now marked by those lines where the rock is lightly, unevenly and irregularly bedded and formed of coarser and more loosely cemented materials than those of which the main body of the stone is composed. All along the most easterly fringe of the oolitic outcrop I have noted that this change from a fine and even grain to a coarse and loose structure is well marked wherever the rock has not been greatly weathered away or otherwise changed by extrinsic forces. In Lawrence County, as we pass eastward from the outcrops of most excellent quarry stone, we soon reach the straggling edge of the deposit, and find it taking on the coarser and looser structure. So it is in Washington County. These rough beds are much thinner, and bear every badge of being the approximate limit of an ancient shore line. Ripple marks and thin, broken strata of imperfect sandstone are the most reliable indicia of this fact. The fossils, too, are of larger species more likely to be preserved amid the debris washed up along the shallows of a shore line.

A careful examination of the oolitic limestone, under a glass, shows that it is oftentimes composed almost wholly of exceedingly minute shells (most of which appear to be nearly perfect), the mass held together by an imperceptible cement. This, however, is not true of all the stone. I have examined many admirably homogenous specimens from the best quarries, and found them largely composed of fine shell fragments and the perfect shells combined. There appears to be no marked difference in the quality of the stone on account of this variation in the structure, so long as the particles of which it is composed are small and of nearly uniform size throughout the substance of the specimen. From the neighborhood of Bedford, southward, the stone, wherever quarried, shows most of the excellent qualities of the Salem deposits of Washington County. Indeed, any of the quarries between Greencastle and New Albany will be found putting out material of the finest sort. It has been found satisfactory by the best architects of America for great public buildings all over the country. This, of itself, should be sufficient to urge the quarrying interests to the highest pitch of development.

THE GEOLOGY OF THE OOLITIC BEDS.

It would be out of place, in this connection, to enter into any detailed, technical account of the geological conditions observable in the oolitic deposits. I purpose to present only such an outline as will enable the reader interested in the development of quarries to proceed intelligently to a study of this incomparably rich and valuable area.

The whole Sub-Carboniferous division presents a series of irregularly alternating strata, suggesting at once the periodic prevalence of deep and shallow sea waters over the face of the earth. As a rule the sandstones represent shallower seas than do the limestones, and wherever an old shore line is indicated the coarser and less compactly bedded sand rocks appear. Dirty shales, too, are often the silt deposited in the shallowing regions of receding seas. Rocks that contain deep sea organisms need not, however, be taken as altogether the deposits of deep waters. What processes have caused the destruction and precipitation of the millions of beings whose remains mark the substance of solid beds of stone must remain to us largely a matter of conjecture.

We can, however, apply certain general rules of natural philosophy in our attempts to reach general conclusions. It is well known that turbulent or violently agitated water will not deposit small objects held in suspension; but it is just as well known that still, or practically still, water will let fall even the finest particles whose specific gravity is greater than that of the water. The agitation of the seas by winds is superficial. Very deep seas are always comparatively still a short distance below the surface, even in the wildest storm, while the shallow seas are often violently stirred to their bottoms. This rule, then, may be taken as general: Shallow water will contain more matter taken up in suspension during boisterous weather than will deep water, and agitated water will deposit a coarser series of material than will still water; therefore, deep seas, being only superficially agitated, will continue to deposit all matter taken up in suspension, while the shallows will drop only the heaviest bodies. If this is true of seas now it was true of them in the days when the limestones of the oolitic region of Indiana were being deposited. Hence, I think that we may reasonably infer that the minute particles of calcareous matter composing this beautiful stone were dropped in place from the water of a deep and quiet part of the then existing sea. If this is true, and we find the stone shading off into a coarser and looser structure in certain directions, we may take it for granted that this condition indicates approach toward water shallower and, therefore, more easily agitated.

All the facts that I have been able to gather, by a good deal of patient investigation in the field, go to suggest that the oolitic limestone owes its fine and even grain, and its perfect cohesion of particles, to the special conditions under which it was deposited; and, in the main, these conditions were due to a deep, still sea, teeming with minute shell-bearing animal forms—a sea whose shores were lined with the deposits of still older seas of the Sub-Carboniferous age. It was from these more ancient rocks that the water took up in solution or suspension the carbonate of lime, which, when precipitated along with the animal remains, served as a cement to bind together those innumerable multitudes of minute shells which form the beautiful body of our far-famed building stone.

The well known fossil beds of the St. Louis rocks are usually found at places where the limestones are of coarse and loose texture, easily weathered down to a sort of marly residuum in which the organic forms are but lightly held.

The oolitic limestone, when found in massive beds, as in most of the quarries, is overlaid with a stratum of bluish or grayish blue limestone which does not weather well, and which, when exposed, rapidly falls to pieces under the action of rain and frost; hence, in many places the oolitic is found immediately under the residuary soil, formed by the degradation of this superior stratum.

The eastern and southern limits of the oolitic are often obscured by outliers of more recent formations, but wherever not thus hidden the rock will be found rapidly thinning out. Passing westward from the eastern margin the rock dips irregularly with the line of your progress, while it also thickens and assumes its characteristic evenness of grain and compactness of structure. Its western margin has not been located, owing to the fact that the rock soon dips far under the Coal Measures, and does not again come to the surface in Indiana. As to its northern limit none of the borings for gas passed through it anywhere north of Greencastle, in Putnam County. The St. Louis limestone of Montgomery County is the bluish stratum which overlies the oolitic, which is not here in place. The boring in Parke County did not disclose the presence of the oolitic deposits, though it cut the St. Louis rocks. The report from the wells sunk for gas and oil at Terre Haute, in Vigo County, shows that in passing through the Sub-Carboniferous strata the oolitic was not found. Indeed, all the facts point to an oblong basin or trough, for which I have proposed the name "Oolitic Basin of Indiana." In this basin lies the best building stone, granite aside, yet discovered in the world. The wealth that is to flow to the counties in which it occurs would appear fabulous were the true calculation made.

Geologically speaking, the oolitic limestone belongs to the lower division of the St. Louis group, to which has been given the name of "Warsaw Division" or group. It is in the upper member of this division, while the dark blue bituminous and often ferruginous limestone immediately overlying it belongs to the lower member of the upper division. Immediately under the oolitic is often found a dark blue crystalline limestone, usually a thin stratum, which, in turn, overlies a gray or whitish fossiliferous stratum, often of very loose texture, and crumbling to a "marl" on exposure to the air.

Toward the northern margin of the basin we find the oolitic passing by imperceptible degrees from its more characteristic composition of minute shells to a granular and even somewhat crystalline structure, though this latter extreme is by no means common anywhere within the area. Viewed at a little distance, its outcrops have the appearance of bold cliffs of heavy bedded gray sandstone, and the quarry blocks seen in transportation on the cars have this same granular appearance. One who wishes to study this stone in its various aspects of structure and deposit, will do well to visit, first, the quarries at Putnamville, Elletsville and Bedford; then he may go to Salem, in Washington County, where the stone takes on its extreme oolitic characteristics.

In the extensive quarries, near Salem, a complete and instructive section of almost the entire lower division of the St. Louis rocks may be seen at a glance, and in places the lower strata of the upper division are shown. The oolitic here is a massive, grayish white deposit, which, when cut through by the steam channelers, presents a bold, clean wall of almost marble beauty. I am far from saying that this stone is any better than that in many other oolitic quarries in the basin; but it certainly is the best exposure for study, from the geologist's point of view. From the dark bituminous stratum, or layer, which forms the lower member of the upper St. Louis, down to the singular blue crystalline layer underneath the oolitic proper, comparatively few fossils have been found, saving, of course, the minute shells that compose so large a part of the oolitic itself. This absence of characteristic fossils might lead to mistakes in identifying the rock where the structure could not be clearly made out. Fortunately, however, the many and extensive quarries scattered over almost the entire oolitic area have rendered such service in tracing the deposit as to leave all doubt behind.

My own careful survey of the oolitic field authorizes me to say, with perfect confidence, that nowhere in the United States, perhaps nowhere in the world, is there so large an area over which so thick, so persistent, and so admirable a building stone appears so near the surface, and so well suited to the operations of the quarryman.

QUALITIES OF THE OOLITIC LIMESTONE.

Architects, builders and contractors will, of course, examine for themselves before adopting any material in buildings for which they are responsible. The writer of this paper has designed and superintended many considerable public works wherein stone was largely used, and can, therefore, speak with experience as his guide. But while the experienced architect, engineer or contractor must at the last depend upon his own tests, there is much to be saved by an acquaintance with the facts and observations of others in any particular field of inquiry of interest to the profession to which he is devoted. Hence it will be always apparent that the most successful men are those who gather information from every available source.

It is unfortunately true that geological reports often lack just the practical quality which would render them of greatest value to practical men. Mere "science" too often clothes itself in a cloak of technical reserve and bookish mustiness, instead of joining freely with the spirit of material progress. Still, it is but just to say that in many instances science has lent a strong hand to the world's practical workers, and geology, if heretofore a trifle behind in this, is gradually coming to the front.

Turning now from a survey of the oolitic field to a practical consideration of the qualities of this superb stone, as a building material, let us view it from the standpoint of the architect and civil engineer.

In a former report on this subject, when I had given it comparatively short study, I said that in cretaceous chalk, formed so largely of foramenifera, the mass is loosely deposited and feebly cemented, as a rule; but the oolitic limestone, though coming comparatively soft from the quarry, has a peculiar toughness and density, and withal a dryness, which render it a puzzle to every examiner. These features are due to the semi-concretionary nature of the structure, resulting from the coöperation of affinity and gravitation in the arrangement of the matter. The stone is granulated, rather than crystalline, in every particular, and yet, under the microscope, the grains show a nicety of correspondence—a perfect fitting, so to call it—which is the secret of resonance, elasticity, flexibility and non-cleavage. The following analysis is a fair average of the true oolitic limestone:

Specific gravity	2.72
Lime	53.55 per cent.
Carbonic acid	43.33 per cent.
Water	56 per cent.

to which must be added a trace of magnesia, iron, alumina, manganese, phosphoric acid, silica, and possibly a trace of another mineral not distinguishable, all in practically equal parts, and amounting altogether to 2.56 per cent. of the whole. I may remark that in the true oolitic the trace of iron is never observable, save by chemical analysis, it never in the slightest discolors the stone by oxidizing. The above analysis was of rock recently quarried.

Chemically speaking, then, the oolitic limestone is practically a pure carbonate of lime, the amount of foreign matter being often less than 4 per cent. of the whole. In other words, in the best specimens the carbonate of lime constitutes nearly 97 per cent. of the stone. It is flexible, elastic, resonant, uniform in its grain, equally strong in every direction, perfectly homogeneous in fact. These qualities give it the best possible power of resistance to strain or to crushing force. A bar of this stone may be bent very perceptibly, and when the force is removed it will spring back to its normal state with the promptness and energy of steel. Its tone, when struck, is a clear, musical bell-note, indicative of thorough metallic sympathy throughout the mass. This quality of perfect resonance, taken in connection with the fact that the stone cleaves nowhere save directly in a line with the cleaving force, gives the best evidence of an evenness of grain and a smoothly distributed cohesiveness of particles throughout the mass When first quarried it cuts like a sandstone, yielding readily to tools of all kinds. It is then soft, and yet tough enough to hold well the finest figures of carving. It comes from the quarry cut by the steam channelers into blocks, or quadrangular columns, six by ten feet, and a hundred feet long if desired. Its color at first is a pale brownish, which gradually lightens to a soft cream or grayish white.

Physically, the oolitic is in fact a calcareous sandstone composed in chief of small grains of carbonate of lime. It occurs in massive bodies, often sixty feet thick, without any lines of cleavage or parting, perfectly bedded, homogeneous throughout, a solid stone, in fact, from which a flawless block of any size, possibly manageable, may be cut. It takes up a very small amount of moisture, which is so distributed that no degree of heat or cold will work injury. When we consider to what awful and prolonged frigidity of temperature this rock was exposed during the glacial age, without in the least affecting its integrity, we may safely trust it in our buildings. Other limestones were cracked, shivered, crushed under the compressions and expansions of the arctic period, while this massive deposit was scarcely changed in any part of its great body.

Any architect or builder, any engineer or contractor, will say at once that, if this is a true description, the oolitic limestone is certainly a wonderful product of nature, and fitted, in the highest degree, for a cheap, beautiful and durable building stone. The best practical demonstration of its durability is given by its own angular cliff walls, which have stood exposed for hundreds of centuries, probably, without loosing the sharpness of their corners or the smallest inequalities of surface.

It has been subjected to every test by the most expert professional architects and builders, who have uniformly recommended it, and fortified their recommendations by using it in the building of some of the most important public works of recent years. State-houses, court-houses, churches, extensive business blocks, and stately private residences, have been constructed of it from New York to New Orleans, and from Chicago, Indianapolis and Louisville to all the smaller cities of our country east of the Rocky Mountains. This is a fact of value—it is one of the strongest possible invitations to an examination of our field—for certainly there can be no better judges of building stone than the architects whose business it is to plan and erect our most pretentious edifices.

The Capitol at Indianapolis is a structure of which any State should be proud. Its exterior walls show to excellent advantage the qualities of the oolitic stone. Although the building is not advantageously situated, as regards its site, yet its beauty is greatly heightened and the lines of its elevations are strengthened by the suggestion of solidity and permanence which the immense blocks of warm, gray stone enforce upon the observer. Were this superb edifice upon some considerable elevation, like that occupied by the State-house at Nashville, for instance, the remarkable suitability and beauty of its material would be demonstrated to even the casual glance.

Our Indiana oolitic limestone, though not the geological equivalent of the celebrated oolite of the British Island of Portland, resembles it in many particulars. It has the advantage of the Portland stone in coming softer from the quarry, and it is fully equal to it in other qualities. The famous Sir Christopher Wren chose the Portland oolite in building St. Paul's Cathedral. Time has proved that his choice was the very best that could possibly have been made.

In both England and America, in cities where large quantities of sulphurous coals are burnt, the oolitic limestone has withstood the sulphuric acid of the fumes without the slightest damage. Sir Christopher Wren thought that exposure to the weather for three years after quarrying was a sufficient test of the Portland oolite. We have a much better test than this, for blocks of our Indiana stone have been lying for twenty years, near some of our oolitic quarries, without showing the slighest change from exposure.

Careful experiments have proven that our oolitic limestone withstands a greater crushing force than any other fairly workable limestone, and at this point it comes next to granite. Indeed it has ample resistance for sustaining double the pressure that any building walls would subject it to under the severest conditions of modern architecture. Its flexibility is truly wonderful. A square rod (sawn from the stone) two inches to the side and five feet long, will bend with an even curve and spring like a bar of steel. Its elasticity is equally fine, and a suspended piece of it will ring like bell metal when tapped with a hammer.

No stone cuts more easily and beautifully. When green from the quarry it can be cut or broken in any direction by proper care, and it responds readily to the cutter's tools without chipping or refractory scaling. Thus dimension stone can be prepared at the quarries ready for shipment at the minimum cost, and with but a trifling waste of material.

A visit among the quarries will be found of interest and value to every person in the least connected with architecture, engineering or contracting, while to the practical quarryman it will open a new field. It will not be long till all the oolitic beds will be in the hands of those who will reap a golden harvest from their development. Already the quarrying interests of that region are swelling to enormous proportions, but the amount of unworked deposits is almost incalculable. Indeed the stone industry of Indiana is yet in its infancy, compared with what it is sure to be within the next few years.

Within the last five years the growth of practical interests in the oolitic deposits has more than doubled, and day by day the quarried stone is reaching new fields of demand, and yet the industry is really in its infancy. I should be called a mere boaster were I to make even a low estimate of what is sure to be its future development. Substitutes may be found for coal, for iron, for brick, for wood, but as the years go by the use of stone as a building material must continue to increase. No nation reaches its meridian of civilization until it enters the stone age of its architecture.

One of the chief points in favor of our oolitic deposit, is that it lies so near the surface over such a large area. Every quarryman knows that the most considerable item of expense in taxing out building stone is that incurred on account of removing overlying masses of earth or rock, an operation which is technically called stripping. Of course, the expense is still greater when the stone must be mined by means of shafts and the like. In very many places in Indiana the oolitic stone lies on the surface or is covered by only a slight deposit of soil or superior rock. This makes a minimum of cost to the quarryman in getting his product ready for delivery.

When we are calculating the future value of our building stone, the readiness and cheapness with which it may be put upon the market, is a most important item of the reckoning. In France, Germany and England the quarries are often extensive underground mines, whence the stone is brought at the maximum of labor and cost, and as compared with our own quarries show the wonderful advantages we shall have when we shall have reached the era of permanent building. Thousands upon thousands of acres of oolitic limestone lie just at the surface in nearly all the counties heretofore mentioned in this paper.

There is yet another feature of the oolitic rock that remains to be mentioned. It is massively, evenly and notably uniformly bedded. Its layers are rarely less than ten feet in thickness, often they are from twenty to sixty feet with scarcely a seam or variation of the grain. These layers are wonderfully persistent and even, like a smooth floor or table of the beautiful material. The elasticity and flexibility of the stone has made it proof against earthquake shocks, the action of intense extremes of heat and cold, and the pressure caused by any settling of the earth's crust—forces which have crushed the stones of other formations into fragmentory condition, as may be observed by the most casual student of our rocks.

A large part of the oolitic area is a decidedly rolling or broken country, the rock outcropping along the hillsides or in the jaws of shallow ravines and hollows. Often these ravines show that they have been formed by extensive sheer fissures through the rock, and one or the other, sometimes both, of the ragged jaws stand forth just as at first exposed, the sharp points and corners still unchanged. These walls, wherever the cliffs chance not to be subject to the drippings from overlying formations which may be ferruginous, show a clear, soft gray color, rarely tending to a bluish or brownish tint. It is often the case that a perishable stratum underlying the oolitic, has been destroyed by the action of water, thus causing the beautiful, even beds of this fine stone to fall, as so often happens with other limestones in the St. Louis formation. Owing to this accidental feature, the oolitic will be frequently found lying at a considerable angle of inclination against the side of a hill with a heavy talus or earth-slide overlying it. This has not seldom given rise to mistakes touching the true dip of the stone. If a local trend of this sort be followed a little way, the proper position of the rock in place will be found, and the dip will be usually very slight and westward.

Thus, in pursuance of the design suggested to me by the State Geologist, I have, as briefly as was consistent with a fair presentation of the subject, set forth the claims of our State in the matter of stone for building purposes. There remains, however, a consideration of the use of stone in the preparation of lime, cement and other artificial aids to building. This might well be the subject of a separate paper, but for many reasons it will be easier to consider the subject here, and to the student of our State's resources such a course will afford a more connected system of examination, as it will obviate the necessity of referring from one paper to the other in order to fully understand both. Moreover in many of our most extensive limestone quarries the manufacture of lime is profitably connected with the quarrying operations.

INDIANA LIME.

The use of lime in building is so universal that no general explanation of its importance need be here made. In all structures of brick, or other artificial stone, it is the chief ingredient of the mortar in which the material is set, and its use for plastering the inner walls of houses, even those of wood, is well nigh universal. This large and constantly increasing demand for lime makes it one of the staple articles of commerce and one of the chief products of our limestone deposits, and adds to them a value which must increase as the years go by. The output of this necessary building material in Indiana is very large, and the quality second to none in the world.

As a rule limestone is best for burning into lime when it comes nearest being a pure carbonate, but before it is fit for use the lime thus produced must be mixed with sand in about the following proportions:

Taking thirty-five pounds of pure lime add three and a half cubic feet of clean sand and mix with one and a half cubic feet of water, the result will be three and a fourth cubic feet of lime-mortar. Two parts of sand to one of lime is a formula which gives very good results for ordinary purposes.

Mortar of this sort, however, will not stand the constant contact of water, and should be used in only those walls that are not exposed to such contact. Indeed it is a rule that mortar made of pure lime and sand will not set in water so as to become hard and durable. Hence the demand in all hydraulic operations for a mortar made of impure lime which in commerce is known as hydraulic lime or water lime, and which is the base of the best hydraulic cements.

Pure grades of lime, or those called pure, are burned out of limestones in which the carbonate of lime is the chief constituent. The product is nearly a pure white in color and has a soft, fine grain. When exposed to the air it rapidly absorbs water and falls into a fine, dust-like powder, known to chemists as hydrate of lime, and popularly called slacked or slack lime. In turn the hydrate of lime, after long exposure to air, absorbs carbonic acid and gradually forms itself into a mixture of single equivalents of hydrate and carbonate of lime.

The limestone of Indiana suitable to the manufacture of lime is found in so many places that it would be impossible to enumerate them. It might be said that wherever a good pure limestone is found there can lime be made.

The process of burning limestone to produce quick-lime (oxide of calcium) need not be here described. The elimination of the carbonic acid gas by means of heat is done by the use of kilns in which the stone is subjected to fire intensely hot. Stone freshly quarried calcines more readily than that which is less hydrous. It is economy, therefore, to quarry and break the stone no faster than it can go into the kiln.

The vast areas of excellent limestone in Indiana must attract the attention of lime manufacturers, and continue to be a source of increasing prosperity to the State. I have felt that this brief allusion to a subject so closely allied to that of building stone might be serviceable in attracting attention of capitalists to a most promising field.

HYDRAULIC CEMENT.

It has been very long known that carbonate of lime containing a large admixture of clay would, when calcined, show little of the property of quick lime, known as slacking. In other words, if the lime product contained 25 to 35 per cent. of clayey impurity it was found that it would not heat in water, and would not slack well. The product was hard, but when ground fine and made into mortar by the admixture with it of water and sand, it would set speedily, and be impervious to water. If the clayey impurity go beyond 35 per cent. the rock, when burned, is spoiled for hydraulic purposes if not supplied with a sufficiency of lime after pulverization.

As a general proposition, it may be said that hydraulic cement must be composed of carbonate of lime and silica, carbonate of lime and silicate of alumina, or carbonate of lime and magnesia. It has been found by experiment that carbonate of lime, mixed with gelatinous silica, forms a good hydraulic cement. Furthermore, it is known that it spoils the hydraulic property of this lime if it be calcined at a heat greater than is barely necessary to eliminate the water from the clay and to expel a greater part of the carbonic acid from the carbonate of lime.

While neither of the ingredients of water lime will, by itself, set in water, it is easy to make a good hydraulic lime by calcining carbonate of lime and silicate of alumina together at a low heat.

After calcination, the silica in the lime is acted upon by acids, resulting in a gelatinous product called gelatinous silica. This is a good test of the hydraulic properties of a silicious limestone.

The presence of iron in the clayey limestone greatly adds to the hydraulic property of the product, for the larger the quantity of iron and alumina, up to a certain limit, the more readily will the substance take on the required stage necessary to a good cement. When the heat of the kiln is too intense vitrification takes place, while, if the temperature of burning is too low, the result will be that the silicates will not be rapidly formed, and the mortar will not harden without the assistance of water.

The best limestones for the production of hydraulic lime are those composed of carbonate of lime, silicate of alumina and iron, all evenly commingled. Some of our magnesian limestones will turn out an excellent quality of cement.

The difference between quick lime and lime suitable for hydraulic purposes, may, in short, be thus defined: Quick lime, when subjected to the action of water, rapidly falls to an impalpable white or grayish white powder, while hydraulic lime slacks slowly without any great generation of heat. Moreover, the hydrated silicates thus formed are not subject to the effect of water, but pass from a soluble to an insoluble condition.

Professor Gorby discovered large quantities of impure limestone in Washington County which he pronounced first-rate for the production of water lime.

This is a subject which will repay much further examination by the Geological Department of the State. The need of a well-equipped laboratory is keenly felt by the person called upon to do extensive scientific work for the State. There can be no doubt that a series of well-conducted chemical examinations extended over a series of years would do more than almost any other work to add new impetus to the material development of our great commonwealth. The cost of a laboratory and the conducting of it would be comparatively small and the outcome could not fail to be valuable.

HIGHWAYS OF STONE.

In concluding this report I deem it proper to call attention to the subject of streets and country highways, which, as our State advances in wealth and physical improvement, must be built of stone in one form or another. Already we are taking steps in this direction. Many of our cities are laying down permanent pavements, and in not a few counties the highways are being built of gravel and broken stone, to the lasting comfort and welfare of the people. It has been said that the enlightenment and prosperity of a country may be read in its public roads. Certain it is that the value of real estate depends largely on the facilities for marketing its products, and good roads are the chief of these facilities. The graveled roads of Indiana and the limestone turnpikes of Kentucky are standing evidence of the effect of good highways on the development of a high state of agricultural prosperity.

It needs no labored essay to point out the inexhaustible supply of gravel and limestone in Indiana suited to use in making permanent roads. The whole Drift area has its beds of gravel, and wherever limestone is outcropping the "metal" for the superstructure of imperishable highways is at hand.

Public schools and public roads are the twins that need to be carefully nurtured by the State.

THE QUARRYING INDUSTRY IN INDIANA.

From the tables and descriptions of quarries appended to this report, it will be seen that the amount of capital invested in taking out and working the building stone of Indiana is in the aggregate very large. Moreover the facts as tabulated show that the quarrying industry gives excellent returns in profits upon the money, skill and labor expended thereon.

It will well repay every person interested in this subject to give this part of our report a careful examination, as it constitutes a practical exemplification of what can be done on both a large and a small scale in the matter of developing the exhaustless treasures of our greatest material wealth.

So far, although much has been done, the quarrying business is in its early infancy in Indiana. As compared with the possibilities of what is actually in sight, the stone taken out is like a drop from the sea; it cannot be missed from the almost inconceivable extent of material from which it is drawn.

Of course the statistics here collected and arranged can not be called exhaustive, and there may be cases in which the figures are not exact, but the greatest pains have been taken to approach absolute truth as nearly as possible. In a few cases men were unwilling to give such details of their quarry workings as would render our report altogether satisfactory, yet as far as they go our statements may be relied upon as containing nothing but facts. We have rejected everything that could not be strictly authenticated.

It will be seen that along with our information touching the limestone industry of the State we have offered all that could be gathered in this connection with regard to the lime product, especially in cases where quarry-masters were interested in kilns. It is a matter of wonder that lime burning is not on a larger scale than it is now in this State. Nowhere in America can there be found stone better adapted, more plentiful or in a condition to be more easily and cheaply handled for this purpose. Fuel, too, is always at hand and as cheap as anywhere in the country.

By a glance at the map, after referring to these tables of quarry products, the reader will be better able to understand the location and area of the most important of our building stone deposits. The large body of the stone lies south of the center line of the State. The best limestone forms an irregular figure on the map's surface east of the Carboniferous outcrops and west of the Devonian; that is, it forms a large part of the southermost Sub-Carboniferous area, and is chiefly confined to the St. Louis deposits. The sandstones, which have not yet received the attention that is due them, are mostly contained in the Lower Coal Measures and in the upper Sub-Carboniferous rocks. They are of all shades of color between white and dark red; some specimens show curious and beautiful variations. The exceeding ease with which the sandstones can be quarried and their fireproof qualities are great recommendations of their value, but the fame of the oolitic limestone and the demand for it all over the United States have kept attention turned from the sandstones.

In collecting the facts contained in the various tables Professor Benedict has used every effort to obtain in each case a full statement from the quarry-master or his acting representative. It will be seen that some of the informants were very kind in furnishing all that was asked, while others either could not or would not disclose anything more than the most meager general statements of their affairs. Many persons are slow to appreciate the value of advertisement in business. The reports of this department are published for free circulation; they go into the hands of inquiring, investigating, progressive people all over the enlightened world, and it will be a great thing for the material wealth of Indiana when the citizens of our State learn that it is the best policy to help in every way to spread abroad in the world a knowledge of our mineral, agricultural and manufacturing wealth. There is a reciprocal law of compensation in the conduct of affairs based upon generous principles. The farmer may have no quarry rock on his lands, but if his neighbor own a quarry the value of the stone reflects its virtue upon the farm, because industry and increased varieties of production increase population and comsumption, and thereby add an increment to the value of farm and farm produce. In a word every citizen of Indiana profits by the thrift and prosperity of every other citizen. The more Indiana's inert wealth of mineral is advertised abroad the sooner will come that increase of capital and population upon which the progress of development depends. Diversified labor is the safety of labor in general. The more avenues we open to wealth the more active will become both labor and capital, each new source of industry adds energy to all the older ones.

Within the past ten years the advance in the development of Indiana stone quarries has been wonderful, especially in the oolitic region where lines of railway intersect the very best deposits of this incomparable limestone. Many miles of track and siding have been laid both by the railway companies and the owners of the quarries, so that most of the material is now cut by steam drills and channelers, hoisted by steam derricks and loaded directly on the cars by the most approved steam-driven machinery. Where a few years ago there were but the beginnings of a crude system of industry, there are many well-organized, thoroughly equipped and admirably managed companies carrying forward immense quarries and far-reaching commercial connections. Not a little of this valuable growth and welcome activity has been due to the researches and reports of this Department. It has been the constant practice of the chief and his assistants to keep before the minds of the scientific, the commercial and the manufacturing world all the discoverable facts in connection with all the undeveloped resources of the State, and among these building-stone has filled a large space. Never till now, however, has the Department been in condition to give anything like exhaustive study to this particular subject and to make a report covering so large a part of the facts most interesting and valuable to those who wish to investigate with a view to investment.

The amount of land now owned by individuals and companies engaged in quarrying, although large, is as nothing compared with the area still open to development. True, much of the best stone is situated at some distance from any railroad line, but to most of it switch lines or tramways could be easily laid, as has already been done in many cases. This will always pay where the quarrying is to be done on a large scale, and where the stone is found to be of the best quality, and so deposited as to be exceptionally easy to take out.

So widespread and excellent is the fame of Indiana stone that the danger of overproduction from the quarries is not an appreciable element in the consideration of the future production and profits of the building stone industry. The demand for bridge stone, rubble, paving stone, flagging, dimension stone for city and county buildings, and for general architectural uses, is increasing all over the country, and must go on increasing as wealth accumulates and building gradually becomes a question of permanent investment rather than the hasty shift of present and pressing need.

Already the eyes of alert capitalists, looking out for a safe and promising security for money, are turned upon these fine stone deposits of Indiana, and many large tracts have been bought as a matter of speculation, and are held by men who will neither develop the quarries nor permit others to do it. Still the area is so large, and the stone so plentiful, that it will be scarcely possible for any combination of capital to control it all. The people are beginning to appreciate the value of these lands, and as the knowledge of the business of quarrying and putting the stone on the market becomes more general, the industry will be urged to its fullest activity. This, so far from interfering with agriculture, will be a great stimulus to it. Wherever a mining or quarrying point is established, there will be a local center of consumption for farm products and a source from which money will be circulated freely. Many localities have already sprung into unprecedented prosperity on this account, especially in the oolitic region.

By reference to the lists it will be seen that, although not complete, they show that about two hundred firms, companies and individuals own quarries in the State, and many of them are operated on a very large scale. These, if evenly distributed, would give more than two successful quarries to each county in the State. Surely this is a most important item of our material prosperity, and when we remember that it is largely due to recent development it ought to be a matter of interest and pride to every citizen of Indiana.

The following tabulated statement will show some valuable facts:

Amount of capital invested in quarries in Indiana	$4,294,943
Number of engines in quarries	129
Number of laborers employed	4,334
Total amount of wages annually	$2,171,375.10
Annual output of stone in cubic feet	20,649,276
Number of bushels of lime annually	1,821,580
Value of annual output	$3,312,446.70

It would be interesting, if it were possible, to give a statement showing the scope of the commerce in stone from Indiana, but we can only state that our best building stone now goes into almost every State east of the Rocky Mountains, and that costly and enduring monuments attest its superiority at the very gates of all the other most celebrated quarry fields. It is carried triumphantly beyond the marble regions of Tennessee and the granite of Georgia, over the limestone ledges of Alabama and into the central cities of Texas. Missouri calls for it, Chicago must have it and does have it every day in the year; Cincinnati, New Orleans, Philadelphia, New York, Atlanta, and hundreds of smaller cities and towns are using it freely in preference to any other stone. Its use is its advertisement, for wherever it is seen in a building its superiority is not to be overlooked or discredited.

The system of quarrying adopted in all the best quarries of Indiana includes the use of all the latest improvements in machinery. The old slop process of hand drilling and hand derricks has been discarded, as a rule, even in the smaller quarries, though there are exceptions. Steam has been applied to nearly all the operations of drilling or channeling, lifting and loading, as well as sawing and planing. Any one of the large quarries is well worth visiting by those who have a desire to know how the business of quarrying has progressed since the days of hand-drill and blasting powder, crow-bar and skid, hand-tackle and ox-team wagons. By the use of the steam channeler monoliths of any size are cut out, from cubes of four feet square to rectangular blocks sixty feet long by ten feet square in the cross-section. After these are taken out they are sawed to dimension by steam and carved into any desirable form. By examining the face of the stone exposed in the perpendicular walls of a quarry one may have the basis for making a rough estimate of the immense money value of all the building stone in Indiana. Often these walls show a thickness of from twenty to sixty feet of solid stone. Now, an acre is 43,560 square feet; make it 40 feet thick and you have 1,742,400 cubic feet to the acre. In many places the cost of quarrying is the minimum, as the stone shows at the surface of the ground, making the stripping very light and the lift short. The reports on the different quarries afford a safe basis for a good approximate calculation of the profits to be made in the quarrying business when carefully conducted. Of course the price of labor, skilled and unskilled, varies, and the nature of the stone, its situation, etc., must affect the first cost of production, but the price of the building stones of varies kinds has been always high enough to insure good returns upon intelligent effort. Indeed no property in Indiana is to-day more certainly profitable than the quarries, as a careful examination of the detailed statements of their workings will show.

A glance at any railroad map of the State makes it clear that facilities for transportation are exceptionally good throughout the entire area of the stone fields, and the number of car-loads annually shipped to all parts of the country is a guaranty that rates are sufficiently low to warrant the large and growing output of materials. In fact the demand for building-stone has been so steady and great that most of the quarries have been worked to the utmost of their capacity with orders constantly ahead throughout the year. The writer of this report has traveled extensively in the Western and Southern States recently, and everywhere he has seen the railroads carrying large consignments of Indiana stone, a fact which gives indisputable evidence of the demand.

In one regard the great activity and success of the stone industry has had a marked effect upon the character of public improvements in the State. The County Commissioners of the various counties in letting contracts for the bridges and culverts of our highways have taken advantage of the facilities for procuring indestructible stone for foundations, abutments and piers, and have stipulated that these should be built of nothing but the best Indiana stone. The court houses, jails, county asylums and other public buildings recently erected are mostly built in whole or in part of this material. The railroads have not been slow to avail themselves of the same advantage and have set all their bridges on permanent stone substructures. These are facts that should have their weight in every study of the economic value of our stone; they should give confidence to capital looking toward investment in the quarrying industry, and should enter largely into every calculation of the material wealth of the State. They supplement the deductions of scientific investigation with practical demonstration of economic values, and make clear to the ordinary mind what has long been known to the few enthusiastic pioneers in geological and statistical study. It has been said that the "proof of the pudding is in the eating," and the homely truth fits well into the process of proving which is now going on in the great building stone areas of Indiana. We are beginning to taste the flavor of ample success. Long ago this Department clearly pointed out this great field of industry, and used every means within its power to call public attention to it. We may now feel justly proud in congratulating ourselves upon a fair prospect of sharing the enjoyment of the prosperity of those who have profited by our advice.

It is not the quarry-masters alone, however, who have been directly benefited by the large demand for our building stones. The number of laboring men who have found employment at good wages in the quarries is quite large. Villages and towns have sprung up at many points and are flourishing little centers of life and traffic dependent largely upon the impetus given to business by the quarry interests.

We feel that it is important, at this time, to call especial attention to the sandstones of Indiana. The limestones have already, as has been shown, reached a popularity and a demand which forestall written recommendation in a large degree, but the sandstones have not been properly appreciated as yet. When we began, in this department, to call attention to the oolitic limestone, it was slow work, indeed, to make the public believe in our statements of its immense value. We hope that it will not be so difficult to convince intelligent capitalists of the equally important part that the sandstones are to take in the commerce of the future. Let us repeat here that nowhere in the world are there greater or better deposits of this fireproof and beautiful building material. The writer of this report has examined samples of sandstone from all the principal quarries of Great Britain and America, and has carefully compared them with the sandstones of Indiana, and is prepared to say that the latter are equal to the best in evenness of grain, solidity, cohesiveness, durability and beauty. It has a great advantage over all the limestones in the facility with which it may be quarried.

These sandstone beds, now so little worked, are waiting to enrich the men who first bring them largely into the market. Our words may not be heeded for years to come, as was the case when this department first began to point to our coal fields, or when we insisted upon the incomparable qualities of the oolitic limestone, but some day our words will be vindicated in this as they have been already amply proven true in the other instances. The tests of science may already be relied upon, and these tests have been fully applied to Indiana sandstones, demonstrating that they are as good as the very best in the world. This is the simplest statement of fact, as will be plain to any person having a knowledge of building stones, who will give the subject a practical examination.

Interested parties have raised groundless objections to the use of sandstone in buildings. It has been said that they are not durable; that they are subject to erosion; that they crumble under the action of frost; that they change color, and that they crush under great pressure. These statements are not true of any good sandstone. It is equally true of both bad limestone and bad sandstone. No architect of standing can afford to say that sandstone has not stood the severest tests of exposure and force for hundreds of years, or that it has not been proven the nearest perfectly fireproof of any easily workable stone yet discovered.

We invite the carefulest examination of the Indiana sandstone by architects, builders and quarrymen of experience, for we know that they are richly worth the fullest development. When once they come before the world in a way to show their true value, we shall see another great industry arise in our State. So sure is this Department of this that it is its purpose to keep the subject agitated in season and out of season until the end is reached. We can well afford to be laughed at for a time, if at last we can see the almost unimaginable material wealth of our State made the basis of a sound, enduring and happy industry, giving employment to thousands of men, competent support for their families, and well-earned riches to the intelligent and far-seeing investor. The sandstones of Indiana invite capital and promise it even larger returns than have yet been realized from the limestone quarries. It is the stone of the future for certain classes of architectural work and will always command a high price in the markets. The future may be well judged by the past. In the old countries of Europe, where stone buildings have been the rule for centuries, we find that the sandstone quarries have not been and are not now neglected. Indeed there are no more famous quarries in the world than those in the sandstones of England and Scotland. In Edinburgh and Glasgow some of the oldest and finest of modern buildings are built of this material. Many castles fashioned of it stand as monuments of its beauty and durability. The sandstones of Indiana are as good as the best of Scotland, and will one day take their place in buildings as beautiful and enduring as any church or cathedral of the old world.

As a matter of course the same judgment and caution must be exercised in selecting sandstones as in choosing other kinds of building stones. The oolitic limestone is not the average limestone of the country; it is exceptionally fine. The best sandstones are equally excellent when compared with the average materials. This may be said, however, in favor of the sandstone; it is more persistently good when found in favorable condition than the limestone, though its areas are smaller. We would not be understood as claiming more for the sandstone than for the limestone, but we do say that within its legitimate uses it is superior to any other stone.

It can not be applied to so many purposes, the demand for it will never, perhaps, be so general, but it will have a wide market and a certain one—a market with scarcely any successful competition within a very extended radius.

Most of our sandstone deposits, from the very nature of things, lie very near to the coal fields, thus insuring cheap fuel for engines. In fact, the quarrying of sandstone will, as a rule, be found much cheaper than in the case of most of the limestones. While the material is generally bedded massively, and has no distinct lines of cleavage, it is so soft and easily cut and split that expensive machinery is rarely necessary in the quarry. We have seen the fresh stone hewn out with an ax, as wood is hewn, and placed in foundations, chimneys, etc., where it would immediately harden to almost the refractory density and ringing resonance of flint. It will be readily seen that this quality is a very valuable one in connection with the first cost of production, as well as regarding its adaptability to many architectural uses.

The lists of quarries show that a number of companies and individuals have already begun the good work of developing the sandstone industry with most excellent results. It is to be hoped that now, with all the facts before the public, many others will see the promise of profitable enterprise in this field. What is now most needed is to get the stone itself before the public, as has already been done in the case of the oolitic limestone and the Silurian flagging stones. It avails little for men to spend their time and money quarrying stone if the great public knows nothing about the nature and value of the output. Unfortunately, the public will not take the statements made by careful and conscientious investigators. It must have occular demonstration, and this must be afforded by exhibition of the stone itself. There can be but one result when our sandstone is as well known as our oolitic limestone. It will be accepted at once as the best of its kind.

If the owners of sandstone deposits would risk a little labor and expense in taking out samples of the material and sending them to builders, architects, masons, dealers in monuments, engineers and geologists, the result would be surprising in a short time. This should be general amongst the owners of the prospective quarries, and should be kept up persistently until the public is fully informed of the valuable qualities of the stone, for it is as sure as that day follows night that active effort will follow the discovery of any paying field of industry. Convince men that they can make money by entering your sandstone fields, and you will not have to wait long to see active competition for possession of the best deposits and the most eligible sites for the drills, the channelers and the derricks.

It is a well-worn saying that the "Gods help those who help themselves," and it would be well if all the owners of our magnificent sandstone would profit by the suggestion.

The appended statistics show that the value of stone on the cars at the quarries varies from about eight dollars the car for rubble up to and considerably beyond two hundred dollars the car for cut stone. Averaging the car-load at two hundred cubic feet, this would make the maximum average for cut stone about one dollar the cubic foot for the best limestones, but by reference to the reports of companies this will be found too low for some of the quarries. The sandstones do not command so great a price, but they are so much cheaper to quarry that the profit is almost, if not quite, as large as on the limestone. Then it must be remembered that it is demand and supply that control prices. As yet the demand for Indiana sandstone is in its incipiency, and this prevents it from commanding the price which would be readily paid for it were the demand an active and general one, based on a full knowledge of its merits as a building stone.

In connection with the subject of building stone proper, it has been found convenient to collect much information touching the use of our various stones in lime-making, in glass-making, as flux in iron furnaces, and in road making. The reader will observe that although lime-burning has not been developed as an industry as it should be in Indiana, there are many firms and individuals doing a large business and producing a most excellent quality of lime. Indeed Indiana lime is classed very high in the markets of the country both for plaster work and for masonry and brick work.

Road-making has recently attracted much attention in the State, and many counties have wholly changed their system of highways from dirt to graveled or Macadam roads. This has created a large demand for broken stone in many counties where gravel could not be had, and has been the means of developing local quarries for the purpose of meeting this need. For railroad track ballast broken stone is the best possible material, and it is rapidly coming into use. It drains better than gravel, is less liable to wash and displacement, lasts indefinitely, relieves the road of the dust which in dry weather renders travel so disagreeable over gravel or dirt ballasted roads, and in the end is cheaper than any other material, all facts considered. Where there is a demand for broken stone for road building or ballasting, the quarry-master finds a ready market for all the chips and refuse stone of his quarries. The statistics show that a great deal of this kind of stone is already being shipped from nearly all the larger quarries of the State. Some one has said that the public highways of a country constitute the index of its prosperity and enlightenment. If this be true the influence exerted by the development of Indiana's stone fields has greatly aided in giving expression to a high state of civilization in our State.

Another important item reported from most of the quarries is flagstone, used so freely now in the paving of sidewalks in cities and towns.

A large part of this is produced from the Niagara limestone and the smooth, thin layers of the Devonian, though it is by no means confined to these. Wherever it can be found in hard, smooth sheets of the proper thickness, it is one of the most valuable products of the quarry, as it comes from the bed ready for use with little or no expense save the bare cost of taking it out.

As yet the marbles of Indiana have been little worked, but in time the deposits of this beautiful white and variegated limestone in the southern part of the State will be put to profitable use.

In concluding this report, it is but justice to say that as a rule the citizens interested in stone have been kind and cordial in giving aid and information toward the fullest collection of facts, and we hope that they may find a rich return in the stimulus which a report like this may give to their industry by attracting wide attention thereto. The fullest efficiency of this department can not be reached without this cordial co-operation of the people, and it has been the effort of the Chief and his assistants to seek in every way the freest communication with those who are most interested in the material prosperity of the several sections of which the Department's work has been carried on. We desire to make these reports full and reliable, so that a reference to them will be made with confidence and with profit. While we do not claim that everything has been told herein about the building stones of Indiana, it is believed that what has been said is true, and that a long step has been made in the right direction.

QUARRIES IN INDIANA.

JOSHUA STAPLES, ROCK RIDGE STATION,

PUTNAMVILLE POSTOFFICE, INDIANA.

Amount of capital invested	$37,000
Number of employes	26
Weekly pay-roll	$218.00
Number of derricks	6
Number of engines	3
Two engines 12-horse power each, and one engine 35-horse power.	
Steam drills	3
Building stone, per month, number of cars	25
Cubic feet per car	200
Number of car-loads used for rip-rap	320
Value at quarry, per car	$8.25
Rubble stone, number of cars	180
Value per car	$11.00
Bridge stone, number of cars	30
Value per car	$25.00
Flagging, number of cars	15
Value per car	$150.00
Street crossings, number of cars	7
Value per car	$60.00
Steps and sills, number of cars	1
Value per car	$210.00
Besides a large amount of bridge stone.	
Acres controlled by firm	123
Acres in quarry	3

STEG HEIRS, GREENCASTLE JUNCTION, IND.

LIME BURNERS.

Capacity of quarry, car-loads per week	4

I. N. PEEK, PUTNAMVILLE, IND.

Product for 1890, number of cars	30

JAMES LEE, PUTNAMVILLE, IND.

Product for 1890, number of cars	52

DAVID B. STEEG, GREENCASTLE JUNCTION, IND.

Amount of capital invested	$12,000
Number of employes	6
Weekly pay-roll	$76.00
Derrick	1
Two horses and carts.	
Building stone, car-loads per month	4
Value per car	$8.00
Cubic yards per car	8
St. Louis limestone, color blue, principal use for lime.	
Acres owned by firm	15
Acres in quarry	2
Amount of lime, car-loads, per month	12
Number of months kiln was run	8
Value per car-load	$50.00

This is a "hot" or quick-setting lime that answers well for masonry, but is too "hot" for plasterer's use.

VIGO IRON CO., GREENCASTLE, IND.

Number of employes	6
Monthly pay-roll	$215.00
Cars per month	41
Cubic yards per car	8
Value per car	$8.25
St. Louis limestone, color blue-gray, used for flux in blast furnace at Terre Haute:	
Acres in quarries	4
Acres leased from Mrs. McLain, and controlled by firm	8

Thirty acres undeveloped land near Greencastle Junction, owned by Patrick O'Boyle.

PATRICK ASH, GREENCASTLE, IND.

Amount of capital invested	$500.00
Number of employes	5
Weekly pay-roll	$45.00
Average wages per day	$1.50
Number car loads per year	60
Cubic yards per car	8
Value per car	$16.00
Blue-gray St. Louis limestone, used for bridge work by the T. H. & I. R. R.	
Acres in quarry	1¼

Stone from this quarry was used in the new buildings of the Depauw University.

OOLITE QUARRY CO., SPENCER, IND.

Amount of capital invested	$20,000
Number of employes	30
Weekly pay-roll	$200.00
One engine, 40-horse power.	
One channeler.	
One steam bar drill.	
One steam gadder.	
One 30-ton derrick.	
Weekly amount of product in cubic feet	6,300
Cubic feet per car	350
Value per cubic foot	$0.35
Oolitic limestone, color blue-cream, used for architectural and bridge work.	
Acres controlled by firm	116
Stone shipped to Indianapolis and Chicago.	

ROMONA OOLITIC STONE CO., ROMONA, IND.

Amount of capital	$100,000
Number of employes	75
Average daily wages	$1.65
Number of engines	3
Two engines 20-horse power each, and one engine 100-horse power.	
Channelers	4
Steam drills	3
Diamond saw	1
Header	1
Planers	2
Traveler	1
Steam derricks	4
Hand derrick	1
Daily capacity, cubic feet	3,000
Number cubic feet per car	350
Value per cubic foot	$0.15
Oolitic limestone (buff and blue), building stone.	
Acres controlled by firm	70

There are several hundred acres undeveloped stone land in this vicinity, and the stone is of excellent quality.

OWEN OOLITIC STONE CO., SPENCER, IND.

QUARRIES AT ROMONA.

Amount of capital	$7,000
Number of employes	25
Average wages per day	$1.40
One engine 30-horse power.	
Channeler	1
Steam derrick	1
Oolitic limestone, blue and gray.	
Acres controlled by firm	10
Large number of acres undeveloped.	

Company just commencing operations, having leased the Simpson & Archer quarry that had lain idle for several years.

SPENCER LIME & RUBBLE QUARRY CO., SPENCER, IND.

Amount of capital	$6,000
Number of employes	25
Weekly pay-roll	$160.00
Two derricks, and one crusher.	
Number of engines	2
One engine 10-horse power, and one 15-horse power.	
Amount of weekly product, cubic yards	100
Cubic yards rubble	10
Crushed stone, cubic yards	18
Rubble per car	$7.50 to $8.50
Crushed stone, per cubic yard	$0.60
Rubble stone, bluish-white used for foundations; crushed stone for street paving.	
Number of acres controlled by firm	40

OOLITIC QUARRY CO., SPENCER, IND.

Amount of capital	$5,000
Number of employes	25
Average wages per day	$1.45
One engine 12-horse power.	
Channeler	1
Steam derrick	1
Number of car-loads per week	18
Cubic feet per car	350
Value per cubic foot	$0.25
Oolitic limestone, buff color, quality good, building stone.	
Acres in quarry	7
Acres controlled by firm	13

Land leased of E. R. Bladen, Spencer, Ind.

Samuel A. Steele, Romona, Ind., has 200 acres undeveloped stone land not for sale.

NORTH BEDFORD STONE CO., BLOOMINGTON, IND.

QUARRIES NEAR STINESVILLE, IND.

Amount of capital	$150,000
Number of employes	20
Average wages per day	$1.45
One engine, 50-horse power.	
Channelers	1
Steam drill	1
Gang saws	2
Steam derricks	2
Number cars per week	12
Number cubic feet per car	350
Value per cubic foot	$0.30
Value rongh stone, per cubic foot	22

Sawed stone, average per cubic foot	55
Oolitic limestone, buff and blue, building stone.	
Acres controlled by firm	43
Undeveloped stone land, Stinesville, Ind.:	
Enoch Morgan, number of acres	80
William Brown, number of acres	80
James Williams, number of acres	100
Dr. Osgood, res. Gosport, Ind., number of acres	80
John Mays, number of acres	60
Alonzo Batts, number of acres	30

This land lies adjoining the North Bedford Stone Co.'s quarries, and is valued at $100 to $150 per acre.

The North Bedford Stone Co. commenced operation September, 1889. Ships its product to New York, Philadelphia and Chicago.

BIG CREEK STONE CO.

QUARRIES AT NORTH BEDFORD, NEAR STINESVILLE, IND.

Amount of capital invested	$100,000
Number of employes	20
Average daily wages	$1.50
One engine, 60-horse power.	
Number channelers	2
Steam drills	1
Steam derricks	1
150 car loads last year. Capacity cars per day	4
Number cubic feet per car	300
Value per cubic foot	$0.20

Oolitic limestone, good buff and blue; building and bridge work.

TERRE HAUTE STONE WORKS CO., STINESVILLE, IND.

Amount of capital employed	$60,000
Number of employes	112
Average daily wages	$2.00
Number of engines	4
One engine 60-horse power, one 25-horse power, one 10-horse power, and one 30-horse power.	
Number of channelers	2
Seven gang saws.	
Number steam derricks	6
Number travelers	2
Number of car loads per year	1,000
Number cubic feet per car load	350
Value per cubic foot	$0.22½
Company sells no rough stone, only sawed or worked material.	
Scabbled bases per foot	$0.35
Oolitic limestone, buff building stone.	
Acres controlled by firm	107

PERRY BROS., ELLETTSVILLE, IND,

Amount capital invested	$25,000
Number of employes	55
Average wages per day	$1.35
Number of engines	2
One engine 30-horse power, and one 20-horse power.	
Number of channelers	1
Number of travelers	1
Number of gang saws	6
Steam derricks	3
Number horse-power derricks	2
Number of cars for the year 1890	598
Number cubic feet per car	225
Total sales for the year	$32,000
Oolitic limestone, blue and buff; good building stone.	
Number of acres controlled by the firm	160

Nearly all the country between Ellettsville and Stinesville abounds in fine exposures of undeveloped oolitic limestone.

MATTHEWS BROS., ELLETTSVILLE, IND.

Amount of capital invested	$30,000
Number of employes	70
Average wages per day	$1.35
Number of engines	2
One engine 30-horse power, and one 40-horse power.	
Number of channelers	1
Gang saws	8
Number steam derricks	1
Number horse power derricks	4
Number hand derricks	1
Number of cars per year	600
Number cubic feet per car	250
Estimated average value per cubic foot	$0.45
Oolitic limestone, good quality; color, buff and blue. Used for building and monument work.	
Acres controlled by firm	80

Stone sent to New York, Chicago, and as far northwest as Montana; as far south as New Orleans and Texas.

MONROE COUNTY OOLITIC STONE CO., BLOOMINGTON, IND.

Amount of capital	$100,000
Amount paid in	$20,000
Number of employes	18
Average daily wages	$1.50
One engine, 25-horse power.	
Number channelers	1
Number of steam drills	1
Steam derrick	1
Number of cars per week	12
Number cubic feet per car	225

Value per cubic foot, buff	$0.22
Value per cubic foot, blue	55

Oolitic limestone, good buff and blue, building stone.

Number of acres owned by firm	80

Estimated amount of undeveloped stone land in the county, 100,000 acres.

BEDFORD QUARRY CO., BLOOMINGTON, IND.

Capital invested	$75,000
Number of employes	15
Average daily wages	$1.50

One engine, 25-horse power.

Number of channelers	1
Number steam drills	1
Number steam derricks	1
Number of cars per week	10
Number cubic feet per car	225
Value per cubic foot, buff	$0.22
Value per cubic foot, blue	35

Oolitic limestone; color, buff and blue. Good building stone.

Number of acres owned by firm	8

BLOOMINGTON-BEDFORD STONE CO., CLEAR CREEK, P. O.

Amount of capital	$100,000
Number of employes	15
Average daily wages	$1.50

One engine, 25-horse power.

Number of channelers	1
Number of steam drills	1
Number steam derricks	1
Number of cars per week	6
Number of cubic feet per car	225
Value per cubic foot, buff	$0.22
Value per cubic foot, blue	35
Number of acres owned by firm	40

OOLITIC COMPANY OF INDIANA, BLOOMINGTON, IND.

Amount of capital	$100,000
Number of employes	25
Average daily wages	$1.50

One engine, 40-horse power.

Number of channelers	2
Number of steam drills	1
Number of steam derricks	1
Number of cars per week	18
Number of cubic feet per car	225
Value per cubic foot, buff	$0.22
Value per cubic foot, blue	35

The quarry averages three-fourths blue.

Oolitic limestone, good building stone, color buff and blue.

Number of acres controlled by company	80

BLOOMINGTON OOLITIC STONE CO., BLOOMINGTON, IND.

Amount of capital	$20,000
Number of employes	20
Average daily wages	$1.75
One engine, 30-horse power.	
Number of channelers	1
Number steam drills	1
Number steam derricks	1
Number of cars per week	5
Number of cubic feet per car	225
Value per cubic foot, buff	$0.22
Value per cubic foot, blue	35
Oolitic limestone, good building stone, color buff and blue—mainly blue.	
Number of acres controlled by firm	9

Located within the city of Bloomington. Commenced operations May, 1890, and expects to double output this year.

STINESVILLE AND BLOOMINGTON STONE CO., BLOOMINGTON, IND.

QUARRIES AT STINESVILLE.

Amount of capital	$50,000
Number of employes	50
Average wages per day	$1.50
Two engines, 20-horse power each.	
Number of channelers	3
Number steam drills	2
Number gang saws	3
Number steam derricks	3
Number carloads per week	8
Number cubic feet per car	350
Value per cubic foot	$0.23
Oolitic limestone, good building stone, color buff.	
Number acres owned by firm	73
Chas. Frantman owns sixty acres undeveloped stone land.	
Jackson Wampler, number of acres	80
Samuel Harris, number of acres	160
This land is valued from $500 to $1,000 per acre.	

HALLOWELL STONE CO., BEDFORD, IND.

Amount of capital	$100,000
Number of employes	100
Average daily wages	$2.50
This is caused by the large number of cutters the company employs.	
Number of engines	3
One engine, 65-horse power, and two 40-horse power each.	
Number of channelers	4

Number of steam drills	2
Number of travelers	1
Number of gang saws	6
Number of planers	2
Number of headers	1
Number of steam derricks	6
Number of hoisting machines	2
One steam pump and boiler, 16-horse power.	
Amount of output, number of cars per year	1,000
Number of cubic feet per car	200
Value per cubic foot, buff	$0.25
Value per cubic foot, blue	40
Oolitic limestone, very good for building and monument work; color, buff and blue.	
Number of acres owned by firm	40

The mill owned by the firm in the city covers five acres; it is located at the junction of the L., N. A. & C. and Narrow Gauge Railroads. This firm sawed a slab of stone nine feet long, twelve inches wide, and about one sixteenth of an inch thick. This shows the wonderful uniformity in texture of this stone.

BEDFORD OOLITIC STONE CO., BEDFORD, IND.

Amount of capital	$45,000
Number of employes	80
Average daily wages	$1.60
Number of engines	2
Of 30-horse power each.	
Number of channelers	4
Number of steam drills	3
Number steam derricks	4
Number of car-loads per week	25
Number cubic feet per car	250
Value per cubic foot	$0.22
Oolitic limestone; good building stone; color, buff.	
Number of acres controlled by firm	460

Estimated amount of undeveloped land in the county, 10,000 acres.

PERRY, MATTHEWS & BUSKIRK, BEDFORD, IND.

Amount of capital	$70,000
Number of employes	50
Average daily wages	$1.60
One engine, 25-horse power.	
Number of channelers	3
Number of steam drills	2
Number of steam derricks	2
Number of cars per week	30
Number of cubic feet per car	275
Value per cubic foot	$0.22
Oolitic limestone; good building stone; color buff.	
Number of acres owned by firm	243

HOOSIER STONE CO., BEDFORD, IND.

Amount of capital	$75,000
Number of employes	150
Average daily wages	$1.60
Three engines, 30-horse power each.	
Number of channelers	5
Number of steam drills	5
Number of gang saws	4
Number of planers	1
Number of steam derricks	6
Three portable boilers, 10-horse power each, for drills.	
Annual output in car loads	2,000
Number of cubic feet per car	250
Value per cubic foot, blue	$0.35
Value per cubic foot, buff	20
Oolitic limestone, used for building, color buff and blue.	
Number of acres controlled by firm	175
All stone land.	
Output will be greatly increased for 1891.	

PEERLESS STONE CO., BEDFORD, IND.

Amount of capital invested	$100,000
Number of employes	45
Average daily wages	$1.65
One engine, 30-horse power.	
Number of channelers	2
Number of steam drills	1
Number of steam derricks	2
Number of car loads per year	108
Number of cubic feet per car	275
Value per cubic foot	$0.20
Oolitic limestone, used for building, color buff.	
Number of acres owned by firm	70
All stone land.	
Commenced operations September, 1890.	

CHICAGO AND BEDFORD STONE CO., BEDFORD, IND.

Amount of capital	$40,000
Number of employes	70
Average daily wages	$1.65
Number of channelers	4
One engine, 40-horse power.	
Number of steam drills	3
Number of steam derricks	3
Number of car loads per annum	800
Number of cubic feet per car	225
Value per cubic foot, buff	$0.20
Value per cubic foot, blue	40
Three-fourths blue.	
Oolitic limestone, good quality; mainly used for building; small quantity bridge stone; color blue and buff.	
Number of acres controlled by firm	80

THE BEDFORD BLUE STONE CO., BEDFORD, IND.

Amount of capital	$100,000
Number of employes	27
Average weekly pay-roll	$270.00
One engine, 25-horse power.	
Number of channelers	1
Number of steam drills	2
Number of steam derricks	1
Number of car loads per day	3
Number of cubic feet per car	225
Value per cubic foot, buff	$0.22
Value per cubic foot, blue	40
Two-thirds buff.	
Oolitic limestone, color light buff to dark blue, used for carvings and for buildings.	
Number of acres controlled by firm,	35
Number of acres of undeveloped stone land owned by Jas. H. Williard	256

INDIANA STONE CO., BEDFORD, IND.

Amount of capital	$50,000
Number of employes	45
Average daily wages	$1.75
Number of engines	2
One engine, 50-horse power, and one 30-horse power.	
Number of channelers	2
Number steam drills	1
Number of gang saws	4
Number of travelers	1
Number of steam derricks	3
Number of hand derricks	1
Annual product, cubic feet	100,000
Cubic feet per car	225
Average value of the output for the year, per cubic foot	$0.32
Oolitic limestone, used for building, color buff.	
Number of acres controlled by firm	415
Company commenced operations in 1887.	

COSNER & NORTON STONE CO., BEDFORD, IND.

Amount of capital	$25,000
Number of employes	20
Average daily wages	$1.50
One engine, 25-horse power.	
Number of channelers	2
Number of steam drills	1
Number of steam derricks	1
Number of car loads for nine months	75
Number of cubic feet per car	225
Value per cubic foot	$0.20
Oolitic limestone, good building stone, color buff and blue.	
Number of acres controlled by firm	20
Quarried, one-half acre; remainder all good stone land.	

DARK HOLLOW QUARRY CO., BEDFORD, IND.

Amount of capital	$300,000
Number of employes	135
Average daily wages	$1.35
Three engines, one 140-horse power, one 70, and one 20-horse power.	
Number of channelers	3
Number of steam drills	3
Number of gang saws	4
Number of planers	2
Number of headers	1
Number of travelers	2
One machine shop.	
Number of steam derricks	4
Three hand and one horse power derricks.	
Six steam pumps, four to six inch cylinders.	
Number of portable boilers	1
Number of stationary boilers	3
One boiler 80-horse power, one 60-horse, and one 40-horse power.	
Number of car-loads per year	1,000
Number of car-loads per day	20
Number of cubic feet per car	225
Value per cubic foot, buff	$0.20
Oolitic limestone, used for bridge work; color, buff.	
Number of acres controlled by firm	110
All good stone land, about two and a half acres worked.	

BODENSCHATZ BEDFORD STONE CO., BEDFORD, IND.

Amount of capital	$40,000
Number of employes	30
Average wages per day	$1.65
One engine, 60-horse power.	
Number of channelers	2
Number of steam drills	1
Number of gang saws	2
Number of steam derricks	2
One engine, 10-horse power, used for stripping.	
Product for last year, number of cubic feet	12,000
Number of cubic feet per car	225
Value per cubic foot, blue	$0.30
Value per cubic foot, buff	20
Nearly all blue oolitic limestone, used for building.	
Number of acres controlled by firm	95

ACME BEDFORD STONE CO., BEDFORD, IND.

Amount of capital	$25,000
Number of employes	18
Average daily wages	$1.65
One engine, 35-horse power.	
Number of channelers	2
Number of steam derricks	1
Number of car-loads per day	4
Number of cubic feet per car	225
Value per cubic foot, buff	$0.20
Oolitic limestone, used for building; color, buff.	
Number of acres controlled by firm	50

Leased of Geo. Dunn. Commenced operations November, 1889. This is the old Baalbeck quarry.

BEDFORD STEAM STONE WORKS, BEDFORD, IND.

Amount of capital	$10,000
Number of employes	20
Average daily wages	$2.00
Number of gang saws	5
One lathe.	
One engine, 45-horse power.	
Number of travelers	1
Number of steam pumps	2
One boiler, 6-horse power.	
Number of cars of stone per annum	400
Number of cubic feet per car	250
Value per cubic foot	$0.55

Oolitic limestone, used for building exclusively; color, buff and blue.

Mill located on the spurs of L., N. A. & C., and E. R. R. R.

Company commenced operations in 1887.

TAN YARD STONE CO., BEDFORD, IND.

Amount of capital	$150,000
Number of employes	50
Average daily wages	$1.37
Two steam hoists and derricks.	
One engine, 25-horse power.	
Number of steam channelers	3
Number of steam drills	2
One duplex pump, one steam jet.	
Number of car-loads per week	36
Number of cubic feet per car	200
Value per cubic foot	$0.25
Building and bridge stone; color, buff and blue.	
Number of acres controlled by firm	80
Number of acres undeveloped stone land	60

THE BEDFORD STONE CO., BEDFORD, IND.

Amount of capital	$150,000
Number of employes	50
Average daily wages	$1.37
Two steam hoists and derricks.	
One engine, 25-horse power.	
Number of steam channelers	3
Number of steam drills	2
One duplex pump, one steam jet.	
Number of car loads per week	36
Number of cubic feet per car	200
Value per cubic foot	$0.25
Oolitic limestone, used for building and bridge stone, color buff and blue.	
Number of acres controlled by firm	22
Number of acres of undeveloped stone land	5

TAN YARD CREEK STONE CO., BEDFORD, IND.

Amount of capital	
Number of employes	25
Average daily wages	$1.50
One engine, 30-horse power.	
Number of channelers	2
Number of steam drills	2
Number of steam derricks	1
Number of cars per day	3
Number of cubic feet per car	200
Value per cubic foot	$0.20
Oolitic limestone, color buff, good quality, used for bridge work.	
Number of acres controlled by firm	10
Commenced operations October, 1890.	
Number of acres of undeveloped stone land on the branch of the O. & M. R. R., owned by J. H. Willard	100

DAVID REED STONE CO., CHICAGO, ILL.

QUARRIES AT SMITHVILLE, IND.

Amount of capital	$125,000
Number of employes	125
Average daily wages	$1.85
Number of engines	3
One engine, 30-horse power, one 25, and one 75-horse power.	
Number of channelers	5
Number of steam drills	3
Number of gang saws	7
Number of planers	3
Number of travelers	2

Number of steam derricks	4
Number of steam pumps	4
Number of cubic feet per year	240,000
Number of cubic feet per car	225
Value per cubic foot	$0.30
Oolitic limestone, used for building, color buff and blue.	
Number of acres owned by firm	100
This company commenced operations in 1880.	

OOLITIC QUARRY CO., OF INDIANA.

CLEAR CREEK POSTOFFICE, MONROE COUNTY, INDIANA.

Amount of capital	$100,000
Number of employes	22
Average daily wages	$1.60
One engine, 35-horse power.	
Number of channelers	2
Number of steam drills	1
Number of steam derricks	1
Annual output cubic feet	120,000
Number of cubic feet per car	225
Value per cubic foot	$0.19
Oolitic limestone, used for building; color, buff and blue.	
Number of acres owned by firm	80

CLEVELAND STONE CO., CLEVELAND, O.

OPERATED AT CLEAR CREEK, IND.

Amount of capital	$40,000
Number of employes	40
Average daily wages	$1.65
Number of engines	3
One engine, 40-horse power, and two 25-horse power.	
Number of channelers	2
Number of steam drills	1
Number of gang saws	2
Number of steam derricks	3
Annual output per car-loads	300
Cubic feet per car	225
Value per cubic foot	$0.35
Oolitic limestone, used for building; color, buff.	
Number of acres owned by firm	29

PROSPECTIVE QUARRIES. DARK HOLLOW OOLITIC STONE CO.

QUARRIES AT DARK HOLLOW.

Machinery is ordered. Incorporators, D. V. Johnson, E. B. Thornton, J. B. Thornton.

SALEM STONE AND LIME CO., SALEM, IND.

Amount of capital	$250,000
Number of employes	165
Average daily wages	$1.40
Number of engines	4
Two engines, 30-horse power; one 80 and one 10-horse power.	
Number of channelers	4
Number of steam drills	6
Number of gang saws	8
Number of travelers	2
Number of steam derricks	6
One machine shop.	
One switch locomotive.	
Number of planers	3
Number of cars per year	750
Number of cubic feet per car	300
Average value of stone on cars, per cubic foot	$0.35
Oolitic limestone; color, buff, blue and mottled; used for building and lime.	
Number of lime kilns	5
Two kilns 400 bushels per day, and three 200 bushels per day.	
Number of bushels of lime per year	197,500
Value per bushel on board car	$0.20
Number of acres controlled by firm	160

J. L. CHILLAUX & BRO., ORANGEVILLE, IND.

Amount of capital	$2,000
Number of employes	5
Average daily wages	$1.25
Annual product	$2,000
Hindoostan stone; sandstone.	
One engine, 10-horse power.	
One rubber.	
Number of acres controlled by firm	40

T. N. BAXTON & SONS, PAOLI, IND.

QUARRIES AT FRENCH LICK.

Amount of capital	$10,000
Number of employes	12
Work six months in the year.	
Average daily wages	$1.00
Two rubbing plates, six feet in diameter.	
One engine 10-horse power.	
Annual product	$5,000
Kaskaskia sandstone, color white and buff, used for whetstones.	
Number of acres controlled by firm	1,000
Principal market New York.	

W. F. OSBORN, PAOLI, IND.

WHETSTONE QUARRIES AT FRENCH LICK SPRINGS.

Amount of capital	$2,500
Number of employes	20
Average daily wages	$1.25
Work seven months per year.	
Value of product	$5,000
Kaskaskia Group, shoe rubber and Hindoostan whetstone.	
Number of acres owned by firm	240
Machinery, gang saws, rubbers, etc.	
Principal market, New York.	
Owners of undeveloped quarry land, French Lick:	
Wm. Able, number of acres (20 acres quarry land)	80
Brown More, number of acres	40
J. E. Buerk, West Baden, Ind., number of acres	80
W. F. Osborn, Paoli, Ind., number of acres	400

J. A. SPRINGER, ABYDELL, IND., ORANGE COUNTY.

Amount of capital	$3,000
Number of employes	10
Average daily wages	$1.25
Number of car loads per week	5
Value per ton	$1.00
Number of tons per car	16
Number of acres controlled by firm	10
St. Louis lithographic limestone, used by the Depauw glass works.	
Number of acres undeveloped stone land owned by J. A. Springer	10
Number of acres owned by W. T. Wells	8
Number of acres owned by Peter Pope	6
Number of acres owned by Moses F. Ham	6

TAYLOR & COFFMAN, PENDLETON, IND.

Amount of capital	$10,000
Number of employes	12
Average daily wages	$1.35
Number of perch for 1890	9,500
Value per perch	$1.50
White sandstone, used for glassmaking and building. This is probably the Schoharie Grit of the New York Geologist.	
Number of acres controlled by firm	8
Number of acres undeveloped territory owned by Barber & Baird, Akron, O	34
Number of acres owned by Wm. K. Lukens, Pendleton, Ind	40
R. G Guptel, Pendleton, Ind., is opening a quarry.	

J. W. SANSBERY, ANDERSON, IND.

Amount of capital	$6,000
Number of employes	12
Average daily wages	$1.60
One horse power derrick.	
Number of perch, 1890	7,000
Value per perch	$1.60
Niagara limestone; color, gray and blue; used for building.	
Number of acres controlled by firm	25

WM. CRIM, ANDERSON, IND.

Amount of capital	$25,000
Capital invested mainly in land.	
Number of employes	8
Average daily wages	$1.25
Number of perch	4,000
Value per perch	$1.60
Niagara limestone, used for building; color, gray and blue.	
Number of acres owned by firm	46
Number of acres of undeveloped stone land owned by Mr. McCulloch	15
Number of acres owned by Wm. Crim	20

L. C. NICOSON, ALEXANDRIA, IND.

Amount of capital	$10,000
Number of employes	25
Average daily wages	$1.40
Number of engines	1
Size of engine, 40-horse power.	
Number of steam drills	1
One gas pump for pumping water.	
Number of steam derricks	2
Number of car-loads per annum	1,000
Number of cubic feet per car	225
Value per car	$12.00
Niagara limestone, used for building, color buff and blue.	
Number of acres controlled by firm	100
Number of acres of undeveloped stone land owned by E. G. Vernon	40
E. G. Vernon is opening a quarry.	

BOOTH & FREE, ALEXANDRIA, IND.

Amount of capital	$10,000
Number of employes	15
Average daily wages	$1.40
One engine, 20-horse power.	
Number of steam drills	1
Number of steam derricks	1
One 7-inch centrifugal pump,	

Number of car loads	350
Number of cubic feet per car load	270
Value per car load	$20.00
Niagara limestone, used for building, color blue.	
Number of acres controlled by firm	35
Number of acres of undeveloped stone land owned by Mrs. Ennis	10
Number of acres owned by Wm. Carver	40
Number of acres owned by Peter Swin	12

D. R. McKENNEY & SON, MARION, IND.

Amount of capital	$35,000
Land is valued at $30,000.	
Number of employes	40
Average daily wages	$1.50
One portable engine, 10-horse power.	
Number of perch of stone	30,000
Value per perch	$1.25
Niagara limestone, used for building, color blue and gray.	
Number of acres owned by firm	30
Number of acres of undeveloped stone land owned by Phil. Matler	30
Number of acres owned by Dr. Williams	15

S. R. FRANKBONER, MARION, IND.

Amount of capital	$1,000
Number of employes	3
Average daily wages	$2.00
(Piecework.)	
Number of perch	2,400
Value per perch	$1.25
Niagara limestone, used for building, color gray and blue.	
Number of acres owned by firm	4

FRANK MAYO, MARION, IND.

Amount of capital	$1,000
Number of employes	3
Average daily wages	$1.50
Number of perch	300
Value per perch	$1.25
Hydraulic limestone, used for building, color buff.	
Number of acres controlled by firm	

MRS. KATE HARTER, EATON, IND.

Amount of capital	$14,000
Number of employes	6
Average daily wages	$1.30
Number of perch	1,200

Value per perch	$0.80
Niagara limestone, used for building, color buff and blue.	
Number of acres controlled by firm	70
Number of acres of undeveloped stone land owned by Brant, Carter & Co	15
Number of acres owned by Dr. Mitchel	100

YONTZ & MORRIS, EATON, IND.

Amount of capital	$2,500
Number of employes	3
Average daily wages	$1.25
One pump run by horse power.	
Number of perch of stone	2,000
Value per perch	$1.10
Niagara limestone, used for building, color buff and blue.	
Number of acres controlled by firm	10
Leased from William Bosman.	

W. D. B. COOK, MONTPELIER, IND.

Amount of capital	$1,000
Number of employes	3
Average daily wages	$1.35
One portable engine, 10-horse power.	
One rotary pump.	
Number of perch	900
Value per perch	$0.75
Niagara limestone, used for building, color buff and blue.	
Number of acres controlled by firm	1½
Leased from I. B. Spalding.	

WOOD & LEWIS, MONTPELIER, IND.

Amount of capital	$3,500
Number of employes	6
Average daily wages	$1.35
One portable engine, 20-horse power.	
One centrifugal pump.	
Number of perch	2,000
Value per perch	$1.00
Niagara limestone, used for building, color blue.	
Number of acres controlled by firm	10
Number of acres of undeveloped stone land owned by Joseph Range	9
Number of acres owned by James H. Markle	60
Number of acres owned by I. B. Spalding	30
Number of acres owned by Emanuel Lacey	30
Number of acres owned by Walker Monroe	20
Number of acres owned by Cal Shull	10
Number of acres owned by F. B. Miller	40

BALTES & PALMER, MONTPELIER, IND.

Amount of capital	$18,500
Number of employes	20
Average daily wages	$1.35
Two engines, one 40 and one 12-horse power.	
One boiler, 60-horse power.	
Number of steam drills	1
Number of steam derricks	1
One centrifugal pump.	
Number of car loads per year	600
Number of cubic feet per car	300
Value per car	$12.00
Niagara limestone, used for building, color blue.	
Number of acres controlled by firm	28

TWIBEL & SONS, MONTPELIER, IND.

Amount of capital	$8,000
Number of employes	15
Average daily wages	$1.35
One engine, 25-horse power.	
Number of steam drills	1
Number of steam derricks	1
One centrifugal pump.	
Number of car loads per year	300
Value per car	$12.00
Number of acres controlled by firm	15
Sold to Baltes & Palmer.	

J. W. FREEMAN, BLUFFTON, IND.

Amount of capital	$7,000
Number of employes	16
Average daily wages	$1.50
One engine, 35-horse power.	
Number of steam drills	1
Number of rotary pumps	1
One Blake crusher.	
Number of perch	4,000
Value per perch	$1.00
Niagara limestone, color gray; used for building.	
Number of acres controlled by firm	12

DECATUR STONE AND LIME CO., DECATUR, IND.

Amount of capital	$8,000
Number of employes	10
Average daily wages	$1.50
One engine, 36-horse power.	
Number of steam drills	1
One steam and one hand derrick.	

Number of steam pumps	1
Number of gang-saws	1
Number of perch—long perch	3,000
Number of bushels of lime per year	15,000
Value per bushel	$0.17
Value of stone per annum	$8,000

Limestone used for building and monument bases. Lime white.

Number of acres controlled by firm	3

ROBINSON & GILLIG, DECATUR, IND.

Amount of capital	$10,000
Number of employes	30
Average daily wages	$1.50

One engine, 35-horse power.

Number of steam drills	1
Number of Gates' crushers	1
Number of perch	1,500
Number of yards of stone	3,500
Value of stone per perch at quarry	$0.90
Value of stone per yard at quarry	.85

Lower Helderberg group, dark dove-colored building stone.
Used for macadamizing.

Number of acres controlled by firm	30
Number of acres of undeveloped stone land owned by Nimrod Dailey's heirs	30
Number of acres owned by Eli Zimmerman	100

SCHINDLER & SMITH, BUENA VISTA, IND. (P. O., LINN GROVE, IND.)

Amount of capital	$2,000
Number of employes	8
Average daily wages	$1.50

One engine, 10-horse power, portable.

Number of perch	2,000
Value per perch	$0.80

Niagara limestone, used for building.

Number of acres controlled by firm	3

Leased from Mrs. Ensly.

MESHBARGER & CO., BUENA VISTA, IND.

Amount of capital	$2,000
Number of employes	8
Average daily wages	

One engine, 10-horse power, portable.

Number of perch	1,800
Value per perch	$0.80

Niagara limestone, used for building, color blue.

Number of acres controlled by firm	4

B. J. RICE, DECATUR, IND.

Amount of capital	$2,500
Number of employes	12
Average daily wages	$1.50
One engine, 25-horse power.	
One crusher.	
Number of cubic yards per month	4,000
Used for roads and streets.	
Value per cubic yard	$0.85
Number of acres controlled by firm	5

GUSMAN, CLINE & CO., MARKLE, IND.

Amount of capital	$3,000
Number of employes	12
Average daily wages	$1.75
One engine, 10-horse power, portable.	
Number of steam drills	1
One horse power derrick.	
One centrifugal pump, 5x4½.	
Number of perch, 16½ feet per perch	5,000
Value per perch	$1.00
Niagara limestone, good building stone, color blue.	
Number of acres controlled by firm	4

F. A. BRICKLEY, MARKLE, IND.

Amount of capital	$1,250
Number of employes	8
Average daily wages	$1.75
One engine, 10-horse power, portable.	
One centrifugal pump, 4x3.	
Number of perch	3,500
Value per perch	$1.00
Niagara limestone, used for building, color blue.	
Number of acres controlled by firm	2

J. W. ENGLISH, GREENSBURG, IND.

Amount of capital	$2,500
Number of employes	35
Average daily wages	$2.00
One engine, 12-horse power.	
Number of steam drills	2
Number of derricks, one steam and three hand.	
Number of steam pumps	1
Number of car loads of stone per annum	250
Number of cubic feet per car	225
Value per car	$115.00
All cut stone.	
Niagara limestone, used for building, color blue.	

Number of acres controlled by firm	14
Number of acres undeveloped stone land owned by—	
Charles Woodward	12
Thomas Kitchen	7
Pleasant Paugh	4
Elisha English	5
Cliff English	½
William Turner	5
Green Barnes	10
Mrs. Updyke	10
Harrison House	10
Everman Styers	40

LETT'S CORNER LIMESTONE CO., GREENSBURG, IND.

QUARRIES AT LETT'S CORNER.

Amount of capital	$4,000
Number of employes	35
Average daily wages	$1.75
One portable engine, 20-horse power.	
Number of steam drills	2
Number of derricks	5
Two are horse power and three hand power.	
Number of car loads per annum	175
Number of cubic feet per car	200
Value per car load	$75.00
Niagara limestone, used for curb and gutter, color blue.	
Number of acres controlled by firm	15
There is good stone land in the vicinity.	

HOLLINSBEE STONE CO., GREENSBURG, IND.

QUARRIES AT WESTPORT.

Amount of capital	$20,000
Number of employes	67
Average daily wages	$1.35
One engine, 25-horse power.	
Number of channelers	1
Number of steam drills	2
One locomotive.	
Number of gang saws	1
Number of derricks	7
Four steam and three hand derricks.	
Number of car loads per annum	750
Number of cubic feet per car	200
Value per car	$26.30
Limestone, used for curbing, bridges and paving.	
Number of acres controlled by firm	50

GREENSBURG LIMESTONE CO., GREENSBURG, IND.

Amount of capital $84,233
Number of employes 125
Average daily wages $2.25
    One engine, 25-horse power.
Number of steam drills 10
    One of them is a capper.
Number of boilers 2
    One boiler, 125-horse power, flue, and one 65-horse power, tubular.
    One black crusher and engine, 35-horse power, and tubular boiler.
    One upright boiler, 30-horse power.
    One upright boiler, 20-horse power.
Number of steam pumps 1
Number of steam derricks 4
    Eight Buffalo horse-power and one hand-power derricks.
Number of car loads per annum 1,566
Number of cubic feet per car 240
Value per car $26.50
Total sales per annum $41,386.00
    Limestone, used for building and bridge work, color gray and blue.
Number of acres controlled by firm 145¼
    All stone land.

THE FUESTON STONE CO., GREENSBURG, IND.

QUARRIES AT WESTPORT, IND.

Amount of capital $2,000
Number of employes 30
Average daily wages $1.75
Number of hand derricks 4
Number of car loads per annum 150
Number of cubic feet per car 200
Value per car, all cut stone $115.00
    Niagara limestone, used for curbing, guttering and flagging; color, blue.
Number of acres controlled by firm 5
    Leased from Aaron Boicourt.

OWENS & STEVESON, WESTPORT, IND.

Amount of capital $225.00
Number of employes 9
    Worked 75 days in 1890.
Wages paid $852.00
Number of hand derricks 2
Number of car loads 12
Number of cubic feet per car load 200
Value per car $75.00
    Niagara limestone, used for curbing and guttering; color, blue.

Number of acres controlled by firm	1
Leased from Thos. Thomas.	
Number of acres of undeveloped stone land owned by	
Wm. Lawrence	70
Thos. Spencer	60
Craig & Forsythe	160
Jasper Patterson	200

W. F. BOBBINS, WESTPORT, IND.

QUARRIES AT LETT'S CORNER.

Amount of capital	$3,500
Number of employes	40
Average daily wages	$1.75
Number of boilers	1
Number of steam drills	2
Number of derricks	3
One horse power and two hand derricks.	
Number of cars per annum	75
Number of cubic feet per car	200
Value per car load	$90.00
Limestone, used for flagging, curbing, footing, bridge and building, color blue.	
Number of acres controlled by firm	7
Leased from Allen Layton.	

BOICOURT & DOWDEN, WESTPORT, IND.

Amount of capital	$1,000
Number of employes	10
Average daily wages	$1.35
Number of hand derricks	3
Number of car loads per annum	200
Number of cubic feet per car	200
Value per car load of cut stone	$70.00
Value per car load of rough stone	$10.00
Limestone, used for curbing, guttering and flagging, color blue.	
Number of acres controlled by firm	3

THOMAS BEMISH, WESTPORT, IND.

Amount of capital	$300
Average daily wages	$1.50
Number of employes	12
Number of horse power derricks	1
Number of car loads for 1890	50
Number of cubic feet per car	250
Estimated value of stone loaded on car	$70.00
Niagara blue limestone.	
Number of acres owned by firm	5

JOHN L. SCANLAN, ST. PAUL, IND.

Amount of capital	$30,000
Number of employes	75
Average daily wages	$1.50
Two engines, one 40-horse power and one 12-horse power.	
Number of channelers	3
Number of steam drills	6
Number of steam derricks	5
Number of horse power derricks	1
Number of hand power derricks	1
Number of car loads per annum—	
Flagging, 25 cars, value per car	$50.00
Curbing, 50 cars, value per car	70.00
Rubble, 200 cars, value per car	7.50
Footing, 400 cars, value per car	25.00
Bridge, 375 cars, value per car	18.00
Macadam, 50 cars, value per car	5.00
Number of cubic feet per car	200
Limestone, color gray and blue.	
Number of acres controlled by firm	150
Forty acres good stone land.	
Number of acres undeveloped stone land owned by E. L. Floyd	100

HARPER & MUNS.

HARPER POSTOFFICE, DECATUR COUNTY, INDIANA.

Amount of capital	$500
Number of employes	20
Average daily wages	$1.50
Two hand derricks.	
Number of car-loads per annum	110
Number of cubic feet per car	200
Value per car-load	$70.00
Number of acres controlled by firm	2
Leased from John Boicourt.	

JOHN BOICOURT, HARPER POSTOFFICE, DECATUR COUNTY, IND.

QUARRIES AT SARDINIA CROSSING.

Amount of capital	$500
Number of employes	10
Average daily wages	$1.50
Two hand derricks.	
Number of car-loads per annum	25
Number of cubic feet per car	200
Value per car-load	$70.00
Niagara limestone, used for curbing and guttering; color, blue.	
Number of acres controlled by firm	60
Number of acres of undeveloped stone land owned by J. Q. Ellett	80
Jas. Meyers	160
Mrs. Dickson	160

WM. POOLE, NORTH VERNON, IND.

Amount of capital	$200
Number of employes	5
Average daily wages	$1.00
Number of car-loads per annum	4
Number of cubic feet per car	200
Value per car-load	$50.00
Devonian limestone, used for flagging and curbing; color, blue.	
Number of acres controlled by firm	2

HICKS & HOLMES, NORTH VERNON, IND.

Amount of capital	$20,000
Number of employes	30
Average daily wages	$1.75
Work eight months per year.	
One engine, 16-horse power.	
Number of steam drills	3
One steam pump and boiler.	
Number of gang-saws	1
Number of horse-power derricks	7
Amount of product per year—number of cars	400
Number of cubic feet per car	270
Value per car	
Devonian limestone, color blue.	
Number of acres controlled by firm	25

HERMAN BROTHERS, VERNON, IND.

Amount of capital	$5,000
Number of employes	7
Average daily wages	$1.10
Number of car loads per year	400
Number of cubic feet per car	225
Value per car	$8.50
Rubble, macadam and bridge stone.	
Number of acres controlled by firm	210
One hundred and twenty acres stone land.	

CONNER & COVERT, NORTH VERNON, IND.

Amount of capital	$600
Number of employes	3
Average daily wages	$1.25
Number of car loads per annum	100
Number of cubic feet per car	250
Value per car	$12.00
Devonian limestone, color blue and gray. Rubble and macadam.	
Number of acres controlled by firm	7

BIG FOUR LIMESTONE CO., NEWPOINT, IND.

Amount of capital	$35,000
Number of employes	125
Average daily wages	$2.25

One engine, 40 horse-power; one portable engine, 10 horse-power, and one hoisting engine, 10 horse-power.

One locomotive.

Number of steam drills	6
Number of steam derricks	5
Number of car loads per annum	1,200
Number of cubic feet per car	225
Value per car load	$50.00
Total sales for last year	$60,000

Niagara limestone, used for rubble, curbing, guttering, bridge, flagging and jail stone; color, blue.

Number of acres controlled by firm	10

Leased from W. W. Hollinsbee.

Owned by same company:

Quarry No. 2, number of acres	80
Number of acres of undeveloped stone land owned by Henry Topmiller, 10 acres good stone land.	120
Number of acres of undeveloped stone land owned by Oscar Barclay	6
Number of acres of John Gerwer's estate	10

EUREKA LIMESTONE CO., NEWPOINT, IND.

Amount of capital	$7,000
Number of employes	40
Average daily wages	$2.25

One portable engine, 10 horse-power.

Number of steam drills	2

Three horse-power and four hand-power derricks.

Number of car loads per annum	700
Number of cubic feet per car	225
Value per car load	$50.00

Niagara limestone; color, blue and gray; used for flagging, curbing, guttering, footing, rubble, paving and rip rap.

Number of acres controlled by firm	14

One quarry leased on royalty from John F. Hollinsbee.

COMAN & CO., NEWPOINT, IND.

Amount of capital	$3,200
Number of employes	12
Average daily wages	$1.50

One portable engine, 8-horse power.

Number of steam drills	1
Number of horse power derricks	2
Number of car loads per year	140
Number of cubic feet per car	225
Value per car load	$30

Niagara limestone, used for rubble, footing and guttering, color blue and gray.

Number of acres controlled by firm	2

Leased from Susan Coman.

ASHMAN & GLASGOW, OSGOOD, IND.

Amount of capital	$20,000
Number of employes	75
Average daily wages	$2.25
Number of steam drills	3
Number of steam derricks	2
One traveler, 20-horse power.	
Number of steam pumps	1
One stationary boiler, 30-horse power.	
One Gates crusher and engine, 25-horse power.	
Number of car loads per annum	700
Number of cubic feet per car	225
Value per car load	$55.00

Niagara limestone, used for curbing, guttering, flagging and bridge stone, color blue and gray.

Number of acres controlled by firm	———
Number of acres of undeveloped stone land owned by W. D. and T. Wilson	30
Number of acres owned by Mr. Levi	10

PETER WAGNER, OSGOOD, IND.

Amount of capital	$10,000
Number of employes	25
Average daily wages	$2.00
One steam engine, 8-horse power.	
Number of steam drills	1
Number of hand derricks	4
Number of car loads per year	100
Number of cubic feet per car	225
Value per car	$70.00

Niagara limestone, used for curbing and guttering, color blue.

Number of acres controlled by firm	126
Number of acres of undeveloped stone land owned by Thomas Jones	48
Number of acres owned by I. Levi	7
Number of acres owned by W. D. Wilson	15

J. T. BEACH, HOLTON, IND.

Amount of capital	$335
Number of employes	12
Average daily wages	$1.50
Number of hand derricks	1
Number of car loads per annum	250
Number of cubic feet per car	225
Value per car load	$50

Niagara limestone, used for guttering, flagging, etc., color gray.

Number of acres controlled by firm	4

Leased from Phoebe J. Murdock.

SQUIRE COX, HOLTON, IND.

Amount of capital	$13,000
Number of employes	50
Average daily wages	$1.75
Number of steam drills	1
Number of hand derricks	2
One boiler, 15 horse power.	
Number of car-loads per annum	850
Number of cubic feet per car	225
Value per car-load	$50.00
Niagara limestone, used for curbing, guttering, etc.; color, gray.	
Number of acres controlled by firm	16
Number of acres of undeveloped stone land owned by Clifford Overturf	80
Number of acres owned by Samuel Overturf	80
Number of acres owned by Henry Overturf	160

SECREST & CO., LAUREL, IND.

Amount of capital	$15,000
Number of employes	85
Work nine months per year.	
Average daily wages	$1.45
Six derricks, four horse power, and two hand power.	
Number of car-loads per year	800
Number of cubic feet per car	200
Value per car-load	$44.00
Niagara limestone, used for curbing, flagging, etc.; color, buff and blue.	
Number of acres controlled by firm	400
Available stone land, 20 acres.	

W. D. ADAMS, LAUREL, IND.

Amount of capital	$500
Number of employes	3
Average daily wages	$1.50
Number of car-loads per annum	5
Number of cubic feet per car	200
Value per car	$70.00
Niagara limestone, used for flagging; color, buff and blue.	
Number of acres controlled by firm	12
Number of acres of undeveloped stone land owned by Mrs. Fannie Derbyshire	4
Number of acres owned by Jas. Derbyshire	8
Number of acres owned by Harrison Crowe	20

JACOB SENIOUR, LAUREL, IND.

Amount of capital	$1,000
Number of employes	5
Average daily wages	$1.50
Number of car-loads per annum	75
Number of cubic feet per car	200
Value per car-load	$60.00
Niagara limestone, used for flagging; color, buff and blue.	
Number of acres controlled by firm	5

FRANK DICE, LAUREL, IND.

Amount of capital	$1,000
Number of employes	3
Average daily wages	$1.75
Number of car-loads per annum	60
Number of cubic feet per car-load	200
Value per car-load	$30.00
Niagara limestone, used for flagging and building; color, buff and blue.	
Number of acres controlled by firm	6

WILLIAM BLUE, LAUREL, IND.

Amount of capital	$1,200
Number of employes	3
Average daily wages	$1.50
Number of car loads per year	40
Number of cubic feet per car	200
Value per car load	$60.00
Number of acres controlled by firm	10

W. T. BALL, LONGWOOD, IND.

Amount of capital	$8,000
Number of employes	10
Average daily wages	$1.25
One derrick.	
Number of car loads per annum	100
Value per car load	$25.00
Limestone, used for foundations, crossings and flagging.	
Number of acres controlled by firm	30

A. W. CLOUD, LAUREL, IND.

Amount of capital	$3,000
Number of employes	15
Average daily wages	$1.40
Number of car loads of stone for 1890	160
Estimated value loaded on cars	$40.00
Number of acres controlled by firm	106

JOSEPH WORSHAM, LONGWOOD, IND.

Amount of capital	$1,000
Number of employes	3
Average daily wages	$1.25
Number of perch	250
Value per perch	$1.00
Number of acres controlled by firm	5

BECK, PURVIANCE & BECK, HUNTINGTON, IND.

Amount of capital	$50,000
Number of employes	50
Average daily wages	$1.35
One engine and hoist, 40-horse power.	
Number of steam drills	2
One steam and one centrifugal pump.	
Number of bushels of lime per annum	280,000
Value per bushel	$0.11
Number of acres controlled by firm	125
Number of perpetual kilns	6

HUNTINGTON WHITE LIME CO., HUNTINGTON, IND.

Amount of capital	$70,000
Number of employes	60
Average daily wages	$1.35
Two engines, one 40-horse power, and one 12-horse power.	
Number of boilers	2
Number of steam drills	2
One steam and one centrifugal pump.	
Number of bushels of lime per annum	420,000
Value per bushel	$0.11
Number of acres controlled by firm	200
Number of perpetual kilns	8

BALTES & MARTINS, HUNTINGTON, IND.

Amount of capital	$75,000
Number of employes	75
Average daily wages	$1.35
Three engines, one 25 horse-power and two 20 horse-power.	
Number of steam drills	2
One steam and one centrifugal pump.	
Number of bushels of lime per annum	525,000
Value per bushel	$0.11
Number of acres controlled by firm	395
Number of perpetual kilns	10

CASPER NOLLIS, HUNTINGTON, IND.

Amount of capital	$1,500
Number of employes	4
Average daily wages	$1.35
One portable engine, 10 horse-power.	
Number of steam drills	1
One centrifugal pump.	
Number of perch	2,500
Value per perch	$0.60
Niagara limestone, used for building; color, blue.	
Number of acres controlled by firm	3

FRANK LISMAN, HUNTINGTON, IND.

Amount of capital	$5,000
Number of employes	10
Average daily wages	$1.35
Two engines, 10 horse-power each.	
Number of steam drills	1
Number of perch	6,000
Value per perch	$0.60
Niagara limestone, used for building; color, blue.	
Number of acres controlled by firm	20
Leased from Dr. Furgeson.	

BRIDGES & SONS, WABASH, IND.

Amount of capital	$10,000
Number of employes	10
Average daily wages	$1.50
Number of perch	5,000
Value per perch	$0.83
Niagara limestone, used for building; color, blue and gray.	
Number of acres controlled by firm	10
Five acres stone land.	
Number of acres of undeveloped stone land owned by Mr. Safford	12
Number of acres owned by Smith heirs	12

W. H. BENT, SOUTH WABASH, IND.

Amount of capital	$10,000
Number of employes	8
Average daily wages	$1.50
Number of perch	4,000
Value per perch	$0.50
Niagara limestone, used for flagging and crossing; color, buff.	
Number of acres controlled by firm	13

JACOB S. LAMBERT, SOUTH WABASH, IND.

Amount of capital	$500
Number of employes	10
Average daily wages	$1.50
Number of perch	6,000
Value per perch	$5.00
Value per foot	20
Limestone, used for flagging and street crossings.	
Number of acres controlled by firm	3

A. C. LAMBERT, SOUTH WABASH, IND.

Amount of capital	$2,000
Number of employes	15
Average daily wages	$1.50
Number of car loads per annum	500
Number of cubic feet per car load	275
Value per car load	$30.00
Niagara limestone, used for building, color buff and blue.	
Number of acres controlled by firm	15
Number of acres undeveloped stone land owned by Joseph Daugherty	25
Number of acres owned by Smith heirs	4
Number of acres owned by Daniel Hutching	116
Number of acres owned by William Unger	80
Number of acres owned by Isaac Unger	80
Number of acres owned by William Pierson	40
Number of acres owned by William P. Stocker	40
Number of acres owned by U. M. Engleman	40

PHILIP DAVIS, SOUTH WABASH, IND.

Amount of capital	$500
Number of employes	3
Average daily wages	$1.50
Number of perch	200
Value per perch	$0.75
Niagara limestone, used for building, color blue.	
Number of acres controlled by firm	60

PHILIP HIPSKIND, WABASH, IND.

Amount of capital	$10,000
Number of employes	14
Average daily wages	$1.50
One portable engine, 12-horse power.	
One steam pump.	
Number of yards per annum	2,000
Number of perch of stone per annum	2,000
Number of square feet flagging	7,000
Value per square yard	$0.85
Value per perch, 16½ feet	65
Value per foot for flagging	15
Niagara limestone, used for macadam, building and flagging, color gray.	
Number of acres controlled by firm	25
Twenty acres leased from T. F. Payne.	

WILLIAM MOELERING, WABASH, IND.

Amount of capital	$10,000
Number of employes	50
Average daily wages	$1.75
Number of car loads per annum	800
Number of cubic feet per car load	275
Value per car load	$12.00
Niagara limestone, used for building.	
Number of acres controlled by firm	35

SMITH BROS., WABASH, IND.

Amount of capital	$3,000
Number of employes	18
Average daily wages	$1.50
Number of perch	6,000
Value per perch	$0.75
Niagara limestone, used for building, color blue and gray.	
Number of acres controlled by firm	1

C. H. BROWNELL, PERU, IND.

Amount of capital	$3,000
Number of employes	8
Average daily wages	$1.25
One engine, 10-horse power.	
Number of steam pumps	1
Number of perch	3,000
Value per perch	$1.25
Niagara limestone, used for building; color, blue.	
Number of acres controlled by firm	6

DAVID LONG, PERU, IND.

Amount of capital	$1,000
Number of employes	3
Average daily wages	$1.25
Number of perch, per month	300
Value per perch	$1.25
Number of acres coutrolled by firm	4

CHAS. TRIPPIER, PERU, IND.

Amount of capital	$500
Number of employes	2
Average daily wages	$1.25
Number of bushels of lime per annum	1,000
Value per bushel	$0.20
Number of acres controlled by firm	2

DAVID McRAE, PERU, IND.

Amount of capital	$1,000
Number of employes	2
Average daily wages	$1.25
Number of perch	1,000
Value per perch	$1.25
Number of acres controlled by firm	2

A. B. KEEPORT, LOGANSPORT, IND.

Amount of capital	$10,000
Number of employes	15
Average daily wages	$1.35
One engine, 10-horse power.	
Number of steam drills	1
Number of bushels of lime per annum	100,000
Value per bushel	$0.11
Devonian limestone; color, blue.	
Number of acres controlled by firm	30

AUGUST GLEITZ, LOGANSPORT, IND.

Amount of capital	$10,000
Number of employes	12
Average daily wages	$2.50
This includes teams and teamsters.	
Two hand power derricks.	
Number of perch, 16½ feet	10,000
Value per perch	$1.00
Devonian limestone, used for rubble; color, gray.	
Number of acres controlled by firm	9
Number of acres of undeveloped stone land owned by Hamburg heirs	15
Number of acres owned by Andrew Young	10
Number of acres owned by Dr. Fitch	20
Number of acres owned by G. M. Fitch	10

HEADY & WOOLF, LOGANSPORT, IND.

Amount of capital	$5,000
Number of employes	6
Average daily wages	$2.00
Number of perch	5,000
Value per perch	$1.00
Devonian limestone, used for rubble; color, gray.	
Number of acres controlled by firm	3
Leased from E. M. Talbot.	

JOHN BARNES, LOGANSPORT, IND.

Amount of capital	$1,000
Number of employes	4
Average daily wages	$1.50
Number of perch	2,500
Value per perch	$1.00
Devonian limestone, used for rubble; color, gray.	
Number of acres controlled by firm	1

T. C. BARNES, LOGANSPORT, IND.

Amount of capital	$500
Number of employes	5
Average daily wages	$1.75
Number of perch	2,000
Value per perch	$1.00
Devonian limestone, used for rubble; color, gray.	
Number of acres controlled by firm	4
Leased from E. M. Talbott.	

LUX & LUX, LOGANSPORT, IND.

Amount of capital	$10,000
Number of employes	6
Average daily wages	$1.50
Number of perch	3,000
Value per perch	$0.75
Devonian limestone, used for building; color, gray and blue.	
Number of acres controlled by firm	26

GEO. W. DEFENBAUGH, KOKOMO, IND.

Amount of capital, principally land	$20,000
Number of employes	10
Average daily wages	$1.25
One engine, 5 horse-power.	
Number of steam pumps	2
Number of perch	2,000
Number of yards of macadam	3,000
Value per perch	$1.35
Value per yard macadam	.45
Water line, used for building and macadam; color, dove.	
Number of acres controlled by firm	20
Number of acres of undeveloped stone land owned by Geo. W. Hocker,	1

HOCKER & DALMAN, KOKOMO, IND.

Amount of capital	$5,000
Number of employes	8
Average daily wages	$1.25
One engine, 10 horse-power.	
Number of steam pumps	1
Number of perch	3,000
Value per perch	$1.35
Number of acres controlled by firm	25

McGLEN & CO., KOKOMO, IND.

Amount of capital	$4,000
Number of employes	14
Average daily wages	$1.75
One engine, 10-horse power.	
Number of steam pumps	1
Number of perch	5,000
Number of yards of macadam	3,000
Value per perch	$1.10
Value per yard, macadam	.90
Water lime, used for building and macadam.	
Number of acres controlled by firm	10

STEWART & BROTHERS, KOKOMO, IND.

Amount of capital	$5,000
Number of employes	100
Average daily wages	$1.50
One engine, 15-horse power.	
Number of steam pumps	1
Number of perch	6,000
Number of yards of macadam	28,000
Value per perch	$1.25
Value per yard macadam	.80
Water lime, dove color.	
Number of acres controlled by firm	8

JOLLISANT & SWEENEY, GEORGETOWN, IND.

Amount of capital	$1,000
Number of employes	12
Average daily wages	$1.40
One hand derrick.	
Number of car loads of stone per annum	300
Number of cubic feet per car load	225
Value per car load	$30.00
Oolitic limestone, used for paving and macadam.	
Number of acres controlled by firm	4

Leased from Jefferson Keithly. Quarries at Crandall were not worked last year; now owned by the Indiana Improvement Co., that expects to work them extensively this year.

This is Oolitic stone, of buff color, and good quality.

CORYDON STONE CO., CORYDON, IND.

Amount of capital	$75,000
Number of employes	40
Average daily wages	$1.40
Number of engines	2
One engine 50-horse power, and one 30-horse power.	
Number of steam drills	2
Number of channelers	3
Number of gang-saws	4
Number of steam derricks	4
Number of horse-power derricks	1
Number of ejectors	4
One rubbing bed.	
Number of car loads of stone per annum	200
Number of cubic feet per car load	200
Value per car	$100
Oolitic and St. Louis limestone; the former buff, and the latter a beautiful blue, that makes fine table tops, door and window sills and caps, and trimmings of all kinds.	
Number of acres controlled by firm	80

INDIANA CONTRACT CO., MILLTOWN, IND.

OFFICE AT EVANSVILLE, IND.

Amount of capital	$20,000
Number of employes	100
Average daily wages	$1.50
Number of engines	2
One engine 100-horse power and one 25-horse power.	
Number of crushers	1
Number of elevators	2
Number of carriers	1
Number of car loads of stone per annum	2,000
Number of cubic feet per car	350
Value per car load	$11.00
St. Louis limestone, used for macadam, color drab.	
Number of acres controlled by firm	42

J. B. SPEED & CO., MILLTOWN, IND.

Amount of capital	$20,000
Number of employes	14
Average daily wages	$1.40
Number of engines	2
One engine 16-horse power and one 10-horse power.	
Number of bushels of lime per annum	100,000
Value per bushel	$0.12½
St. Louis limestone, color drab.	
Number of acres controlled by firm	24

MRS. GARROW, MARENGO, IND.

Amount of capital	$2,000
Number of employes	15
Average daily wages	$1.25
One engine, 35-horse power.	
Number of crushers	1
One set of burrs.	
Number of bushels of lime	8,000
Number of car loads of stone, pulverized for glass making	150
Number of car loads of macadam	100
Number of cubic feet per car	250
Value per car, pulverized	$40.00
Value per car load, macadam	12.00
St. Louis limestone, color gray.	
Number of acres controlled by firm	2½

DR. BUEST, ST. ANTHONY, IND.

RESIDENCE, NEW ALBANY, IND.

Amount of capital	$5,000
Number of steam drills	1
One-horse power derrick.	
Lower Coal Measure sandstone, color brown, used for building.	
Number of acres controlled by firm	200
Not worked for two years.	
The above facts were gathered from a visit to the quarry.	

WINDSTANLY & BREYFOGLE, ST. ANTHONY, IND.

Lower Coal Measure sandstone, color brown, used for building.	
Number of acres controlled by firm	200
Not worked in 1890.	

JACOB ECKERT, JASPER, IND.

Amount of capital	$2,000
Number of employes	5
Average daily wages	$1.50
One hand derrick.	
Number of cubic yards per annum	300
Value per yard	$3.50
Carboniferous sandstone, color blue and white.	
Number of acres controlled by firm	37

VAN SCHRODER, JASPER, IND.

Amount of capital $1,500
Number of employes 2
Average daily wages $1.50
One derrick.
Number of cubic yards per annum 200
Value per cubic yard $3.50
Carboniferous sandstone, color white, good quality.
Number of acres controlled by firm 2
Leased from Buelline Bros.

EIEGENMANN & HALLENBACH, CANNELTON, IND.

Amount of capital $2,000
Number of employes 50
Average daily wages $2.25
One derrick boat and engine, 25 horse-power.
Three hand derricks.
Number of cubic yards per annum 1,535
Value per cubic yard $2.50
Lower carboniferous sandstone; color, buff.
Territory leased from American Cannel Coal Co. and N. Vaughn.

FRANK PAULINE, CANNELTON, IND.

Amount of capital $200
Number of employes 8
Average daily wages $1.35
Three hand derricks.
Number of cubic yards per annum 300
Value per cubic yard $2.50
Lower carboniferous sandstone, used for bridge and foundation work; color, buff.
Number of acres controlled by firm 4

CLEARWATER BROS., CANNELTON, IND.

Amount of capital $200
Number of employes . . . .
Average daily wages $1.35
Two horse-power derricks.
Number of cubic yards per annum 443
Value per cubic yard $2.50
Lower carboniferous sandstone, good, used for bridge and lock work; color, buff.
Number of acres controlled by firm 2
Leased from N. Vaughn.

W. S. DOUGLAS, FOUNTAIN, IND.

Amount of capital	$300
Number of employes	3
Average daily wages	$1.25
Number of car loads per annum	30
Number of cubic feet per car	180
Value per car	$20.00
Lower carboniferous sandstone, used for building; color, buff and blue.	
Number of acres controlled by firm	2
Leased from H. J. Reed.	
Number of acres of undeveloped stone land owned by L. B. Brooks	10
Number of acres owned by W. C. B. Sewall	4

THE ILLINOIS & INDIANA STONE CO., SILVERWOOD, IND.

Amount of capital	$250,000
Number of employes	60
Average daily wages	$1.50
Two engines, 40 horse-power each.	
Number of channelers	4
Two bar and two Waddell.	
Number of gang saws	3
One double gang, 16 feet long.	
Number of steam pumps	2
Number car loads per annum	750
Number of cubic feet per car	275
Value per car	$75.00
Carboniferous sandstone; color, gray; used for building.	
Number of acres controlled by firm	25
Number of acres undeveloped stone land, owned by Jacob Oldshoe	40
Number of acres owned by Robert Oldshoe	40
Number of acres owned by Samuel Milligan	40
All limestone.	
Number of acres undeveloped stone land, owned by William Jarvis, Guion, Ind.	30
Sandstone.	

JAMES SCHEE, POTTSVILLE, IND.

Amount of capital	$1,500
Number of employes	12
Average daily wages	$1.25
Number of car-loads per annum	400
Number of cubic feet per car	180
Value per car	$12.50
Carboniferous sandstone; color, gray; used for rip-rap.	
Number of acres controlled by firm	4

PARK COUNTY BROWN STONE CO., MANSFIELD, IND.

Amount of capital	$150,000
Number of employes	20
Average daily wages	$1.50
One engine, 30-horse power.	
Number of channelers	2
Number of derricks	3
One steam, one horse, and one hand power.	
Number of car-loads per annum	150
Number of cubic feet per car	275
Value per car	$200.00
Carboniferous sandstone; color, brown; used for building.	
Number of acres controlled by firm	200
Number of acres undeveloped stone land owned by J. R. Johnson	40
Number of acres owned by Mrs. Zopher Coleman	20

E. & T. H. R. R. FARMERSBURG, IND.

Amount of capital	
Number of employes	12
Average daily wages	$1.50
Number of derricks	3
One horse and two hand power.	
Number of car-loads per annum	60
Number of cubic feet per car	225
Value per car	$70.00
Coal measure limestone; color, gray; used for bridge work.	
Number of acres controlled by firm	2
Leased from Mr. Cally, Sullivan, Ind.	
Number of acres undeveloped stone land owned by William Baldridge	150
Number of acres owned by William Johns	40
Number of acres owned by Willis Bennefield	30

McKAIN BROS. & CO., DELPHI, IND.

Amount of capital	$10,000
Number of employes	20
Average daily wages	$1.25
One engine, 12-horse power.	
Number of steam drills	1
Number of steam pumps	1
Number of bushels of lime per annum	80,000
Value per bushel	$0.12
Niagara limestone; color, buff.	
Number of acres controlled by firm	21

DELPHI LIME CO., DELPHI, IND.

Amount of capital	$20,000
Number of employes	25
Average daily wages	$1.25
One engine, 12-horse power.	
Number of steam drills	1
Number of bushels of lime per annum	110,000
Value per bushel	$0.12
Niagara limestone; color, gray.	
Number of acres controlled by firm	20
Number of acres undeveloped stone land owned by L. B. Sims	40
Number of acres owned by McKain heirs	50
Number of acres owned by Sarah Mitchel	40
Number of acres owned by William Bradshaw	20

A. T. BOWEN & CO., DELPHI, IND.

Amount of capital	$10,000
Number of employes	5
Average daily wages	$1.50
Number of perch	1,000
Value per perch	$0.75
Devonian limestone, color buff, used for building.	
Number of acres controlled by firm	20

BARNHART BROS., ATTICA STONE QUARRY, ATTICA, IND.

Amount of capital	$40,000
Number of employes	35
Average daily wages	$1.75
Number of engines, 14-horse power each	2
Number of derricks, three steam and four hand	7
Number of car loads per annum	1,200
Number of cubic feet per car	190
Value per car	$18.00
Sandstone, color buff, used for bridge and rubble.	
Number of acres controlled by firm	40

C. & G. P. HARLEY, DELPHI, IND.

Amount of capital	$5,200
Number of employes	12
Average daily wages	$1.25
Number of bushels of lime per annum	40,000
Value per bushel	$0.12
Niagara limestone.	
Number of acres controlled by firm	40
Capacity of kilns, per annum	100,000

JACOB SMITH, ATTICA, IND.

Amount of capital	$500
Number of employes	4
Average daily wages	$1.50
Number of car loads per annum	20
Number of cubic feet per car	180
Value per car	$18.00
Sandstone, color white, used for bridge work.	
Number of acres controlled by firm	4
Leased from Robert Milligan.	

HENRY HERRICK, WILLIAMSPORT, IND.

Amount of capital	$1,500
Number of employes	12
Average daily wages	$1.25
Number of hand derricks	4
Number of car loads per annum	180
Number of cubic feet per car	180
Value per car	$18.00
Sandstone, color buff, used for building.	
Number of acres controlled by firm	4
Leased from Gregory heirs.	
Number of acres undeveloped stone land owned by Gregory heirs	20
Number of acres owned by Henry Herrick	25

J. L. STUMP, WILLIAMSPORT, IND.

Amount of capital	$1,500
Number of employes	20
Average daily wages	$1.25
Number of hand derricks	2
Number of hand pumps	8
Number of car loads of stone per annum	40
Number of cubic feet per car	200
Lower carboniferous sandstone, color buff; used for bridge abutments and piers.	
Number of acres controlled by firm	4
Leased from James McCabe.	

J. L. STUMP, WILLIAMSPORT, IND.

Amount of capital	$400
Number of employes	8
Average daily wages	$1.25
Number of hand derricks	2
Number of car loads per annum	17
Number of cubic feet per car	200
Value per car	$21.00
Lower carboniferous sandstone, color buff; used for bridge work.	
Number of acres controlled by firm	10
Leased from Isaac D. High.	

J. L. STUMP, WILLIAMSPORT, IND.

Amount of capital	$600
Number of employes	15
Average daily wages	$1.25
Number of hand derricks	2
Number of car loads per annum	18
Number of cubic feet per car	200
Value per car	$21.00
Lower carboniferous sandstone, color buff; used for bridge work.	
Number of acres controlled by firm	20
Leased from Woods & Boner.	

JACOB PFEIFER, WILLIAMSPORT, IND.

Amount of capital	$500
Number of employes	10
Average daily wages	$1.50
One horse and one hand power derrick.	
Number of car loads per annum	120
Number of cubic feet per car	180
Value per car	$18.00
Lower carboniferous sandstone, color buff; used for bridge work.	
Number of acres controlled by firm	10

ANTON ELLGEN, WILLIAMSPORT, IND.

Amount of capital	$1,500
Number of employes	8
Average daily wages	$1.50
One horse power.	
Number of derricks—one horse and two hand powers	3
Number of car loads per annum	200
Number of cubic feet per car	180
Value per car	$18.00
Lower carboniferous sandstone; color, buff; used for rubble and bridge work.	
Number of acres controlled by firm	8
Leased from Gregory heirs.	

HARRISON & LANGDON, RIVERSIDE, IND.

Amount of capital	$5,000
Number of employes	15
Average daily wages	$1.50
Number of hand derricks	2
Number of car loads per annum	100
Number of cubic feet per car	200
Value per car	$20.00
Lower carboniferous sandstone; color, buff and blue; used for rubble and bridge work.	
Number of acres controlled by firm	6

GUYER & BURCHBY, RIVERSIDE, IND.

Amount of capital	$10,000
Number of employes	20
Average daily wages	$1.75
One engine, 10 horse-power.	
Number of steam drills	8
Number of channelers	4
Number of hand derricks	4
Number of car loads per annum	600
Number of cubic feet per car	180
Value per car	$50.00

Lower carboniferous sandstone; color, buff and blue; cut stone, bridge and rubble work.

Number of acres controlled by firm	60

GODDARD & CO., INDIANAPOLIS, IND.

Amount of capital	$15,000
Number of employes	20
Average daily wages	$2.75
Number of engines	1
30 horse-power.	
Number of steam gang saws	4
Number of derricks	5
Four hand and one steam derrick.	
Number of car loads of stone per annum	100
Number of cubic feet per car	225
Value per cubic foot	$1.40

Niagara and oolitic limestone, mainly the latter.

ITTENBACH & CO., INDIANAPOLIS, IND.

Amount of capital	$40,000
Number of employes	30
Average daily wages	$2.75
Number of engines	1
25 horse-power.	
Number of gang saws	6
Number of planers	1
Number of hand derricks	1
Number of travelers	1
Number of car loads per annum	125
Number of cubic feet per car	225
Value per cubic foot	$1.30