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# COBBLESTONE MASONRY

When we consider that up to the coming of the automobile our vehicles were still rolling on roads similar to those used by the Romans, we should not be surprised that medieval house building techniques were employed throughout the Western world way into the 19th century. Nay, techniques initiated 2000 years ago by the Romans were still in use. This applies especially to cobblestone buildings, for the Romans knew the use of cobblestones not only as a wall infill material, but also as a wall facing. But before we touch on the history of cobblestone masonry, let us have a clear understanding of what constitutes a cobblestone wall.

Cobblestone masonry falls into the category of the rubble wall, walls laid up of stones picked from fields or of rubble from a quarry, as opposed to hewn blocks wrought to an even facing, or ashlar. The most primitive type of rubble wall are the well known New England stone fences. These are laid up "dry", that is without any mortar or other binder, relying for stability on the pressure of the weight each layer of stones exerts on the lower layer. This would not do for walls of the height of houses. Here a "binder", cement or mortar, is used to hole the stones in place. The most rudimentary type of wall of this kind is the "random" rubble wall (Ill.1). Stones of various shapes and sizes are set in mortar, just as they happen to fit into each other, forming an irregular pattern. Of greater refinement is the "coursed" rubble wall, where stones are selected for equal height and layed on a level bed in straight rows or courses (ill.2). In these coursed rubble walls often the horizontal mortar joints are emphasized.

Cobblestone walls fall into this category of coursed rubble walls. But we must avoid the mistake made by so many (perhaps caused by the misnomer "cobblestone" street) to think that any rubble wall or field stone wall is a cobblestone wall. As we have seen in the chapter on geology, a cobblestone is clearly defined by size and must show evidence of rounding by erosion. Since erosion takes place by degrees, cobblestones vary considerably in roughness or smoothness, the least rounded being picked up from the fields, the most rounded on beaches and lakeshores (ill.3 and 4). When upstate New Yorkers speak of cobblestone houses, they refer to either type, but imply that they are laid neatly in straight courses, with mortar joints finished in a clearly discernable pattern. Let it be said here that the appearance of the wall is deceiving. What shows on the surface is only a part, often a small fraction of the cobblestones. The rest is tied into the wall.

Rubble walls, be they random or coursed, are very solid. The rocky material congeals with the binder and solidifies into a dense concrete of great hardness and durability. Rubble walls are also economical, which recommended them to the practical Romans. who brought this type of masonry to the highest perfection. Roman engineering genius knew how to make use of readily available materials. When, for example, in the city of Rome buildings burned and deteriorated, new buildings were erected from the rubble salvage. And the Romans made excellent use of native materials. Since ingredients for making good mortars were abundant, mortars (common lime as well as ~~and~~ hydraulic mortars) became most essential in their building techniques. Large pieces of good quarried building stone were scarce, hence a

small cut-stone masonry was developed, making good use of mortars. Wherever the Romans went in their conquests, they adapted their building methods to the materials locally available. In northern Italy with her mountain rivers, river "pebbles" were employed; in England they preferred to use small cut stone. But it should not surprise us if the Romans could be credited with the development of the flint-stone techniques of south-east England, which are the immediate antecedents to the cobblestone architecture of upstate New York.

Walls built by the Romans essentially consisted of a concrete core faced on both sides with small cut-stones or brick, bonded to the core.[1] The work of laying up walls proceded as follows: The facings were built up first, stone by stone with mortar in the interstices, against a wooden plank. Then the core was built up in layers, a layer of rubble followed by a dressing of mortar. While the concrete core provided volume and stability, the facing added protection from the elements and a smooth finish. Facings were laid in regular patterns, the honeycomb (opus incertum) and the lozenge (opus reticulatum) being predominant. Or courses of cut stone and brick would alternate; or brick alone, of varying sizes, would form the facing. Their is an endless variety. Bonding courses were used for structural strength as well as quoins of cut stone to strengthen the corners. Instances are known were river cobbles were split in half and the smooth face laid in rows flush to the surface, just as we see it in the "knapped" flint walls of England (ill.5)[2]. While more often than not these wall patterns were hidden behind stucco or a revetment of dressed stone, the patterns developed in pavements remained visible. It is here were we find the herringbone pattern (opus spiccatum) that is so richly represented in the cobblestone

walls of upstate New York.

Toward the end of the Roman Empire, after A.D.300, techniques began to degenerate. Stones were less carefully hewn, patterns less carefully adhered to and mortar joints become unproportionately thick. This is the heritage of the Middle Ages:Small cut-stone or "squared rubble" facings on a concrete core are dominant, although with varying characteristics according to locally available materials.

With the suppression of decorative architectural features, such as classical columns and pilasters, during the Middle Ages, the embellishment of walls through their own material gains importance. Of special interest are the "appareils" of pre-Romanesque buildings, such as patterns created by varicolored stones as well as patterns created by cutting and laying small stones in zigzag, lozanges, chevron, reticulate and herringbone fashion. Cobblestones too, were used in an imaginative manner, especially in the South of France (ill.6).

With the beginning of Gothic architecture in the 11th century, interest switches from the massive self-contained wall to problems of stress and balance. The light-weight, ashlar-clad membrane walls of Gothic cathedrals add nothing of interest in the light of upstate New York cobblestone construction. The rubble wall, however, antecedent to the cobblestone wall, is continued in more humble structures.

We must now turn to England, more specifically to East Anglia and the Southern Downs, where "flint" architecture bears similarity to the cobblestone work of upstate New York. Flint is pure silica, akin to quartz. It is very hard, yellow-grey to black in color and

slightly translucent. It splits easily to a smooth, glassy face. Flint is found in bands or in irregular nodules in a bedrock of chalk, but occurs also as cobblestones in alluvial soils on beaches and in river beds. It's hardness recommends it as a material for facing walls. Flint is used in England everywhere along chalk deposits where other quarried stone is scares or non-existing. It is often used in combination with other materials such as brick or chalk.[3] Since chalk is subject to quick atmospheric wasting, it is used as the wall core with a facing of flint.[4] Flint rubble walling according to Cox[5], is of Saxon origin. However, a more plausible interpretation seems to be that the Saxons, through their contact with the withdrawing Roman legions and a first-hand knowledge of Roman building, acquired flint rubble wall techniques from the Romans.

Flint plays a very important part in Norman buildings and in Medieval churches from Sussex to Norfolk. There are also remains of pre-Norman (pre A.D.1066) buildings, round towers built of flint and cobbles bound together with an abundance of nortar.[6] Solid flint rubble walls without a veneer, showing an irregularly patterned surface (ill.7) were predominant into the 16th century. At this time "dressed" or "knapped", i.e. split flints make their appearance. Eventually the splitting of flint nodules is much refined so as to show a fairly smooth glassy surface to the outside of the wall (avoiding the weathered, somewhat mealy looking outside). Flints are chipped to form squares or rectangles. These dressed stones were laid carefully in straight rows (ill.8).[7] Decorative features are also introduced at this time, such as "flush-work", consisting of panels of flint surrounded by a frame work of cut stone set flush with the flint; or checker and diaper patterns in flint and stone, or alternating courses

of flint and stone and flint and brick. Flint was used more and more in a decorative manner as a veneer over a rubble wall.

The construction of flint walls continues through the 19th c., especially in flint cobble rich areas. In the context of this book we are most interested in the buildings of the southern coastal areas, where round beach flint cobbles, matched for size, are laid in straight rows. It is in Brighton and vicinity that we find the greatest similarity to American cobblestone work: here the mortar jointing and pointing up shows the embellishment so common in American cobblestone masonry: "V'd" horizontal joints and a pyramidal treatment of the verticals between cobbles. (ills. 9 and 10)[8]

An exact instance in which an American mason has been influenced by this technique has not and probably cannot be ascertained. However, there can be little doubt that New York cobblestone masonry has its immediate roots in English flint wall techniques, and that not one, but a number of persons setting foot on these shores were familiar with the appearance of flint architecture. These settlers need not be masons themselves to "built" cobblestone houses, witness the story of the Chapman - Martin Harris (Mormon) house of Palmyra: It was built for William Chapman, who came to this country from North Riding, Yorkshire, England (the English cobblestone country). But the builder or mason was a Robert Johnson.

In a pioneer society, such as the settlers society of upstate New York, professional craftmen are few and far in between. It would be a mistake to presume that trained masons built the first cobblestone houses. More likely the settlers themselves, perhaps with the

help of a handyman, built these first dwellings, using the stones from their fields, buying or making their own lime and mixing the mortar according to common knowledge. After the completion of the Erie Canal, some of the stone setters found engagement in the building of cobblestone houses. Others settled in the area and built their own dwellings. To call these workers "masons" in the sense of a trained craftsman, seems to be a misnomer. Few built more than three or four houses, hardly enough for a life-long sustainance of a trained craftsman. Cobblestone architecture is truely a folk art, grown from the soil, primitive at first and highly refined toward the end of its short life. And, as with other folk art, a good deal of lore obscures the facts. Some of the makers are known, other names are lost. Little can be inferred from the names that have come to light that could not be "read" in the buildings themselves.[9] Workers learned quickly from each other, if only by examining finished buildings. Indoubtably, each mason had his preference of wall construction, cobblestone pattern and type of mortar.[10] All relied for the laying of their walls on the well-known, ages old rubble wall construction.

How were American cobblestone houses built? Since mortar-aggregate walls are extremely durable, few of the houses have deteriorated to the extent where the construction can be studied conveniently. But three basic masonry patterns have emerged: The earliest cobblestone walls were laid up with a complete integration of the outer and inner wall. Here, just as in early Roman rubble walls, the exterior layers cannot be distinguished from the interior structure. The entire thickness of the wall is laid up in one operation (ill.11a). This is a very durable construction. With the gradual refinement of exterior textures, a second method can be observed: A facing of cobbles,

most likely the lake-washed variety, is laid up with bonding stones reaching into the rubble core. The facing stones are of irregular dimensions, but the outwardly exposed tips match perfectly in shape and size. The facing was laid up along with the backing wall.(ill.11b) This too is a very durable construction. The third method is the least permanent: a rubble wall (of varying compositions) is laid up first, and a mortar and cobblestone veneer is added separately. Cobbles are small and there are no bonding stones. (ill.11c) Buildings which show the finest wall textures, such as the Munro House in Elbridge, Onondaga County, are usually laid in this technique and are prone to demage. When cracks occur in the veneer due to irregular settling of the wall, water can penetrate behind it and frost wedging sets in, prowing the facing loose from the core. Repairs of such demage can often be detected by the different color of the cement. Portland cement, commonly used today, has a blueish-grey color and is darker than the warm-colored mortars used in pre-Civil War building. - - There are, doubtlessly, varieties of these techniques, but these three methods seem to be basic.

How did the masons work? Here we have excellent comtemporary accounts. The Genesee Farmer and Gardner's Journal, published by Luther Tuck at Rochester, New York, carries in the January 1838 issue an inquiry about "Cobblestone Walls". The inquirer suggests a more extensive use of cobblestones for building "for their extreme plenty here, would render them far cheaper than brick or flat stone.... The stone must be picked up at all event, and we might as well put them together for a building, as ... to throw them away. But will these walls stand? -- and if so, how are they constructed?" The answer comes in the March issue of the same year from Chester Clark

of Marion (Wayne County). "...I cheerfully transmit a few facts..." "Having erected two or three buildings each season, for several years past, I shall only mention one which I built last season[11]. It is 40x60, four stories high. The foundation is three feet high, the first story 10 8-12...; making from the foundation to the plate, 48 4-11 feet in height, with a wing 24 feet/by 34, one story. The whole was built of cobblestone (not of the first quality)."The outside was laid in courses of cobblestone four inches in thickness, and larger stone on the inside." "As regards the durability, I am perfectly convinced that if they are laid with good materials, they will stand and their solidarity increases as their age increases. The quality and quantity of sand with the lime is very essential. The coarser and purer the sand, the stronger will be the cement and the firmer the wall. As for the proper quantity of sand with the lime, it depends on the coarseness and the purity. The proportion which I generally use, is from five to eight bushels of sand to one of lime in the stone.[12]

In writing "The outside was laid in courses of cobblestone four inches in thickness, and larger stones on the inside", this mason describes the wall construction of illustration 11a, the "inside" meaning the full thickness of the wall, in the illustration the interlaced vertical layers of glaciated cobblestones.

Mr.P.S.Bonsteel (the name is now spelled Bonesteele), in a letter to the Cultivator, v.IX 1842, n.7, furnishes some information about the thickness of walls of his house, built 1835:"My plan for thickness of wall was, the cellar wall 20 inches thick to first floor, drop off two inches to second floor, then drop off 2 inches and extend out to top". He continues: "Sort your stones so as to have the outside

courses 3 or 4 inches, with straight lines for cement. Take the coarsest of sand .... I used the common stone lime, one bushel of lime to seven of sand."

An other letter comes from Cayuga County to the Cultivator, v.VIII 1841, n.3. This letter describes the method which may have been used in the construction of ill.11c: "Cobblestones of any size not exceeding six inches in diameter may be used, but for the regular courses on the outside those of two inches in diameter should be preferred. Small stones give the building a much neater aspect. Two inch stones are very neat, though three inch stones will answer. The inside row of stones may be twice as large as those on the outside." Follows a description of mortar: eight to nine bushels of "clean sharp" sand to one bushel of fresh stone lime. "...the strength of the building depends on the goodness of the mortar." "The thickness of the wall is sixteen inches, though twelve inches will answer very well for the gable ends above the garret floor." "When the foundation, or cellar wall is leveled and prepared, a layer of two (or two and a half) inches of mortar is spread over it, and the stones are pressed into the mortar in two rows which mark the outside and the inside of the wall, leaving about an inch between each adjoining stone in the same row. If the wall is to be grouted" (i.e. poured with mortar sufficiently liquid to fill the interstices), "the two rows are formed into two ridges by filling the vacancies between the stones with mortar, and the space between these ridges (about a foot in width) is filled with such stones as are not wanted for the regular courses. The grout is then applied. If the wall is not to be grouted however, the mortar should be carefully pressed round every stone, making the wall solid

without flaw or interstice. When one course is leveled, begin another." "P.S. Since writing the above, I have received two communications .... One says, "The thickness of the wall is measured from the outside of the stones. Pieces of timber, four to six inches and two feet (i.e. 24 inches!) long, are used for setting the lines. These are laid in the course just finished, and the line is drawn through saw-cuts just 16 inches apart."

Here we have the Roman technique of infilling the rubble with mortar. Unfortunately there are no written accounts of the use of planks to keep the wall plumb and the lines in the veneer straight. But oral testimony of the use of planks has come down to us, and an investigation of walls reveals that certain patterns could hardly have been created without such a device (ill.12). The method has been employed since Roman times. We find a description for "Cobblestone... ~~or Niggerhead (probably flint)~~ Facing" in H.G.Richey, The Building Mechanic's Ready Reference, New York, 1907: "To keep those stones straight and in line until the mortar hardens is a very difficult piece of work for the mason. A quick and easy method is to build a form of plank for the face of the wall .... and build the cobblestones up against this form. This will make a straight and even wall, such as can be obtained in no other way. After the mortar has hardened, the form can be taken down and the joints between the cobblestones cleaned out and pointed."

That much for the laying of the wall. In passing it should be mentioned that not all cobblestone walls are solid stone. There are instances in which the veneer was laid against a plank wall (District Nr.5 Schoolhouse, Childs, Orleans County), and perhaps in some cases a frame with "nogging" might lay behind the veneer. Time may tell.

Of equal importance as the above described masonry techniques are the treatment of the wall piercings and corners of the buildings. Here we find the use of wood, field stone and quarried stone, as well as brick. Door and window enframements are mostly of wood, sills and lintels of the other materials. The corners of the buildings are for the most part reinforced with stone quoins, cut-stone being the rule. But we find also brick, wooden pilasters or plaster as a corner treatment. Cut-stone was not free for the asking, as cobblestones. It was purchased from quarries.[13] To avoid this expense, rounded corners of continuous rows of cobblestones were used. But this is the exception. Watertables, where they have been introduced, are of cut-stone. A considerable variety can be found in the treatment of these solid wall members which add much to the appearance of the buildings. Although of structural importance as well, they will be discussed and illustrated under the heading of "Textures, Patterns and other Wall Embellishments".

One often hears that cobblestone masonry is a "lost art". We hope that this chapter may dispel this folksy theorem. A method come down to us from before A.D. and used extensively until a hundred years ago could hardly get lost in these last hundred years. It just is not practical any longer.

## NOTES

1. Concrete consists of an aggregate of stones or similar material bound together into a compact mass by mortar or cement. Mortar consists of lime, "slaked" and mixed with sand. Lime is derived from limestone. Limestone, calcium carbonate, is reduced to calcium oxide by heating or "burning" in a lime kiln. The latter is easily ground into a powder called quicklime. This powdered calcium oxide is slaked, i.e. combined with water. The resulting paste or lime putty is mixed with sand or fine gravel to make a mortar. Mortar solidifies to a stone-like material.

2. G.T.Rivoira, Roman Architecture and its Principles of Construction under the Empire. Oxford: 1925

3. Victor Bonhem-Carter, The English Village. London: 1952

4. Edward Hull, A Treatise on the Building and Ornamental Stones of Great Britain. London: 1872

5. J.Charles Cox, The English Parish Church. London: 1914

6. The round form was practical as it avoided the use of cut-stone necessary for quoins and angles.

7. George R.Barham, Masonry. Longman's Technical Handicraft Series,1914

8. Gerda Peterich, Cobblestone Architecture of Upstate New York. Journal of the Society of Architectural Historians, v.XV, n.2

10. Mortar can be mixed of varying materials, such as coarser or finer grained sand, and in different proportions of sand to lime. Slaking and ripening methods too are variable. See Edward Shaw, Operative Masonry: or A Theoretical and Practical Treatise of Building.... Boston: 1832.
Much experimenting with mortars took place during the building of the Erie Canal where engineers were troubled by the problem of common lime mortar not being stable under water. Hydraulic mortar, i.e.mortar which will set under water, was needed, but the well-known European hydraulic cements were too expensive to import. During excavations natural cement rock was discovered in quantities. (A band of natural cement rock together with lime stone reaches from Buffalo through Batavia, Geneva, Auburn, Oneida etc. to Port Jervis.) Natural cement yields a mortar which will not only set under water, but sets much quicker and becomes much stronger in the air than common lime cement. Its color is the buff most common in cobblestone walls. Has natural cement been employed here?
See Harley J.McKee, Canvass White and Natural Cement, 1818-1834. Journal of the Society of Architectural Historians, v.XX n.4

9. Carl Schmidt in his Cobblestone Masonry, Scottsville: 1966, lists some masons and their known work.

11. The building referred to was a steam flouring mill on Canal Street in the village of Palmyra, Wayne County.

12. Probably limestone after burning, but before grinding to quicklime. Limestone changes its weight but not its volume in burning.

13. We find the following advertisement in the Rochester Republican of June 16, 1837:

> "Smith Stone Quarry: The subscriber can furnish at the Smith Stone Quarry on the direct road leading from Rochester to Lima 1 mile and ½ west of the village of Mendon, almost all kinds of building stone, of the best quality; step stones of all shapes and sizes; columns and pillars for open fronts; all kinds of stone used in brick and cobblestone building; door and window caps; sills and thresholds; circle door and window caps; .... all kind of stone cut to order in plain molding. .... All communications and orders by mail will be promptly attended to.
>
> G.M. & D.M.Tinker
>
> West Mendon, December 9, 1836"

The writers are indebted to the Landmark Society of Western New York for this information.