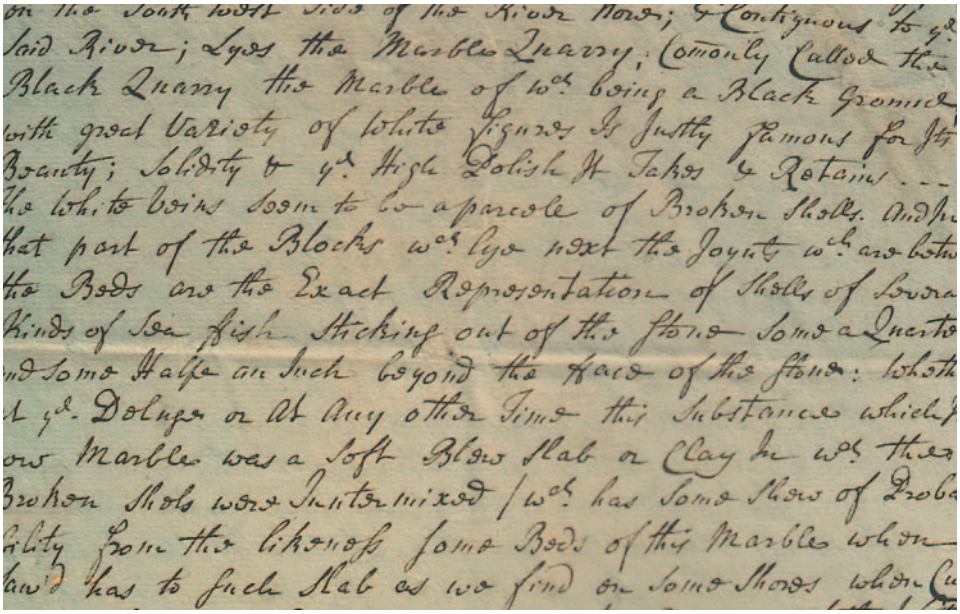
‘Doing Everything of Marble wch can be Done with it’: some descriptive accounts of the Kilkenny Marble Works

TONY HAND

At some time during the early 1740s, a visitor to Maddoxtown, county Kilkenny, examined what he called a ‘Curious piece of Mechanicall Art’ situated on the banks of the River Nore, a few miles south-east of Kilkenny city. He suggested that, with the proper encouragement, this machinery would prove ‘a Valuable Manufactory to this place [Kilkenny] and to the Whole Kingdom In Generall’.[1] These comments, along with a detailed report of this ‘Mechanicall Art’, are contained in the papers of the Physico-Historical Society, held in Armagh Public Library. This society was established in 1744, and its purpose was to record the antiquities, natural history, geography, economy and society of the whole of Ireland. Its papers were based on topographical and statistical returns sent to Walter Harris, a founder of the society, from selected persons representing each county, the respondent for county Kilkenny being one Hugh Dawson (Plate 2).[2] The machinery that Dawson witnessed was the innovative and highly developed equipment involved in the cutting and polishing of the renowned black marble of Kilkenny. Dawson informed Walter Harris that the inventor of this wonderful industry, known as the Kilkenny Marble Works, was ‘Mr William Colles a Native of this Kingdom’ (Plate 1). Colles’ enterprise was open for all to see, and it appears that no visit to Kilkenny was complete without visiting the Black Quarry, the source of the marble, and the Marble Works. This article will examine some of the more enlightening reports of the quarry and the marble mills to reveal how William Colles transformed the mar-

1 – S. Whitmore, William Colles (1702-1770) oil on canvas, 75 x 62 cm (Rothe House, Kilkenny) (courtesy Kilkenny Archaeological Society; all photos by the author unless otherwise stated)



2 – An account of the Black Quarry from the Physico-Historical Society Papers
(courtesy the Governors and Guardians of Armagh Public Library)

ble industry in Kilkenny and how his endeavours influenced this industry, not only at local and national levels, but at an international level also.[3]

William Colles (1702-1770) was the second son of William Colles, a surgeon, of Kilcollan and the city of Kilkenny, and his second wife Hannah. At an early age William was adopted by his aunt, Mrs Elizabeth Berry. She had been married and widowed three times but only had one child from these marriages; this child died in infancy, hence her adoption of William. William's father passed away in 1719 and declared in his will that his son was so amply provided for by his aunt that all he was to receive was £100 and a family heirloom of a silver hilted sword. William senior appears to have been a fairly wealthy man, having bought lands in Kilcollan and Lisnafunchin from Kilkenny Corporation in the 1690s. He built a number of houses on the west side of St Stephen's Green, Dublin, in 1716, in one of which his eldest son Barry died in 1785.[4] It transpired that the young William was not amply provided for by his aunt, as she became embroiled in a dispute over property in Spain associated with her first husband, and, arising from this, all that she left to William was 'the satisfaction of burying her at his own charge'.[5]

It appears from this that William had to learn the art of self-reliance at an early age. Nothing is known of his education, and not being inclined to follow in his late-father's medical footsteps, he 'depended on his own exertions', becoming 'a man of universal talent, pre-eminent as a mathematician and mechanician'.[6] By

1742 William was earning over £300 per annum from his marble business, the fruit of his inquisitive and inventive mind.[7] Colles may have been something of a mathematician and inventor, but he also displayed a very keen business sense.

It was, in fact, Colles himself who first brought his inventions to public attention. In February 1732 he wrote to the recently formed Dublin Society informing them of improvements he had carried out in Kilkenny regarding the exploitation of marble. In his letter he mentioned a quarry on the outskirts of Kilkenny city, formed of 'Excellent black Marble, beautifully Veind, with great Variety of White'.[8] He also mentions that he had just secured an interest in this quarry on foot of successful experiments carried out on cutting and polishing the marble, using machinery driven by water power. This feat was the first of its kind in this country and in Britain, and the quarry Colles described was the famed Black Quarry of Kilkenny.

Colles recognised that the traditional way of sawing and polishing marble was laborious and costly;

> ye tedious & expensive Methods of sawing, & polishing which, in the comon Way renderd the Trade for the said Marble less extensive than it might be, if wrought by a more expeditious Manner, induced me to try some Experiments in relation to sawing the same by an Engine, wch appearing practicable, I obtained an Interest in the Quarry, & some Mills, on the River ... where I have now ten Saws, wch are mov'd by Water, & going Night and Day, and saw the Marble more true, and expeditious, than it can otherwise be done.[9]

Sawing marble in the 'comon Way' was indeed a laborious affair. The basic technique for sawing stone was that a mixture of water and sand was fed between a flat toothless metal blade and this was moved back and forth along the stone. The blade ground the sand against the surface of the stone, slowly wearing a narrow channel in the stone. Pliny, writing in the first century AD, gave an account of this method of sawing stone from Roman Antiquity. He stated that 'This division [sawing], though apparently effected by the aid of iron, is in reality effected by sand; the saw acting only by pressing upon the sand, within a very fine cleft in the stone as it is moved to and fro.' [10] Little seems to have changed in this method of cutting stone up to the seventeenth century, as revealed in an entry in the diary Samuel Pepys, dated 24th February 1664. Pepys was observing a stonecutter sawing marble at Somerset House and recorded how 'He told me ... how he could not saw above 4 inches of the stone in a day, and of a greater [amount] not above one or two [more inches] ... Their saws have no teeth, but it is the sand only which the saw rubs up and down that doth the thing.' [11]

Not only had Colles set up ten water-driven saws to cut the marble, but he had also constructed another machine to grind the marble with sand so as to enable it to be polished by hand. He employed upwards of thirty men to polish and finish

3 – Mr Stern Tighe's house on Usher's Quay
It is now demolished. The downpipe on the right was made from marble, eight inches square and in lengths of three feet (courtesy Irish Architectural Archive)

4 – Piece of marble water pipe
Note the countersunk top to allow pipes to fit neatly without leaking.

marble chimney pieces, tables, cisterns, mortars and tombstones 'wch I sell at more reasonable Rates, than heretofore they were Sold'.[12] The success of the initial experiments led Colles to take things one step further. He developed a system enabling him to bore 'Pipes of the sd Marble, wch I have brought to such Perfection, that I can bore Pipes of any reasonable Length from 2 to 10 inches Diam fit for conveying water underground, or from the tops of Houses'. Colles sounded very confident indeed that his products were top quality and fit for their purpose, and as if to quell any doubts Society members may have had about the said items, he concluded his letter by stating that the pipes could be witnessed carrying out their task 'at Mr Stern Tighs Mercht on Ushers Quay' (Plates 3, 4).[13]

In November 1734, the following advertisement appeared in *Faulkner's Dublin Journal*:

> Just arriv'd from Kilkenny, and are to be sold at the Kilkenny Marble Ware-house in Batchelor's-Lane, the lower End of the Batchelor's Walk, Marble Chimney Pieces, Tables and other Marble Furniture of the best kinds and newest Fashions; As also, a large Parcel of Flags, the best and cheapest, for flooring of any Flags hitherto brought to this City. At which Place, as also at the Marble Mills near Kilkenny, all Kind of

5 – George Miller, Mr. Colles Marble Mills, Millmount
detail of early nineteenth-century watercolour
(courtesy Royal Society of Antiquaries of Ireland: Miller-Robertson Collection)

Marble Work is made and sold at reasonable Rates, by Mr. William Collis.[14]

This advertisement displays the business acumen of William Colles. Just a few years after informing the Dublin Society of his marble cutting and polishing ventures in Kilkenny, he is firmly established as a marble dealer in Dublin, selling his own products. He was using a natural resource to craft items that were not only practical but fashionable also, appealing to a clientele that was busy in the construction of town houses at this time. Colles was now bringing to fruition the ideals contained in his letter to the Dublin Society. He was providing marble more expeditiously than ever before by a process never before seen in this country, resulting in the price being more reasonable for a quality product, and, ironically, rather than machinery replacing men, it was creating much employment locally.

Two anonymous English gentlemen, on visiting Kilkenny in the late 1740s, were suitably impressed by the 'Invention & Contrivance' they witnessed at the Marble Works. They wrote in their book *A Tour through Ireland*...[15] that the mills were worked by 'the finest Piece of Mechanism our Eyes ever beheld'. The visitors were of the opinion that a statue 'cut by the Chisel of a Praxitelles' should be erected to the 'Inventor, Mr. Collis'. The mills, situated 'in a delightful Bottom, the Passage to it through a pleasant Grove ... do their marvellous Work by the Help of

the River; and are so wonderfully contrived, that they saw, bore, and polish at the same time' (Plate 5). Colles appears to have had a production line in operation at the mills: the machinery was 'perpetually at Work, by Night as well as by Day, and required little Attendance'. This concurs with Colles's statement above that the operation was 'going Night and Day'. The Englishmen felt that the Marble Mills were beyond compare: 'Had I not seen any thing worthy of notice in the Kingdom, but this one, I should think all my Labours fully paid.' They sounded suitably impressed, to say the least.

Alongside the marble mills, the gentlemen stated, were warehouses in which were stored chimney pieces, cisterns (Plate 6), buffets, vases, punch bowls, mugs of different dimensions, frames for mirrors and pictures. The visitors also mentioned the quality of the marble: 'It is full as durable, and bears as fine a Polish as any brought from Italy.' Unfortunately the authors are very economic with their description of the workings at the quarry. Blocks of marble weighing several tons were removed from the quarry, 'yet the Method the Contriver has used to lift them, draw them out, and convey them to the Mill, without any other than manual Operation, adds still more to the Surprize'.[16] This tantalisingly brief summary of the quarrying methods being carried out indicates that no machinery was being used in the quarrying of the marble.

6 – A fine example of a carved Kilkenny Marble cistern
(photo courtesy Knight of Glin)

The Black Quarry had been the source of quality stone in Kilkenny for architectural and decorative purposes since medieval times, but now Colles was exploiting this natural resource more efficiently than at any other time in the quarry's history. The quarry lies in the great expanse of carboniferous limestone that stretches across central Ireland. The age of the marble has been estimated to be about 300 million years old.[17] Over this time the marble was laid down in the form of beds. These beds inclined from the river, to appear near the surface in the area of the quarry. Situated on a sweeping bend of the River Nore in the Archersgrove area, the quarry had been used by the people of Kilkenny as and when they needed it. The marble was used by local sculptors for many monuments and memorials found in Kilkenny and the surrounding area, a splendid example being the Rothe monument, carved in 1637 by Patrick Kerin, in St Mary's church. (Plate 7).

In an article by the Revd James Graves and John Prim written in 1858, there is an account of marble quarries in Kilkenny written in the seventeenth century and attributed to Bishop David Rothe. This account mentions two quarries, one to the east of the city, the other lying to the north.[18] The marble from the northern quarry was of a rough grain, prepared in large quantities and dressed for building purposes. The inhabitants of Kilkenny were 'distinguished above most others of the realm by their propensity to erect structures of marble of a large and more splendid class'. The quarry to the east is most certainly the Black Quarry, as the marble was described as 'cerulean, black, white, or variegated with divers hues', and was 'exported to a distance, or else stored at home for building purposes'.[19] Whether the marble was exported a distance from Kilkenny or a distance from Ireland is unclear from this account, but the fact that the marble was 'exported' from the region proves the estimable quality of the stone. We do know that in 1664 the Duke of Ormonde instructed John Morton to raise marble from the 'Quarry near Kilkenny' for a chimney piece, and that it be 'sent forthwith to Waterford that so it may be sent in the Spring on the first ship' to the Lord Chancellor of England, the Earl of Clarendon.[20] In 1652 Dr Gerard Boate stated that marble was to be found in many places around the country, but 'more about Kilkenny, where not only many houses are built of the same, but whole streets are paved with it'.[21] It would appear from this statement that Boate was suggesting that the marble was being put to better use here than anywhere else in the country at that time. He also suggested that the quarry 'belongeth to nobody in particular, lying in common for all the townsmen, who at anytime may fetch as much out of it ... without paying anything for it'.[22]

Thomas Dineley, believed to have visited Kilkenny in 1680/81, described the recent addition to Kilkenny Castle – the water house. This structure, adjoining the bowling green, had a summer banqueting room attached, 'floor'd and lin'd with white and black marble, which abounds here'.[23] James Beeverell is regarded to have visited Kilkenny in 1707. In the Irish volume of his *Les Delices de la Grande-*

Bretagne he noted the following:

> The quarry from which the inhabitants get their marble is only two or three hundred paces from the town and belongs to no-one in particular, so that anyone may take as much as he wants. The marble found there is greyish in colour when newly cut from its bed, but receives a fine polish and takes on a dark blue colour.[24]

The quarry had been in the hands of Kilkenny Corporation at this time, but early in the eighteenth century it became a private concern, and by 1730 Colles was its leaseholder. For a clearer view on how William Colles transformed the operation of the quarry, we must return to Hugh Dawson.

Dawson had emphasised the quarry's reputation, its marble 'which being a Black Ground with good Variety of White figures Is Justly famous for Its Beauty; Solidity & ye High Polish It Takes & Retains'.[25] The white particles were assumed to be broken shells of several types of sea creatures, and they stood proud of the surface of the stone by a quarter to half an inch. The vocabulary used by the author is interesting. He suggested that, at some stage, the marble was a 'Soft Blew Slab of Clay', and at a period of, perhaps, 'ye Deluge', it was mixed with broken shells and on the 'Withdrawing of the Waters or by Some Power In Nature to us as yet Undiscovered' this mixture became solidified. The possibility was then considered that the white particles were never shells in the first instance, and were formed in the stone at 'the Creation of All things'. These comments display an enquiring mind trying to reason the formation of the fossilised marble in relation to Biblical accounts of the Creation and the Great Flood.[26]

Dawson's next descriptions are physical rather than hypothetical, and display a first-hand knowledge of the quarry. A layer of about twenty feet of clay and loose limestone covered the uppermost part of the quarry. This rested upon another thirty feet of inferior stone which was used for walls. At this time, he says, the quarry was being worked to a depth of about seventy feet from the surface. This is a considerable depth, and indicates that the quarry had been producing stone over a long period of time. Dawson goes on to state that the quarry was opened originally from the river and gradually worked into the rising ground, following the limestone beds.

The means by which the stone was quarried in the past were regarded as somewhat primitive by Dawson. As the stone was only being used randomly for building or monumental purposes, those using the quarry 'had not the Art of Sawing It for Marbles', nor did they use gunpowder, resulting in 'those Beds wch were Difficult to Raise' being left behind. Most likely these beds were of valuable stone, but were rendered inaccessible due to the piecemeal quarrying being carried out.

---

7 – Patrick Kerin, Rothe Memorial (1637), St Mary's church, Kilkenny

The current quarrymen used the modern method of clearing the upper levels with gunpowder, which they 'Ram with Dry Clay Into Holes bored In the Solid Stone'. This was the standard method of quarrying, and upon reaching the superior beds, all blasting ceased. He goes on to say that the quality stone was then raised with 'Very long Crows[bars] and by Driving Iron Wedges under the Blocks of Marble & In the Back Joynts'(27), a method known as 'plugs and feathers'.[28] Blocks had been raised that were over twenty feet long and weighing over twenty tons. This concurs roughly with Richard Pococke's comments when he visited the quarry in 1752 where he witnessed 'entire pillars and jaumes of doors of one stone' being raised, up to a length of fourteen feet.[29] Dawson informs us that the quarry 'Is the Estate of Warden fflood Esq and Mr Richard Jacob', and was at that time in the occupation of Mr William Colles. Pococke also provided a description of the marble and its products during his visit in 1752. He said that there were two or three kinds of marble in the quarry, 'the white being made by petrified shells, but there is a sort called the feather marble from some resemblance of feathers'. The machinery 'turned by water for sawing and polishing ... made punch bowls, tea dishes, saucers and frames of pictures'.[30]

Dawson's account above of the quarrying of marble at the Black Quarry does not tell us how the marble was loaded and taken away. The normal series of stages in removing and transporting blocks of stone were that once the required block was removed from the quarry face, it would have been lowered carefully to the quarry floor. Some remedial work may have been carried out at the quarry prior to its delivery to the marble mills. Whether preliminary work was required or not, the block would be placed on horse- or ox-drawn carts and then transported to the mills, but as the Black Quarry was very close to the Nore, it was possible that some of it may have been loaded on to barges and brought down the river to the Marble Works just a few miles away. There was a quay on the Nore at the Black Quarry, and Colles laid a wager with a gentleman by the name of Godfrey Cooksey as to the possibility of bringing up a load weighing forty tons on a boat from the quay at the Black Quarry to the new quay at John's Bridge in the city in 1762,[31] a formidable task, indeed, to haul such a weight against the current. Whether Colles won his bet or not was never recorded.

In the seventeenth century, the whereabouts of the marble being exported was not revealed, except for Clarendon's chimney piece, but in the eighteenth century the two English gentlemen informed their readers that 'this ingenious Gentleman sends yearly several Ship Loads to England'. They also felt that their fellow countrymen were 'often better in improving than inventing, but here ... their Industry must fail' when compared to the innovations Colles had carried out at the Marble Works.[32]

It was not only English visitors that recorded their visits to Kilkenny; a French traveller, Aubry de la Mottraye, visiting in 1729, commented that Kilkenny was a 'large City, one of the most magnificently built on account of the Marble

Quarries'.[33] A fellow countryman, Charles Etienne Coquebert de Montbret, was less impressed when visiting Kilkenny in 1790. In his travel recollections, *Carnets de Voyage*, he remarked that the streets were 'badly paved, without footpaths or lamp-posts'. However, he does portray the quarry in better light. The structure of the quarry was soil, gravel and several beds of limestone, which lie upon 'seven or eight bands of non-conchiferous marble two or three feet wide and then return to the black stone'. The marble was worked at a depth of thirty or forty feet and was 'exploited from top to bottom entirely in the open air'.[34] Hugh Dawson stated the marble was being worked at a depth of seventy feet from surface in his description from about fifty years earlier, so we may assume that the Frenchman's measurement of thirty or forty feet was the thickness of the quality stone deposited below at least thirty feet or more of inferior material. This may appear that not much marble had been quarried during this period, but it should be remembered that a quarry will advance in both vertical and horizontal directions in order to access the more lucrative beds of stone, and in the Black Quarry the most lucrative beds were the black marble beds containing the fossilised remains of once-living sea organisms.

In 1757, Emanuel Mendes da Costa gave an account of the fossilised stones and marbles that were known at that time. He stated that black marble could often contain coralloids, remnants of coral, composed of a whitish opaque spar, and when polished could result in a beautiful finish, and 'Sometimes this marble has also many white sparry casts of shells, both turbinated and bivalve; but this is not common, and is only observable in the sort dug at Kilkenny.'[35] He describes the Black Quarry, which 'is about half a mile from Kilkenny in Ireland; the quarry is vast, having been workt many years'. The ground above the quarry consists of small masses or 'nodules of this same marble, no wise different from what is found in strata in the quarry' which was used to pave the streets of the city.

It was not only male visitors that wrote of the quality of the Black Quarry. Anne Plumptre, writing in 1817, noted that the 'marble quarries are not above a quarter of a mile from the town; they are very extensive'. She stated that all the rock was composed of course and fine marble. The finer marble slabs were 'reserved to be polished and used for the purposes of chimney-pieces and the like', and the course marble was 'employed in all the most ordinary uses ... with this refuse the town is paved'.[36] She also recorded that some of the 'poorest houses in the town are in like manner built of marble, the roads are mended with marble, and some of the inclosures are fenced with marble'.[37]

William Colles was very adept at self-promotion and relaying the benefits of his machinery, but appeared very coy in explaining how this machinery actually carried out its work. In 1743 Colles wrote a letter to the Revd John Perry in Dublin.[38] In this correspondence he enlightened Perry on how his own business was developing as he informed the good reverend that he was 'always on new Inventions for Doing

Everything of Marble wch can be Done with it', and that he had 'Contrived a very Light Cheap and Expeditious Handmill of stone for grinding apples for cyder'. This invention would result in greater volumes of cider produced. and would also 'grind them without leaving any part unground'. Colles also described another new product he had brought to fruition, this being 'picture frames of marble for Prints and small paintings wch Look light & neat'. These were obviously the same frames the English gentlemen and Richard Pococke were to observe on their later visits. The last item mentioned regarding the Marble Works was the new method he had invented for 'giving many Kinds of mouldings in the marble by water without ye help of a stone cutter'. Colles does not elaborate any further, so once again we must turn to Hugh Dawson for some idea on how the machinery performed its tasks.

Dawson described how Colles had 'Erected Mills on the River Nore for Manufacturing the said Marble where by Iron Saws moved by two Waterwheels It Is Sawed with Much more Expedition and Truer than by Mens Hands'.[39] After this initial process, the marble is then 'Ground to Bring It Truly out of Winding by a Waterwheel fixed Horizontaly which Is moved by a Current Passing by One Side of the Wheel while the Rest Wades in an Eddy'. To take the stone 'out of Winding' or 'out of twist' was, and still is, a process to create a flat plane surface which, up to this, was always done by hand.[40] Once this flat surface was achieved, the other surfaces could be squared and measured from it. Placed above this horizontal waterwheel

> is a Circular Bed of the Saw'd Marble of 27 feet In Diameter Laid Levell and Bedded In Sand on wch are laid a parcelle of Marble Slabbs…wch by an arm Passing from the Shaft are Moved Round over the Bed and by a Small wheel fixed on said arm are so Shifted to and from the Center That they Every round change their Possision so as to Make no Hollows In ye Bed.[41]

It is difficult to picture this process, but it appears that there were three waterwheels in action – two vertical wheels and one horizontal wheel. It does state that the smaller slabs of marble were rubbed over and back along the large circular piece, and that, most likely, sand was used as an abrasive in this process. It is also not clear whether the circular bed was a standard twenty-seven feet in diameter or how such a large piece was cut into a circular shape. The thickness of this piece is not mentioned and we are not informed as to whether it had to be replaced, or how often it may have been replaced when worn. It would have to have been cut by hand, as Colles would surely have mentioned if he had invented a machine for cutting blocks into circular shapes. Was it one whole piece of marble or was it constructed from a number of pieces to form a circle? Even the quarrying of such a large piece, if it was one piece, is a mystery.

This description of the horizontal wheel is very likely a variation, or adapta-

tion, of the horizontal-wheeled flour mill which had been widely used in this country since early medieval times. A mill of this kind consisted of a small two-storey wooden building, or stone in this case. The lower compartment, where the wheel was situated, straddled the millrace, the water entering through a chute at one end and flowing out the other, which was open. The millstones were placed in the upper compartment where the grinding was carried out. This would appear to be the basic mechanics of Colles' wheel. Whatever the case may have been, the time taken to complete this rubbing process is indicated in the following:

> the Bed Stones take a fortnight or 3 weeks to Rubb Sufficiently but the Uper Stones wch are always In Motion are Rub'd twice In a Day Here the Marble after being Rub'd on the fface Is alsoe Rub'd on the Edges wch Makes It as True as if Chiselled and free from Gapps.

This appears to suggest that the circular bed was stationary, as it was bedded in sand, but after a fortnight or three weeks would seem to have done its job, while the smaller slabs were moved by an arm attached to a shaft being powered by the horizontal waterwheel. The following stage in the process involved the marble being placed in another mill,

> where 3 or 4 Peices [*sic*] being Laid Side by Side there and fixed on Each of Them a piece of a Kind Greet [grit] Stone Called Black Hone…which being moved by ye Mills Backwards and forward the whole Length of the Marble Slabb Takes out ye Tracks of the Sand & Leaves the Marble Smooth Skin'd and Black:

This would indicate that the marks left by the sand during the rubbing process were then removed by the honing process. This was the last mechanical process prior to the marble being worked on by the stonecutters into chimney pieces, tables and other items, before being returned to another mill for the finishing touch:

> It Is again Laid In a Mill like the last mentioned over the Sawmill & Moved by one of the wheels wch move ye Saws where the fflat part Is Polished with Emery & Putty & Entirely ffinished; no hand being able to give It a Higher Gloss than this do's.

It is evident from this description that one of the waterwheels was powering the cutting and the polishing of the marble. Alongside the waterwheel used in the honing process, Colles had constructed a machine which was capable of producing some rather diverse objects, including the marble water pipes as mentioned earlier. This machine was used for

> Making Pumps for all wch uses they are Excellent He alsoe Turns & Polishes Marble Punch bowls, by the Same Mills. and Has thereby Made Engines for

> Extinguishing fires…wch Is a Valuable Improvement of these Kinds of Engines being Less In Bulk more Durable Incapable of Rusting & Subject to fewer Repairs.

Dawson concluded by stating that the marble mills were Colles' 'own Invention & Contrivance', a fact reiterated at the end of the eighteenth century in a survey by William Tighe, confirming that the marble mills were still being worked by the Colles family and that they were the 'invention of Alderman Colles, grand-father of the present proprietor'.[42]

William Colles had already stated seventy years previously that he had carried out experiments to ensure the machinery would function as he intended it to, but did not elaborate any further on these experiments. Tighe, on the other hand, informs us that Colles tried out models of the machinery in a small stream, and when satisfied that the machinery would work at full scale, 'he applied his marble to the construction of a vast variety of articles'. So amazed were the local people by Colles' creations that 'to this day his feats are proverbial among them, and they speak of him as a necromancer'.[43]

Tighe stated that some coarse work on the marble was carried out at the Black Quarry, indicating that the quarry was still the source of the marble, and 'a few blocks are split in the town by handsaw; where a little of the polished work is also done.'[44] The main work was carried out at the marble mill 'which is on the left bank of the river, near two miles from Kilkenny, to arrive at which blocks must be drawn across the bridge' (Plate 8). Tighe recorded that the mill 'is admirable for the simplicity of its structure, and for the power it exerts'. At this stage there was only one waterwheel in operation. This wheel was ten feet in diameter, which had 'twelve floats or ladles', and moved a 'crank at one end of its axis, to a frame containing twelve saws, which do the work of about twenty men'. A second crank, positioned at the other end, moved a frame consisting of five polishers. This polishing frame had recently been fitted underneath with another frame containing eight saws. From this description we can see that one waterwheel, centrally positioned to operate the cranks, was powering three separate pieces of equipment for cutting and polishing the marble. Although the waterwheel moved these frames, they did not reduce the waterwheel's power output, 'the power of the machine fully equal' to its task.[45] According to Tighe, the means by which the wheel was constructed ensured it was not dependent on a strong flow of water: 'The strength of the stream has some effect upon the working of the wheel, but not much', and, in any case, 'water is never wanting'. The operation 'may fairly be said to do the constant work of forty-two men daily'.[46]

Due to the mill's method of construction, it was stopped only for necessary repair work during the day, but at night the operation was completely shut down so

8 – Bridge at the ruins of the Marble Mills, Maddoxtown, county Kilkenny

that sand could be supplied to the saws and work could be carried out on the polishers. It certainly appears at this time that the mills were not in operation twenty-four hours a day, as in the past, and only one waterwheel was being used compared to three in William's time. Richard Colles, William's grandson, appears to have streamlined the operation and concentrated more on manufacturing chimney pieces, as Tighe enlightens us a little, stating that 'The working of these smaller articles [vases, punch bowls, frames, etc] is now abandoned, as well as many of the contrivances of the inventor'.[47] Richard was 'extremely attentive to the business, which seems in a very thriving state'. Due to the efficiency of the mills, the marble was easily worked, resulting in it being sold at moderate prices, with a middle-sized chimney piece costing about two or three guineas, and the price of 'the common ones, usually made, varies from twenty five shillings to four guineas' (Plate 9).[48]

An interesting point Tighe made was that at the time of his survey there was a duty to be paid on marble in a finished state entering into England and Scotland. The cost of two shillings per cubic foot appears to have deterred the export of finished marble products such as chimney pieces, etc, and any marble exported across the Irish Sea was in 'the rude block'.[49] The aforementioned chimney pieces were obviously for the home market, but there is also the possibility that some of these chimney pieces were destined for the North American market (Plate 10).[50] In all, Tighe estimated that the Kilkenny Marble Works exported about fifty tons of marble

9 – Kilkenny marble chimney piece, Castlefield House, county Kilkenny

10 – Kilkenny marble chimney piece in the home of Colonel Samuel Washington, Harewood, West Virginia (photo courtesy Knight of Glin)

annually. This figure would seem to have increased greatly if we are to believe Mr and Mrs S.C. Hall, who stated that around a hundred tons of marble was exported to England by the 1840s, and that 'one waterwheel, by machinery, saws and polishes slabs with the par of 40 men'.[51]

Tighe tells us that the saws were made of a soft iron, and lasted about a week. There was a constant supply of water and sand provided for the saws, the sand being taken from the Nore, 'well washed and riddled until nothing remains but very fine and pure siliceous particles'.[52] The rate of cutting at Kilkenny by water power was, according to Tighe, ten inches per day, twelve inches when the flow of water was stronger, this being equivalent to two men cutting with a handsaw, which is comparable to Pepys' earlier account above. After the cutting process, the marble was then taken from the mill and polished with cove stones. Tighe tells us that this cove stone was a brown sandstone, or grit, and was imported from Chester. The marble was now ready to be polished by the hone stone, 'found in the hills between Kilkenny and Freshford'.[53] After this, the marble was returned to the mills where it received its final polish with rags and putty. The main processes were the same as they were seventy years earlier when William first invented them.

Tighe informs us that between forty and fifty men were employed at the quarry and the mills, indicating that the Colles family was still a good employer. The price for raising and squaring marble at the quarry was 9s 9d per week, and overall the wages varied from eight to twenty shillings per week.[54]

Land carriage was problematic for the Marble Works. Tighe stated that the weighty marble being sent to Dublin had to be transported on cars as far as the Barrow at Leighlin-bridge, and from there to the Grand Canal. The marble for export was sent to Waterford, and 'goes by land at least as far as Thomastown'.[55] Richard Colles echoed the sentiments of his grandfather when he estimated that over six shillings per ton could be saved on the carriage to Waterford if a canal was constructed to the tidewater at Inistioge. In addition to the savings, he felt that demand for the marble would increase also.

Marble in 'the rude block' was exported through the port of Waterford and mainly shipped to Liverpool and Glasgow at this time. Tighe states that, on occasion, Colles would take white Carrara marble from Liverpool, 'which he works up at Kilkenny into handsome and high priced chimney pieces, generally inlaid with coloured stones, and adorned with sculptures in relief'.[56] It would appear that Italian marble had been worked at Kilkenny for a number of years prior to Tighe's survey, as the following newspaper advertisement from 1785 show: 'Marble Mills near Kilkenny. For sale, a large assortment of Kilkenny Marble Chimney Pieces of the newest kinds of Italian and Kilkenny Marble finished in the best manner, which will be sold on the very lowest terms.' [57]

The Kilkenny Marble Works was the seen as the standard by which all other

marble industries should be encouraged to attain. In Scotland it was regarded as the best example by which that country's marble industry could and should be developed. The description of the Marble Works given in *A Tour through Ireland*... was used to show how such an account could be used to encourage the government to develop Scotland's natural resources. John Knox, writing in 1789, stated that the north of Scotland 'abounds in marble of curious colours and qualities, [and] it may be proper to employ certain qualified persons to examine into the different veins, and make a report of their observations to government.' [58] The author then used the account of the Marble Works by the two Englishmen to portray how the 'expediency and utility of such information', such as that from Kilkenny, could assist in the exploitation of the marble and the creation of much employment in these areas.[59]

In the nineteenth century, Samuel Lewis was another individual who regarded the Black Quarry as still the most important quarry in the entire area. The 'jet black specimens' of marble were the most valuable of all.[60] The blocks of marble were transported to the marble mill, 'a very elegant combination of simplicity of structure with powers of execution'. Lewis then paraphrases William Tighe as he states that the mills perform the work of 'forty-two men daily. Water never fails, and from the excellence of its construction it is scarcely ever stopped on account of repairs.' [61]

William Colles' ingenious endeavours were seen as a pivotal point in the development of sawing and polishing marble. The Middlebury Historical Society of Vermont, USA, saw Colles as reinventing saws driven by water power in the cutting of marble. His use of water-powered machinery to polish marble was regarded as most innovative. The Middlebury Historical Society was formed in 1843, and decided to research and publish a history of marble quarrying in the New England area of the United States in 1885.[62] Professor Henry Seely, a prominent member of the Society, gave an account of the development of tools and machinery involved in the marble trade in chronological order. He began with the mallet, chisel and drill, used from earliest times. Hand-saws were next, Seely using Pliny as the authority for this (as already noted above), with the saws being fed sand and water by hand from 350 BC. Ausonius was the authority on the fact that saw mills for cutting stone, driven by water power, were used in Germany in the fourth century AD. The intervening centuries saw long toothless saws, up to twenty-three feet in length, in operation in the Pyrenees, and a design by Leonardo da Vinci for two or more saws stretched on a frame, known as 'gang saws', used from the sixteenth century. After such illustrious figures Seely placed William Colles. Seely noted that not since the fourth century in Germany had saws been driven by waterpower, but this process had been 'reinvented by William Colles, Kilkenny, Ireland, 1730'. Polishing and boring marble was 'done at the same place ... and by the same power'.[63] Seely enhanced his essay by quoting from William Tighe and *A Tour through Ireland*..., supplied

through correspondence with Richard Colles and Revd James Graves of Kilkenny. More than 150 years after his key inventions brought sweeping changes to the marble industry in Ireland and Britain, William Colles' contribution to the industry was given international credit by the greatest marble-producing area of nineteenth-century America, and still one the largest today.

William Colles suffered from gout for most of his life, and he finally succumbed to an attack of this affliction in March 1770. His body was interred in the family vault in St Mary's church in Kilkenny city. On the exterior of the west wall of the south transept of the church stands a monument to his memory (Plate 11). Colles' involvement in the civic life of the city, his role in the linen and flour industries, his promotion of the ill-fated Nore navigation, and his part in transforming public and private architecture of the time are subjects for future discussion. He will be remembered forever as the man who harnessed the power of nature to create artistic marvels from nature. His memorial, carved from Kilkenny marble, is inscribed with the following words from the pen of his nephew-in-law, Dr Arthur Jacob, Archdeacon of Armagh:

Inventas aut qui vitam excoluere per artis
[Who ennobled life by arts discovered]
To the Memory
Of
ALDERMAN WILLIAM COLLES
Whose steady attention to all Religious and Civic duties
Gained him the love of his fellow citizens
And
Whose ingenuity
Procured him the admiration of Strangers.
By an uncommon genius he discovered
And
By unwearied application he perfected
The Art
Of sawing, boreing [*sic*] and polishing marble by water mills
Which
By lowering the price of that valuable manufacture
Rendered it more extensive.
His whole life was employed in works beneficial to society.
His manner was inoffensive and his conduct always upright.
He died the 8th day of March, 1770, in the 68th year of his age.

Within a week of Colles' death, the following advertisement appeared in *Finn's Leinster Journal*: 'The business formerly carried on at the Marble Mills, and the

11 – Memorial to Alderman William Colles, St Mary's church, Kilkenny

opposite *12 – Ruins of the Marble Mills, Maddoxtown, county Kilkenny*

Flour Mills near Kilkenny, by the late Alderman William Colles, is now carried on by his son William Colles.' [64] Even with the sad loss of William Colles it was business as usual at the Marble Mills. Not even Death could stop the water flowing and the wheels from turning, as they carried out their respective tasks. As for the Black Quarry, the following notice appeared in the next edition of the newspaper: 'To be let and entered on immediately, the famous black marble Quarry near Kilkenny, lately in the possession of Alderman William Colles, deceased. Proposals to be sent to Henry Flood, Esq; at Farmley near Kilkenny.' [65]

The Black Quarry was filled in a number of years ago, and a petrol station now occupies part of the site on the Bennetsbridge Road on the outskirts of Kilkenny. A rock face is still visible today, but this gives no indication as to the size of the excavation that lies below the surface. The Marble Mills now lie in ruin on the banks of the Nore at Maddoxtown (Plate 12). The Colles family finally ended their association with Kilkenny and the Marble Works in the 1920s after a period of almost two hundred years. Thankfully we are blessed with countless marble chimney pieces and other assorted marble items, scattered throughout Ireland and abroad, as testaments to the craftsmanship of the employees of the Kilkenny Marble Works and to the genius of its creator, Alderman William Colles.

———

ACKNOWLEDGEMENTS

I would like to thank Desmond Guinness and Desmond FitzGerald, Knight of Glin, for their hospitality and enormous generosity. A debt of gratitude is owed to Dr Edward McParland for his support and constant encouragement. Thanks are also due to the staff of the following: Armagh Public Library, Irish Architectural Archive, Royal Society of Antiquaries of Ireland, and Kilkenny Archaeological Society, especially Cóilín Ó Drisceoil and Emma Devine, for their courtesy and permission to reproduce images. The assistance of the following individuals is gratefully appreciated: Mary Kelleher at the Royal Dublin Society; Sinéad Mahony and Melosina Lenox-Conyngham, Lavistown, Kilkenny; Seamus and Caroline Corballis at Castlefield House, Kilkenny; and the late Ted Nevill, Cork. A special word of thanks to George Sherwood senior for access to St Mary's church, Kilkenny. I am also very grateful to Donal McDonald and Jim Harling, the Kilkenny branch of An Taisce, and Clara Heritage Society, Kilkenny. Finally, thanks to my colleagues Livia Hurley, Patricia McCarthy, Conor Lucey and Kevin Mulligan, always on the look out and prepared to pass on any mention of Kilkenny marble.

ENDNOTES

1 Armagh Public Library, Topographical and Statistical Returns from Various Respondents sent to Walter Harris and the Physico-Historical Society of Ireland, circa 1745. This citation is worded as requested by Armagh Public Library.

2 For a detailed account of the Physico-Historical Society, see Eoin Magennis, 'A Land of Milk and Honey: the Physico-Historical Society, improvement and the surveys of mid-eighteenth-century Ireland', *Proceedings of the Royal Irish Academy*, 102C, no. 6, 2002. The account of the Kilkenny Marble Works in Armagh is undated, but would have been compiled in the period given in this article. The account of the Marble Works in the Physico-Historical Society's papers was the basis of a paper delivered at the Royal Irish Academy Committee for the History of Irish Science meeting, Trinity College Dublin, 14th March 2008.

3 William Colles was an alderman and treasurer with Kilkenny Corporation. He also served as Mayor of Kilkenny in 1755. He was influential in the Nore navigation scheme and the flour and flax industries in the city. He was involved in house construction, in both town and country, and barracks and bridge construction. Colles worked with Francis Bindon, and arranged for his nephew Christopher Colles to work under Davis Dukart. He was also the grandfather of the noted surgeon Abraham Colles, he of the 'Colles Fracture' fame. This article is only concerned with his interests in the marble business. The stone was actually limestone but was referred to as marble due to its ability to take a polish.

4 *Records of Eighteenth-Century Domestic Architecture and Decoration in Ireland*, 5 vols (Irish Georgian Society, Dublin, 1909-13; reprint 1969) II, 106.

5 National Archives, Dublin, Prim Papers, M.86a, Notes on the Colles Family.

6 *ibid*.

7 *ibid*., M.87. In a letter from John Blunden to John Lloyd, October 1742, regarding William's proposal of marriage to Peggy Lloyd, Blunden states he has no objection to the marriage of his cousin to Colles. 'Mr Colles is a widower with one daughter, his fortune is of his own making.' This marriage did not take place.

[8] This letter was read and ordered to be registered at the Dublin Society's meeting dated 3rd February 1732. It was entered into the minutes of the meeting, which are filed in the records of the Royal Dublin Society.

[9] *ibid*.

[10] John Bostock and H.T. Riley, *The Natural History of Pliny, Book XXXVI* (London, 1857) 325-26.

[11] Robert Latham and William Matthews (eds), *The Diary of Samuel Pepys*, V, 1664 (London, 1970) 63.

[12] Letter to the Dublin Society.

[13] *ibid*.

[14] *Faulkner's Dublin Journal*, 903, Saturday, 23rd November, to Tuesday, 26th November 1734. This same advertisement appeared in many subsequent issues. Some eighteenth-century documents use 'i' rather than 'e' when spelling Colles. For the purpose of this article, 'i' will be used in direct quotations only.

[15] Anonymous, *A Tour through Ireland in several entertaining letters ... by two English gentlemen* (London, 1748) 191.

[16] *ibid*., 192.

[17] Ted Nevill, 'Kilkenny Bird's Eye Marble', *Old Kilkenny Review* (Kilkenny, 1988) 502.

[18] Revd James Graves and John G.A. Prim, 'The History, Architecture and Antiquities of the City of Kilkenny', *Journal of the Kilkenny and South-East of Ireland Archaeological Society*, II, 1858-59. The authors provide evidence to suggest that this account was written after 1624 and prior to the rebellion of 1641. Rothe was Bishop of Ossory from 1618 to 1650.

[19] *ibid*., 324.

[20] Bodleian Library, Oxford, Carte MS 145, f.86, Duke of Ormonde to Mr Morton, 31st December 1664. The Lord Chancellor was building Clarendon House in Picadilly, London, at this time. Ormonde enclosed a design for a chimney piece made from Kilkenny marble, but sadly this no longer exists with the letter. Clarendon's house was demolished in 1683. See Rolf Loeber, *A Biographical Dictionary of Architects in Ireland 1600-1720* (London, 1981) 78.

[21] Gerard Boate, 'Ireland's Naturall History', *A Collection ofTracts and Treatises Illustrative of the Natural History, Antiquities, and the Political and Social State of Ireland* (Dublin, 1860) 122.

[22] *ibid*.

[23] Evelyn Philip Shirley, 'Extracts from the Journal of Thomas Dineley, Esquire, giving some Account of his Visit to Ireland in the Reign of Charles II', *Journal of the Kilkenny and South-East of Ireland Archaeological Society*, IV, 1862-63, 106.

[24] R.W. Lightbown, 'Some Eighteenth and Early Nineteenth Century Visitors to Kilkenny, Part 1', *Old Kilkenny Review*, III, i, 1984, 4.

[25] Armagh Public Library, Physico-Historical Society Papers.

[26] The use of Biblical references tends to indicate that Hugh Dawson was actually the Revd Hugh Dawson of Kilkenny mentioned in a deed in which Dawson had taken a house from William Colles in Coal Market, Kilkenny city. Registry of Deeds, Dublin, 271/18/173106.

[27] Armagh Public Library, Physico-Historical Society Papers.

[28] See Patrick McAfee, *Stone Buildings* (Dublin, 1998) 104-5, for a concise account of this method of quarrying.

[29] George T. Stokes (ed.), *Pococke's Tour in Ireland in 1752* (Dublin, 1891) 129.

[30] *ibid*., 127-28.

[31] National Archives, Dublin, Prim Papers, M.87. Letter dated 12th September 1762; addressee not stated.

[32] Anonymous, *A Tour through Ireland...*, 191-92.

[33] R.W. Lightbown, 'Some Eighteenth and Early Nineteenth Century Visitors to Kilkenny, Part I', *Old Kilkenny Review*, III, i, 1984, 5.

[34] Síle Ní Chinneide, 'A View of Kilkenny, city and county, in 1790', *Journal of the Royal Society of Antiquaries of Ireland*, 104, 1974, 29-31.

[35] Emanuel Mendes da Costa, *A Natural History of Fossils* (London, 1757) 232. Mendes da Costa was a fellow of the Royal and Antiquarian Societies of London and a member of the Imperial Academy of Germany.

[36] Anne Plumptre, *Narrative of a Residence in Ireland During the Summer of 1814, and that of 1815* (London, 1817) 226.

[37] *ibid*.

[38] National Archives, Dublin, Prim Papers, M.87. Letter dated 15th November 1743. As can be seen from the quotes from this letter, Colles remained very vague as to the actual designs of his inventions. No drawings or plans are known to exist for any of his designs, and it does seem strange that he never expanded on how his machinery worked. Perhaps seeing as how the machinery was open for anyone to see, its workings were easily understood when viewed.

[39] Armagh Public Library, Physico-Historical Society Papers.

[40] McAfee, *Stone Buildings*, 72-74.

[41] Armagh Public Library, Physico-Historical Society Papers. All passages quoted are from these papers.

[42] William Tighe, *Statistical Observations Relative to the County of Kilkenny, made in the years 1800 & 1801* (Dublin, 1802; reprinted Kilkenny, 1998) 105. William's grandson Richard was now running the operation.

[43] *ibid*.

[44] *ibid*., 103.

[45] *ibid*.

[46] *ibid*.

[47] *ibid*., 106.

[48] *ibid*., 104.

[49] *ibid*.

[50] Thomas M. Truxes, *Irish-American Trade, 1660-1783* (Cambridge, 1988) 75. Truxes mentions that a Dublin merchant, William Alexander, one of the leading exporters of Irish linen to British America during the 1760s and 1770s, sometimes supplied Kilkenny marble to colonial buyers. It is possible that Colles knew Alexander through the linen trade. The chimney piece in Plate 10, is in Harewood, West Virginia, in the house built by Samuel Washington, brother of George, in 1771.

[51] Mr and Mrs S.C. Hall, *Ireland; its Scenery and Character*, 3 vols (London, 1842) II, 41.

[52] Tighe, *Statistical Observations Relative to the County of Kilkenny*. See also Clara Heritage Society's *A Social History of the Parish of Clara in County Kilkenny* (Kilkenny, 2006) 80. One of the occupations mentioned at the Marble Works was 'sand risers', indicating that it was a specific, specialised job to take the sand from the river and render it fine and pure enough to be used for sawing and polishing the marble.

[53] Tighe, *Statistical Observations Relative to the County of Kilkenny*, 104.
[54] *ibid*., 102.
[55] *ibid*.
[56] *ibid*., 103. It certainly appears that Richard Colles was making chimney pieces to cater for any size of purse. This is very evident from the variety of styles of pieces that are still in existence.
[57] *Finn's Leinster Journal*, 29th January 1785.
[58] John Knox, *A View of the British Empire, more especially Scotland; with some proposals for the improvement of that country* (London, 1789) 465.
[59] *ibid*., 466.
[60] Samuel Lewis, *Topographical Dictionary of Ireland* (London, 1837) 107.
[61] *ibid*.
[62] See Zadock Thompson, *History of Vermont, Natural, Civil, and Statistical* (Burlington, VT, 1842) 114-15. Thompson states that the first marble quarry opened in the United States was in Vermont in about 1800, and marble was discovered in Middlebury in 1804. In 1810, 20,000 feet of marble slabs were sawn here. At the time of publication in 1885, over 6,000 men were employed in the marble industry in the New England states, and Vermont alone accounted for about $2.5 worth of marble.
[63] Henry Seely, 'The Marble Fields and Marble Industry of Western New England', *The Marble Border of Western New England: Papers and Proceedings of the Middlebury Historical Society*, I, part 2, 1885, appendix. Prof. Seely was formerly secretary of the Vermont State Board of Agriculture, and at the time of this publication was attached to the Chemistry and Mineralogy Department at Middlebury College.
[64] *Finn's Leinster Journal*, Wednesday, 14th March, to Saturday, 17th March. William Colles continued to run his late-father's business until his untimely death in 1779, aged only 34.
[65] *ibid*., Saturday, 17th March, to Wednesday, 21st March.

———