

The Quarrying and Distribution of Reigate Stone in the Middle Ages

By TIM TATTON-BROWN

REIGATE stone was one of the most important building stones used in London and along the Thames littoral in the Middle Ages but, despite this, its use has been largely ignored by archaeologists. This introductory essay attempts to look at both the geology and documented history of the stone quarries, and at the Battersea and other Thames-side sites from which the stone was distributed.

During the Middle Ages the 'freestone of Reigate' was used more than any other building free-stone in London. When great buildings like (old) St Paul's Cathedral, Westminster Abbey or the buildings of the Palace of Westminster were being erected, it was to the quarries at the base of the North Downs, sixteen miles (25 km) due south of London, that the masons turned for their main supplies of building stone.¹ Other fine building stones, that were harder than Reigate stone, were also used, but never in the same quantities. These stones like Quarr and Binstead stone from the Isle of Wight in the early period, Caen stone from Normandy and, in the later Middle Ages, carved Kentish Ragstone (as opposed to rubble stone) from the Maidstone area, came in by water up the Thames and are better known.² So what do we know about Reigate stone and how it was extracted from the ground?

As with virtually all medieval stone quarries in Britain, no archaeological work has been published on the sites themselves, and the answers have to be sought in documentary and geological evidence.³ One day, however, it should be possible to rediscover and excavate several of the medieval quarry sites including some of those in the Reigate area. Sadly a great opportunity was missed between 1972 and 1974 when the M23 and M25 motorways were being constructed. Their huge

¹ For example, the well-known 1253 accounts for Westminster Abbey record the purchase in the spring of 1253 of 240 cwt of Reigate freestone for £72. See H. M. Colvin, *Building Accounts of King Henry III* (Oxford, 1971), 236–7. Much more of the stone was bought later in the year.

² See T. Tatton-Brown, 'The use of Quarr stone in London and East Kent', *Medieval Archaeol.*, 24 (1980), 213–15 and 'La Pierre de Caen en Angleterre', 305–14 in M. Baylé (ed.), *L'Architecture Normande au Moyen Age* (Caen, 1997). See also B. C. Worssam and T. Tatton-Brown, 'Kentish Rag and other Kent building stones', *Archaeol. Cantiana*, 112 (1993), 93–125. Some early writers, like D. Knoop and G. P. Jones, *The Medieval Mason* (Manchester, 1949), 12, could not distinguish between Reigate stone (Upper Greensand) and Kentish Rag (Lower Greensand). For some early notes on the history of Reigate stone, see *VCH Surrey II* (1905), 277–8.

³ This is in great contrast to the study of other medieval industries, where pottery and tile kiln sites, for example, have been excavated in increasing numbers in recent years. For a recent review of all these industries, see J. Blair and N. Ramsay (eds.), *English Medieval Industries* (London, 1991).

carriageways and crossover cut right across several of the probable sites of a later medieval quarry without any rescue archaeology taking place. By contrast, several of the underground mines have been explored and recorded by cave research and exploration groups.⁴

Although a few fragments of late Anglo-Saxon sculpture in Reigate stone have been found,⁵ and one or two late Anglo-Saxon churches may contain some Reigate stone,⁶ the real beginning of the freestone industry must be related to the construction of the huge new church for Westminster Abbey by King Edward the Confessor. Work on this very large new Romanesque building must have started in the 1050s,⁷ and though there is no documentary evidence to say that Reigate stone was used, the remains of the great church that were found below the later floors in 1866, 1910 and 1930 do contain plinth blocks and moulded bases in a mid-11th-century style which are certainly of Reigate stone.⁸ This new abbey church was one of the largest churches to be built in Britain, at a time when the erection of large masonry buildings was only just starting again in North-West Europe, and so a special new quarry would have been sought at the very beginning of the work.⁹

The stone that was selected is a very distinctive fine-grained sandstone containing glauconite (hence the green colour) and mica. This type of stone is known only to occur in a very small strip of the Upper Greensand just below the Lower Chalk at the bottom of the upper scarp slope of the North Downs in the Reigate and Merstham areas (Fig. 1). The outcrop of the stone only extends for a maximum of about eight miles E.-W., and the useable stone itself occurs in a few beds at the top of the Upper Greensand that are 1.5 m high at most.¹⁰ Immediately beneath the Upper Greensand is the Gault, a heavy blue clay, which creates a spring line at the Upper Greensand base, and so at quite an early date the quarrymen would have learnt to find the beds from above and to follow them northwards and downwards (as well as eastwards and westwards) in underground drifts or mines. A northward limit underground was imposed by the water table (see Fig. 4). Exactly when underground mining on a large scale started is not yet

⁴ I am most grateful to Paul Sowan for showing me some of these, mostly unpublished, surveys. He also very kindly arranged for me to visit some of the underground quarries in July 1989, a most interesting and instructive experience.

⁵ From Betchworth and Reigate in Surrey, and Orpington and Dartford in Kent. See B. C. Worssam, 'Regional geology' in D. Tweddle, M. Biddle and B. Kjøbye-Biddle, *Corpus of Anglo-Saxon Stone Sculpture. Vol. IV: South-East England* (Oxford, 1995), 17.

⁶ See E. M. Jope, 'The Saxon building-stone industry in southern and midland England', *Medieval Archaeol.* 8 (1964), 91-112. I am, however, doubtful of the supposedly early Saxon work at Stoke d'Abernon church: *ibid.* p. 98.

⁷ See R. D. H. Gem, 'The Romanesque rebuilding of Westminster Abbey', *Proc. Battle Conf. Anglo-Norman Stud.*, III (1980), 33-60. Harold's large new mid-11th-century church at Waltham (Abbey) may also have used Reigate stone (pers. comm., P. Huggins).

⁸ The bases on either side of the great pavement in the sanctuary can still be inspected in man-holes. See J. A. Robinson, 'The church of Edward the Confessor at Westminster', *Archaeologia*, 62 (1910), 81-100, and L. E. Tanner and A. W. Clapham, 'Recent discoveries in the nave of Westminster Abbey', *Archaeologia*, 83 (1933), 227-36.

⁹ See Gem, *op. cit.* in note 7. It is worth noting that Caen stone was apparently not used in the Confessor's great church. It was probably only used on a large scale in England after 1066, see T. Tatton-Brown (1997), *op. cit.* in note 2.

¹⁰ This is fully discussed in P. W. Sowan, 'Firestone and hearthstone quarries in the Upper Greensand of East Surrey', *Proc. Geologists' Assoc.*, 86 (1975), 571-91. Other different types of building stone, in the Upper Greensand, were quarried further to the West, in the Farnham-Selbourne area, for example, or in the Vale of Wardour and Devizes area in Wiltshire. This stone is, however, much more glauconitic and not at all like Reigate stone.

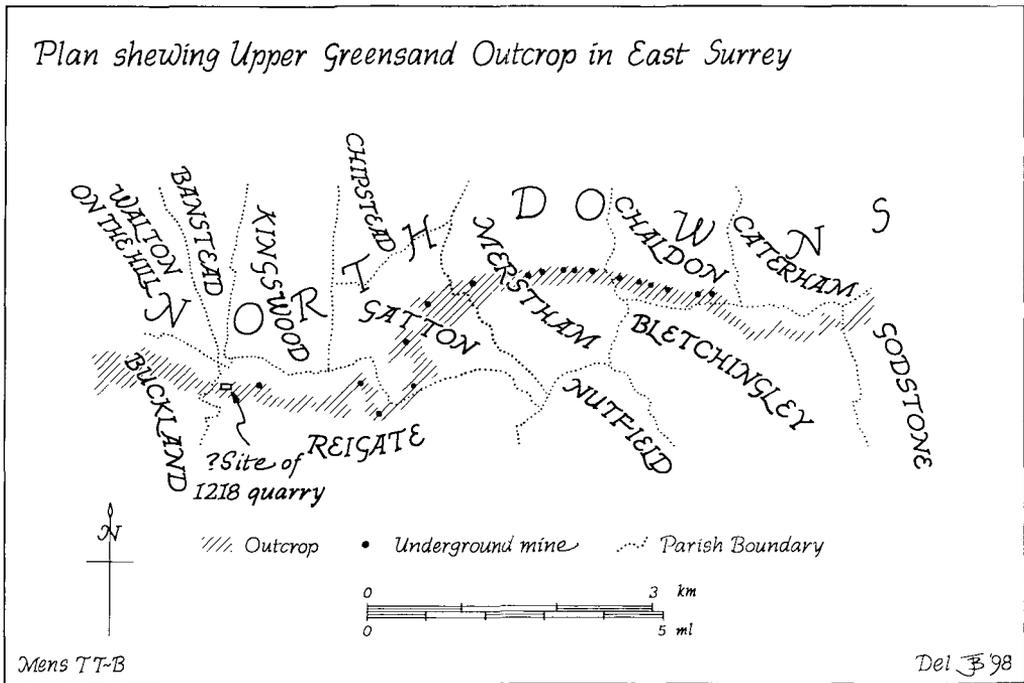


FIG. 1

known, but it is very likely to have been in the late 12th or early 13th century, and with the huge demand for the stone in the 13th century (particularly at Westminster Abbey), there were probably underground quarries at this time, though this is not mentioned in any of the documentary evidence, which starts at the beginning of the 13th century.

THE EARLIEST DOCUMENTED QUARRY

Among the early charters of Waltham Abbey, an Augustinian monastery in Essex, 13 miles north of London, are two that date from 1218.¹¹ The first is a grant by Earl William de Warenne, to the canons, of two acres of land in his vill of Reigate lying at the foot of the hill beside the road to Walton [on the Hill] at the place called Witelamb extending from east to west, and being 8 perches [42.3 m] wide and 40 perches [211.5 m] long, for a quarry where they may dig when they wish for stone for the building of their church or for any building. This quarry probably lay in the NW. corner of the parish of Reigate below Colley Hill, where a track snakes its way up the steep scarp slope to the North-West (Fig. 2).¹² On the

¹¹ R. Ransford, *The Early Charters of Waltham Abbey 1062-1230* (Stud. Hist. Medieval Religion, 2, 1989), 431-3, charters 631 and 632. It should perhaps be added that Reigate stone had already been used at Waltham Abbey in the Romanesque church.

¹² See map in end pocket of W. Hooper, *Reigate, its Story through the Ages* (Guildford, 1945). The book also has a very brief discussion, on pp. 105-6, of the Reigate stone industry.

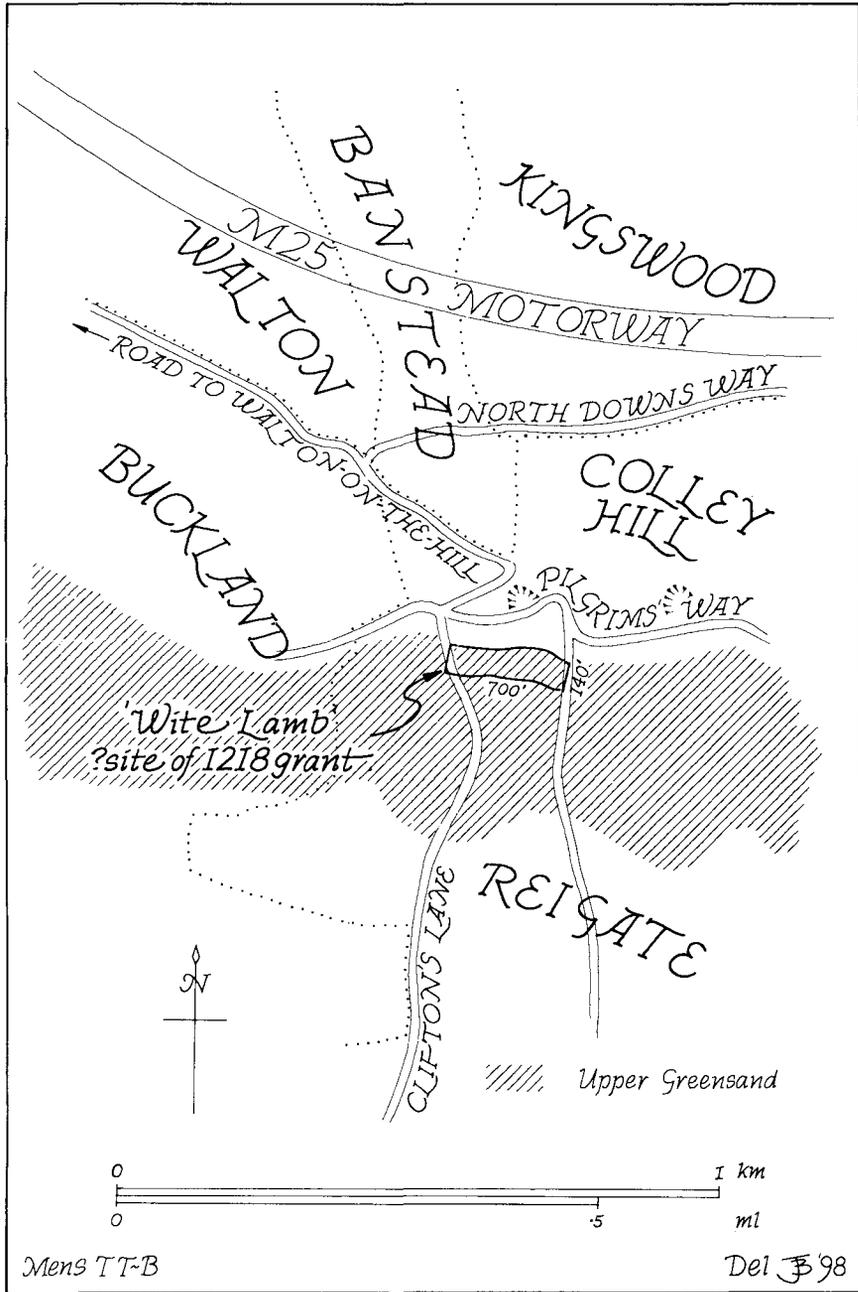


FIG. 2
Probable location of the earliest documented Reigate Stone quarry.

top of the Downs it reaches the extreme SE. corner of the parish of Walton-on-the-Hill, and there is little doubt that it is this road that is referred to in this charter (Fig. 1). Where this road reaches the foot of the North Downs, it immediately crosses the Upper Greensand outcrop,¹³ and this must be the location of the 1218 quarry which the charter indicates was, at least initially, to be a new surface one. The given dimensions of 40 E.-W. by 8 perches N.-S. would also almost exactly cover the upper part of the Upper Greensand outcrop in which the stone occurs, and the E.-W. length can with some confidence be placed as running between the two public footpaths that now run up to the foot of the North Downs scarp (Fig. 2). The northern boundary of the 2 acres in the charter, at the foot of the Downs, is now the boundary to the National Trust land on the Downs, and just within it lies the so-called Pilgrims' Way in a now heavily wooded area.¹⁴ The Upper Greensand outcrop is now in gently sloping pasture land, and there are no obvious signs of old surface disturbances. However, for most of the Upper Greensand outcrop in the Reigate area, the harder beds of the Upper Greensand form a secondary scarp. At this point, however, the secondary scarp is missing, and it is possible that this is because it has been quarried away.¹⁵

The second Waltham Abbey charter of 1218, which immediately follows the one described above, is for a plot of land at 'Bruges' in Battersea, which lay on the south side of an inlet from the Thames, with the Thames itself on the West.¹⁶ This land was granted by Pentecost of Wandsworth (his court and garden lay to the South of the site), and we are told it measured 6 perches (32 m) E.-W., and had a 4 perch (21 m) frontage on the Thames to the West. It was, however, only 3½ perches wide on the East (Fig. 3). We are not told what the land was to be used for, but the canons were:

... to have free access to their men's carts, horses and pack animals and free licence to enclose the plot and to build and work on it in any way which may seem useful to them.

This land can now be located fairly precisely in Battersea Reach (about 800 m WNW. of Clapham Junction railway station), and the inlet on the N. side of the site was probably where the Falcon brook joined the Thames. It is still shown as Battersea Creek in late 19th-century maps.¹⁷ This brook is now almost all underground and the southern part of the site is built over by the early 19th-century warehouses of Price's Candleworks, which in turn replaced a late medieval moated house, which was built by the Bishop of Durham in 1471-4. It was later given to the Archbishopric of York. As it happens the site on the Thames frontage, mentioned in the 1218 charter, in July 1998 was being bulldozed for redevelopment.¹⁸

¹³ British Geological Survey, Sheet 286 (1932).

¹⁴ The Reigate Mines Ltd., which quarried 'hearthstone' in quarries in the Upper Greensand until 1961, had their site a short distance to the east. Earlier this century, at least, there was much less woodland here.

¹⁵ The area immediately to the West and East does still have the secondary scarp. A natural (geological) explanation could, however, be the reason for the missing scarp here.

¹⁶ Ransford, *op. cit.* in note 11, 432-3 charter 633.

¹⁷ See N. J. Barton, *The Lost Rivers of London* (Leicester, 1962), 41, and the Ordnance Survey 1:2500 map of 1894-6.

¹⁸ This house may have succeeded Pentecost of Wandsworth's house, mentioned in the 1218 charter. For the very small-scale excavations here, see D. Hawkins with A. Douglas, A. Harris and V. Ridgeway, 'The Archbishop of York's Battersea mansion', *London Archaeol.*, 9 (2000), 129-36.

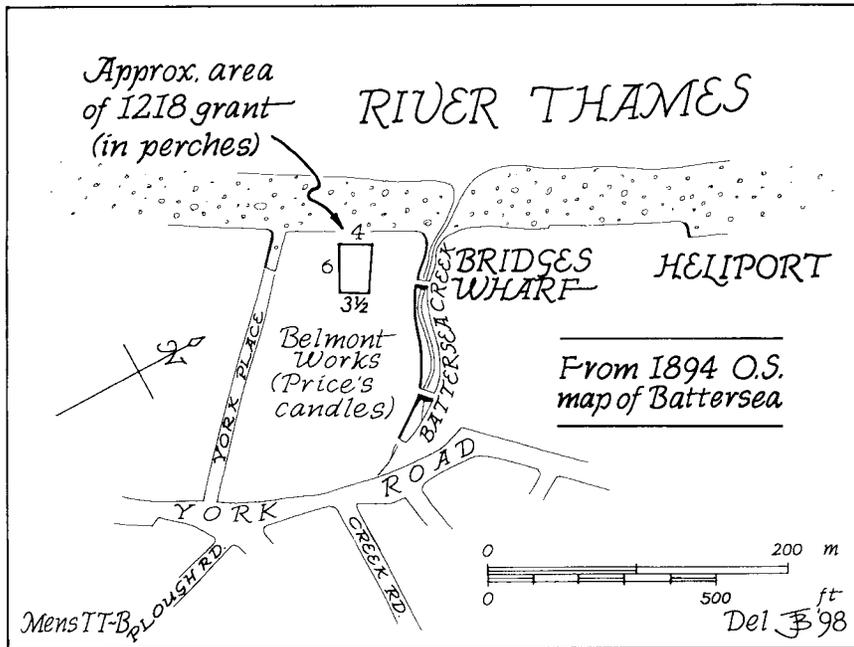


FIG. 3

Location of the plot in Battersea referred to in the second Waltham Abbey charter of 1218.

The use of the site was almost certainly for stock-piling the Reigate stone before it was transported to Waltham Abbey by boat down the River Thames and up the Lea. A nearly contemporary pipe-roll tells us that the Reigate stone for royal works at Windsor Castle was also transported by 'Bruges' or 'Bridges',¹⁹ and in the mid-13th century much Chaldon freestone was purchased from Algar and William 'of Bridge' for Westminster Abbey.²⁰ Battersea lies about 24–5 km due north of the Reigate quarry area, and all the stone must have been carted this distance by horse- (or oxen-) drawn carts over the North Downs. The modern A23 and A217 roads perhaps partly follow the medieval routes to Battersea, and the Merstham gap, where the A23 and the railways go through the Downs, may have been used as a slightly less steep route from the quarries through the North Downs.

The use of the Battersea sites by the Thames for stock-piling Reigate stone, before moving it onwards by water, perhaps goes back to the mid-12th century, because it is from this date that we first find Reigate stone being more widely used in the Thames estuary littoral. Earlier in the 12th century the main freestone that was used in this area was Caen stone from Normandy, but in some late Romanesque architectural features, like the c. 1160 W. doorways of Luddenham

¹⁹ Pipe Roll 6 John, 57. The neighbouring site immediately to the North, which now incorporates the London Heliport, is still called Bridges Wharf.

²⁰ Colvin, *op. cit.* in note 1, 290–1, etc. It seems likely that there were, by the mid-13th century, several different Thames frontage sites here, that were all used for stock-piling the Reigate stone. In the late 14th century 'a garden called Briggekourt' was leased for storing Reigate stone, at 3s. 4d. per annum. See R. B. Rackham, 'The nave of Westminster', *Proc. Brit. Acad.*, 4 (1909–10), 11.

and Davington churches near Faversham, Reigate stone is found for the first time. Much use was also made of Caen and Reigate stone at the nearby Royal Abbey of Faversham (founded in 1148).²¹ At Rochester Cathedral all the building and rebuilding work of the first half of the 12th century (including the W. front) uses Caen stone, but at the E. end of the nave, at triforium level, quantities of Reigate stone of c. 1160 can be seen for the first time.²² In the large-scale rebuilding of the eastern arm of Rochester Cathedral after the fire of 1179, Reigate stone rather than Caen stone is the predominant material, and Reigate stone is also found in many later 12th-century phases in parish churches in north-western Kent, like the large cruciform church at Horton Kirby.²³ Reigate stone is not found in the eastern arm of Canterbury Cathedral (rebuilt 1175–84), but it was used with Caen stone in the early 13th-century great hall of the Archbishop's Palace there.²⁴ In the first half of the 13th century Reigate stone is very commonly found in the quoins and window jambs of most of the new chancels of churches in northern and north-eastern Kent.²⁵ A similar pattern could no doubt be found in southern and eastern Essex. Reigate stone was also taken westwards up the River Thames in the later 12th century, and it was at this time that it was first used at Windsor Castle. In summary, Reigate stone was perhaps used only locally and in London from the mid-11th to mid-12th centuries. Production then increased in the mid- to later 12th and 13th centuries, and it was used as the principal 'dimension' stone or freestone in large areas east and west of London, where it could be taken by water.

LATER MEDIEVAL QUARRIES

Until the early 13th century, the quarries for Reigate stone may have been in part surface quarries, as is perhaps shown by the Waltham Abbey charter discussed above. After this very large quantities of new Reigate stone were required in the middle to later 13th and 14th centuries for vast royal building projects like Westminster Abbey and Palace, and Windsor Castle, and it seems highly likely that most of this stone came from underground quarries that were situated particularly in the parishes of Merstham and Chaldon.²⁶ There must also have been underground quarries in the neighbouring parishes of Gatton and Reigate to the West. The evidence for this has not yet been found by archaeological means, but once again one can look at both the contemporary documentary evidence and the geological and known 'probably medieval'²⁷ underground quarries to draw some provisional conclusions.

²¹ B. Philp, *Excavations at Faversham, 1965* (privately publ., 1968), 39, though the report on building materials here is in need of revision.

²² See B. C. Worssam, 'A guide to the building stones at Rochester Cathedral', *Friends Rochester Cathedral Rep.*, 1994/5, 23–34, esp. p. 30. Some capitals and bases in the late 11th-century crypt at Rochester were, however, made with Reigate stone.

²³ Observations principally made by the writer, during survey work in Rochester diocese.

²⁴ See T. Tatton-Brown, 'Building stone in Canterbury c. 1070–1525', 70–82 in D. Parsons (ed.), *Stone: Quarrying and Building in England AD 43–1525* (Chichester, 1990), esp. p. 76.

²⁵ Observations made by the writer, during church surveys in the diocese of Canterbury.

²⁶ Since 1933, when the boundary was moved northwards, the Chaldon quarries are within Bletchingley parish (cf. Fig. 1).

²⁷ As first suggested by Paul Sowan, *op. cit.* in note 10. The known underground quarries in Gatton parish, at Tower Wood, for example, seem to be post-medieval.

In the well-known and very full 1253 building accounts for Westminster Abbey very large quantities of Reigate freestone (*france Petre de Reygate*) were acquired for the work, mainly from Roger of Reigate and Algar of Bridge (*Brige* - see above), but also from other men like Richard Croydon, Ralph of Lambeth, William Bridge and William Karre.²⁸ On many occasions stone was paid for in advance, and the average price seems to be around 4 shillings per cwt of stone. Some transport costs are given, but these are not very high, suggesting that the Reigate stone was bought at Battersea, and then just transported the short distance down the Thames to Westminster. We are also told that at the end of August labourers began in the king's quarry, but it is not stated where this is. A few years later, in 1259, we read of Chaldon freestone being bought from Algar and William Bridge, as well as from Ralph of Lambeth and Ralph of Waltham for freestone 'from the same quarry'. This cost 6 shillings per cwt.²⁹ Peter of Merstham is also supplying freestone at the same price.

A survey of the area of the Upper Greensand outcrop in the parishes of Merstham and Chaldon (the latter now Bletchingley) reveals no obvious quarry sites. However, there is a whole series of large pits and filled-in shafts (often now in small woods), which are known to be entrances to underground quarries.³⁰ Most of these entrances are now blocked, but excellent new survey work by various members of the local caving clubs has shown that these shafts must have been the principal entrances to medieval and later underground quarries, which interconnected below ground. The stone would have been hauled up an incline, or raised vertically in the shaft from the mine floor by shearlegs or cranes (Fig. 4). Eastwards from Merstham parish church, along Merstham and Chaldon Bottoms (i.e. in the E.-W. 'valley' at the base of the Chalk Downs), the remains of at least ten old quarry entrances have been recorded at intervals of approximately 90–180 m (Fig. 1). Part of this area has now been obscured by the M23 motorway (and a large series of underground quarries below the western part of Ockley Wood was filled in, in 1972–4, during construction work), but it is still possible to find some old shafts at Quarry Dene, Ockley Wood, Bedlam's Bank, Rockshaw House and in Spring Bottom. Spring Bottom is in the SE. corner of the old parish of Chaldon, and there do not seem to have been any medieval quarries east of this in Bletchingley or Godstone parishes.³¹ West of Merstham parish church, in Gatton Bottom, there are some underground quarries running across the boundary between Gatton and Merstham parishes, but after this the Upper Greensand outcrop is more sinuous in Gatton and Reigate parishes, and the evidence for 'probable medieval'³² underground mines is more tenuous. More research and fieldwork is needed, but the field and documentary evidence perhaps suggests that

²⁸ Colvin, *op. cit.* in note 1, 236–87.

²⁹ *Ibid.*, 290–1.

³⁰ Most of the known sites are listed in Sowan, *op. cit.* in note 10, 588–90. They lie a hundred or so yards to the north of the modern Rockshaw road, and further east they are close to Spring Bottom lane. For a useful map of the known underground quarries immediately to the east of Merstham church, see B. E. Osborne, 'Early platemays and firestone mining in Surrey', *Proc. Croydon Nat. Hist. Scientific Soc.*, 17 (1982), 85, fig. 2.

³¹ Sowan, *op. cit.* in note 10, lists various later (19th-century) underground quarries in these parishes, which used the stone for 'firestone' and 'hearthstone'.

³² As defined by Paul Sowan, *op. cit.* in note 10.

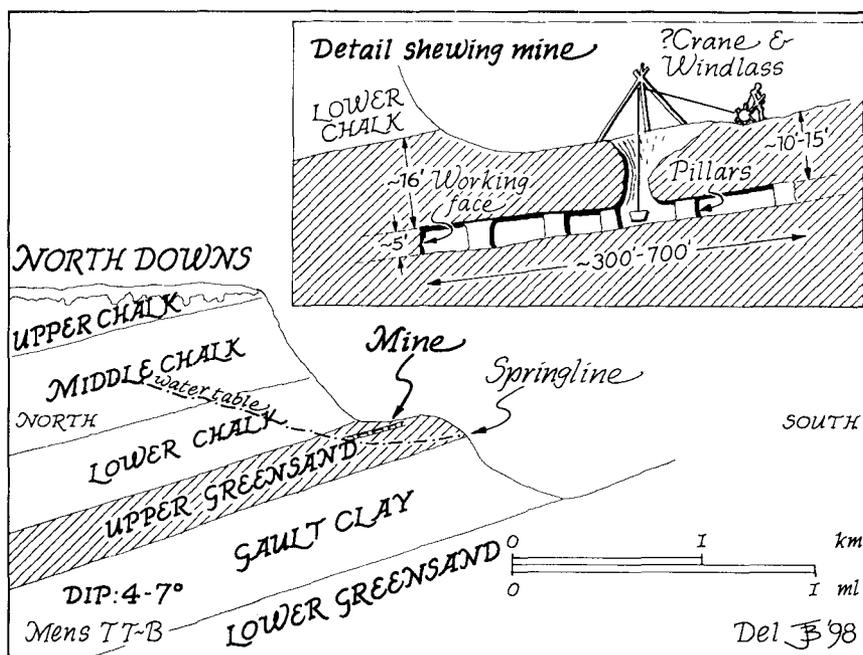


FIG. 4

Diagrammatic representation of the form and position of a mine for Reigate Stone.

Reigate stone was first worked from the surface in Reigate parish (manor) in the mid-11th to early 13th centuries, and that from the 13th century onwards almost all the stone was obtained from underground in a series of mines that were mostly situated in the parishes (manors) of Merstham and Chaldon (Fig. 1).

No documentary evidence about the mines themselves has been found,³³ but various later medieval accounts do give a few clues. For example, Westminster Abbey rented a quarry at 'Chaldon' for £3 6s. 8d. a year from 1387 to supply stone for the 'new work' at the abbey (i.e. the completion of the nave). They worked the quarry with their own men, but the accounts go on to tell us that after 4-5 years, it was found more convenient to give up this direct working and instead to buy the stone directly. We also know that at this time the stone was taken by cart to Battersea, where a garden called Briggekourt was leased, at 3s. 4d. per annum, for the storage of the stone.³⁴ It was then taken by small boats to Westminster Mill (i.e. the quay on the SE. corner of the Abbey precinct), before being finally carted up to the lodge or Abbey church. In the mid-15th century, a new storage site at Wandsworth, a little further up the Thames, was acquired, and boats called *showtes*

³³ The manor of Merstham belonged to Canterbury Cathedral Priory, but no mention of mines has yet been found in its extensive documentary records. By contrast, a lot of work in the last 30 years has gone into using documentary sources to identify post-medieval underground workings, either quarries for 18th- to 20th-century building stone (firestone), or quarries for 19th- and 20th-century hearthstone, or workings functioning simultaneously as quarries and mines, as Paul Sowen has kindly drawn to my attention.

³⁴ See Rackham, *op. cit.* in note 20. It was probably close to the Battersea sites mentioned above.

were used.³⁵ Then in 1473–4 they moved the site downstream to Vauxhall, and three years later a new wharf was built here. At this time boats called ‘lighters’ from Rotherhithe were used to transport the stone.³⁶

In the second half of the 14th century we learn that members of the Prophete family ran the Reigate stone quarries. In 1369 John and Philip Prophete were appointed ‘masters of the quarries’ at Merstham and Chaldon for the supply of stone to Windsor Castle, with power to impress labour.³⁷ Large quantities of stone was then taken up the Thames to the castle for Edward III’s building works, and the accounts give us the costs ‘from the quarry at Merstham and other places, to Kingston and Battersea, and thence to Windsor’.³⁸ At the same time much stone was also going to other royal works at the Tower of London, Westminster Palace and many other places. In 1367–8, for example, Philip Prophete was paid £13 4s. for 44 tons of ‘Reygat freestone’ (at 6s. per ton), and a further 51s. 4d. was paid to William Adekyn ‘and his fellows’ for the freight of this stone from Battersea to Rochester Castle (i.e. at 14d. per ton).³⁹ Many other accounts for the later 14th to early 16th centuries could be quoted, but perhaps the most interesting is for royal works at Eton College in 1447–8. In the revised scheme for the chapel, it is specifically stated that ‘Yorkschyre’ (Magnesian Limestone) and ‘Teynton’ stone are to be used for the wall faces, with rubble infill of ‘hard and durable heth ston and flynt’. It then goes on to say that ‘neyther in the seid growndes [foundations] ne walles schall in anywise be occupied Chalke Bryke ne Reygate stone otherwyse y called Merstham stone’.⁴⁰ This prohibition of the use of Reigate or Merstham stone shows that by this time they were fully aware of how quickly Reigate eroded away, particularly on external faces. The stone goes on being used, but from the mid-15th century, it is used mostly only for internal work and carving. A good example of this is at St George’s Chapel, Windsor which was built in the last quarter of the 15th century using only Taynton stone (and some Caen stone) externally. Inside Reigate stone was used for ashlar in the aisle walls and, along with Caen stone, for very elaborately carved work. At Westminster Abbey the great rose window in the S. transept was rebuilt in 1457–61 but, just before this work was undertaken, the lower external walls of the S. transept, which had been faced with Reigate stone in the mid-13th century, were cased up externally in the ‘Northirstone’ (i.e. Magnesian Limestone from south Yorkshire).⁴¹ Clearly two centuries of weathering had already taken their toll on the outside of the Abbey. After another two-and-a-half centuries of weathering at the Abbey, Sir Christopher Wren produced a report on the state of the fabric in 1713. Here is what he says about the stonework:

That which is most to be lamented, is the unhappy Choice of materials, the Stone is decayed four Inches deep, and falls off perpetually in great scales. I find, after the Conquest, all our

³⁵ Ibid.

³⁶ Ibid.

³⁷ L. F. Salzman, *Building in England down to 1540* (Oxford, 1952), 130.

³⁸ W. H. St J. Hope, *Windsor Castle, an Architectural History* (London, 1913), 179. Kingston was thus another transhipment site.

³⁹ Fabric Roll of Rochester Castle published in *Archaeol. Cantiana*, II (1859), 112 and 121.

⁴⁰ Transcribed in Salzman, *op. cit.* in note 37, 527. ‘Heth’ stone is Sarsen from Bagshot Heath.

⁴¹ See Rackham, *op. cit.* in note 20, 27.

Artists were fetched from Normandy; they loved to work in their own Caen-stone, which is more beautiful than durable. This was found expensive to bring hither, so they bought Rygate-stone in Surrey, the nearest like their own, being a Stone that would saw and work like Wood, but not durable, as is manifest; and in the highest degree: this Stone takes in Water, which, being frozen, scales off, whereas good stone gathers a Crust, and defends itself, as many of our English Free-stones do.⁴²

As a result of this almost all of the external Reigate stone masonry at the Abbey was either cased up or replaced between the 17th and 19th centuries. Today the newly cleaned Abbey is found externally to be made almost entirely of Portland and Bath stones, though a little Reigate stone survives on the outside in the 13th-century E. doorways to the N. and S. transepts, and the clerestory ashlar (now beneath thick limewash) and on the W. front in the N. aisle window above the Jerusalem chamber. This window is particularly interesting as a rare survival of external 13th-century work, in showing how the capitals and other important carved details were done in Caen stone, while the rest of the work is in Reigate stone.⁴³ Internally much original Reigate stone remains, though it too has weathered very badly in the damp and polluted atmosphere.

Let us now return to the underground quarries at Merstham and Chaldon, which were probably in their heyday as building stone mines between the mid-13th and mid-15th centuries with large numbers of people being employed both as miners underground and in the transportation of the stone to the Thames quays.⁴⁴ Exploration work by cave research groups in the past three decades has shown that underground the quarries contain very large areas of 'drifts' worked by the 'pillar and stall' method. Only three to four beds of the stone were worked, and these were found at one level that occurs between 16 feet (4.9 m) and 21 feet (6.4 m) below the base of the chalk. The stone here is described as 'massive bedded tough micaceous sandstone with cherty nodules'. In between the three to four beds of this are some thin 'glaucinitic sandy earth marls' which were picked out by the miners. The highest of these marls was immediately under the roof, which was another 'very hard pale creamy-grey sandstone with nodules of bluish-white chert'.⁴⁵ All the underground mines that have been investigated to date have a maximum ceiling height of about 1.5 m, making it impossible to stand upright underground. From the entrance pit the miners worked in all directions at this level, with the main trend being 'up dip' to the South-West or 'down dip' to the North-East.⁴⁶ In this latter direction the mine soon found itself at a great depth below the chalk, but within a short distance working would have been impossible because the water table was reached. Each passage was 3–3.6 m wide, and roughly parallel passages were cut to the East and West with pillars in-between to hold up the roof. Many of the worked-out passages were subsequently filled almost to the roof with quarry

⁴² Quoted in A. Clifton-Taylor, *The Pattern of English Building* (London, 1972), 117.

⁴³ T. Tatton-Brown, 'Westminster Abbey: archaeological recording at the west end of the church', *Antiq. J.*, 75 (1995), 171–88.

⁴⁴ In the post-medieval period their use would have declined greatly, and in the 18th and 19th centuries they were used almost entirely for firestone and hearthstone: see Sowan, *op. cit.* in note 10.

⁴⁵ For the geology, see H. G. Owen, 'The stratigraphy of the Gault and Upper Greensand of the Weald', *Proc. Geologists' Assoc.*, 86 (1975), 475–98, esp. p. 486.

⁴⁶ The dip of the beds varied usually from 4 to 7 degrees and, as Paul Sowan points out, the underground workings rarely penetrated far beneath the Chalk itself.

waste, and this 'dead' material was held in place by rough dry-stone walls. As a result of this, it is now very difficult to ascertain the full extent of the underground workings. Some excellent new surveys of the mines have, however, been produced in recent years, and these do give some indication of the huge areas of almost continuous below-ground workings running eastwards for about two miles from Merstham church.

Only one place in south-eastern England is known to have had comparable underground stone quarries in the Middle Ages, and this was at Totternhoe in south-western Bedfordshire. These quarries are within a thick bed of coarse phosphatic and glauconitic chalk in the middle of the Lower Chalk along a short stretch of the NW. scarp of the Chiltern Hills.⁴⁷ Totternhoe stone was worked from at least the early 12th century for the nearby Dunstable Priory, and from the 1170s it was used for Henry II's building work at Windsor Castle,⁴⁸ and the early accounts refer to a quarry at 'Eglemunt' or 'Egremont', which was the probably the name for the motte and bailey castle at Totternhoe. The digging of ditches for this castle may first have discovered the harder beds of chalk rock here. Areas of 'hills and holes', just beyond the ditches, must indicate early surface quarries. By the later Middle Ages, underground quarries were in use in a large area to the East of the castle, and the methods of underground working were perhaps similar to those at Reigate, though the roof was much higher. The stone from these quarries was used in quite a wide area of southern Bedfordshire and Buckinghamshire, as well as in Hertfordshire.⁴⁹ It seems, however, to have been used in London only rarely (in the 1350s at Westminster, for example),⁵⁰ but when it was used at Westminster and Windsor Castle, it was used alongside Reigate stone. It is also worth noting that the Caen stone from Normandy that was also being used at this time, almost certainly came from underground quarries just outside the city of Caen beside the river Orne.⁵¹

In summary, Reigate stone was one of the most important freestones used in London during the Middle Ages. Even though it was not really hard enough to use on the external faces of buildings, it was used very extensively for this sort of work between the late 12th and 15th centuries. Alongside this it was an easy stone to use for carving sculpture, and this use continued well into the 16th century, by which time Reigate stone was no longer being used externally.⁵² Reigate stone continued to be used, however, for doors, windows, fireplaces, newel stones (in spiral stairs) and many other features, in the new brick buildings of the early Tudor period. In the second decade of the 16th century Cardinal Wolsey set up his building yard for the construction of Hampton Court and York Place (Whitehall) in Battersea, and

⁴⁷ M. G. Sumbler (ed.), *British Regional Geology: London and the Thames Valley* (4th edn, London, 1996), 79–84.

⁴⁸ Hope, *op. cit.* in note 38, 15. For the gift of the stone quarries to the Abbey in 1132, see *VCH Bedfordshire I* (1904–14), 371.

⁴⁹ See E. Roberts, 'Totternhoe stone and flint in Hertfordshire churches', *Medieval Archaeol.*, 18 (1974), 66–89.

⁵⁰ *Cal. Pat. Rolls* 16 Aug. 1355, p. 277. This was presumably because of high transport costs.

⁵¹ A survey of the medieval quarries at Caen has yet to be undertaken, but see G. Coppola, 'Carrières de pierre et techniques d'extraction: la pierre de Caen', 289–303 in M. Baylé (ed.), *op. cit.* in note 2.

⁵² From the 15th century, Kentish Ragstone was the most favoured stone for external work: Worssam and Tatton-Brown, *op. cit.* in note 2.

he was certainly stock-piling Reigate stone here.⁵³ Even in the 17th century it was still being used internally in many buildings. Wren used it internally in large quantities for his new St Paul's Cathedral and at Hampton Court. After this, however, its use as a building stone was only local.⁵⁴

Reigate stone is now once again being sought for conservation and repair work to medieval and Tudor buildings, but before this can be done, more work on the archaeology of the quarries (both above and below ground) needs to be carried out. This could start in the north-western corner of Reigate parish, where the earliest quarries may have been situated, and it is also worth considering the excavation of one of the shaft-entrances (and its surroundings) in the parish of Merstham so that we can understand more of the industry in its heyday. Finally it would be worth carrying out excavations on one of the storage sites for Reigate stone by the River Thames. Bridge Wharf at Battersea is an obvious place to start.⁵⁵ Here various old warehouses and factories are currently being redeveloped, and suitable sites along the old river frontage could well uncover remains of the medieval stone yards and quay, as well as perhaps the boats (*showtes* and lighters) that serviced them.

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⁵³ As Simon Thurley points out. See his 'The domestic building works of Cardinal Wolsey', 76–102 in S. J. Gunn and P. H. Lindley (eds.), *Cardinal Wolsey: Church, State and Art* (Cambridge, 1990).

⁵⁴ For its later use see Sowan, *op. cit.* in note 10.

⁵⁵ Sadly the very small-scale 'evaluation trenches' carried out in 1996 on the 'Bridges' site, did not examine the medieval levels properly. See Hawkins et al., *op. cit.* in note 18, and T. Tatton-Brown, 'Reigate stone at Battersea', *London Archaeol.*, 9 (2000), 160.