NO. XVII.—THE “CHINA-CLAY” MINE, AND THE WATER-OF-AYR
HONE-STONE BED AT TROON, AYRSHIRE. By JOHN SMITH.
With Four Diagrams.

[Read 10th April, 1898.]

THE recent excavations for a dry dock at Troon broke in on two of the “places” of an old mine where “china-clay,” so-called, had been worked. A local tradition tells that “once upon a time” some French ships used to land smuggled goods, which were concealed in the mine, and afterwards taken inland, the return freights consisting of the “china-clay,” though where it went or what purpose it was used for is not recorded.

On the first visit I paid to the old mine I did not enter the workings, but noted the strata exposed as follows:—

1. Forced Material, - - - -	8 feet.
2. Bedded Trap, coarse grained, -	8 „
3. Volcanic Dust, the “China-clay,”	6 „

As will be seen presently, the trap (No. 2) is probably a lava-flow or sill which has hardened the underlying bed (No. 3) at the point of contact. The latter, the “china-clay,” measured 6 feet as far as exposed, the depth it had been worked to, but it went lower. It was of several shades of colour, yellowish at the top, whitish in the middle, and bluish at the bottom, and exceedingly fine in texture. Under the microscope it appeared to consist of fine granular transparent particles. It is in all probability, a finely levigated volcanic dust deposited in still water, though the lines of stratification are very faint.

Like the fireclays, it is full of slickensides, but has no rootlets running through it, as in those of the Coal-measures. It is well jointed which would conduce to its easy working. The lighter-coloured portions give a streak nearly as white as chalk. It is quite sufficiently soft to be scratched with the finger-nail, but when heated to redness in an open fire it becomes hard enough to scratch glass. In this state it is of a rich cream-colour. A few days in a closed brick-kiln give it a light grey or a bluish shade. When exposed to weather for a short time it crumbles to pieces.

On 27th March, 1897, Mr. Joseph Downs and I examined the

mine so far as could be done on account of water. We found it had been worked on the "stoop and room" principle, the "rooms" and "rances" being 15 feet or more in width. The "stips" were very irregular, and "trees," which had been set up in the middle of the "rooms" to support the roof, were still standing.

Fig. 1.—Plan of the "China-clay" Mine at Troon.

Probably we were the first to enter the mine since its recent discovery, the people about having, apparently, been afraid to do so. A few "falls" of the roof had taken place from the lowest bed of the trap, but were not large. At one "place" part of a "room" was choked up to the roof with debris,

probably where a shaft had been put down to the clay. This "place" was only 6 feet wide, indicating, I thought, that the "door heads" had been broken away, and this was afterwards verified. The walls of the "rooms" had been carried along the master-joints of the clay, and here and there pick-marks were visible on them, as was very noticeable on the last working faces. All the rock-surfaces were covered with a fine-grained irony "glut," showing that the mine had probably been filled with water since it was abandoned. Hanging from the roof were plants apparently of a low order, their roots creeping over its surface, and these must have grown in complete darkness.

A few remains were still in the mine. There were wooden tally pins of three kinds: (*a*) plain with both ends sharpened; (*b*) with two nicks on one edge and one on the other, and sharpened at both ends; and (*c*) with the figure IV. cut out on one side, and sharp-pointed. All had evidently been used to keep count of the loaded hutches or creels, when filled by the miners. Similar pins are in use at the present day, though tallies or "counters" are now made of other materials, such as knotted string, leather (cut into a great variety of patterns), tin or copper (sometimes with cut or stamped devices). But they are all called "pins" after the original wooden pegs or pins.

A number of old boots, some very sharp-pointed at the toes, and one with tackets, were seen. This last was of the shoe type with a single hole on each side of the flap for passing a buckle-pin or a whang through. When lifted up they all fell to pieces, the sewing material having quite decayed. One boot was found on the top of a "fall," so that must have taken place before it was left.

A stake 2 feet 8 inches by 6 inches by 2 inches, and axe-sharpened at one end, was seen, besides a few odd pieces of wood including some barrel hoops. Some other "pins" were got, the wooden handle of a "creel," and a small oak wedge like those used for pick handles. But nothing turned up to throw any light on the question of the age of the mine or its contents.

My latest visits to the dock works and the mine were made in March, 1898, and I was just in time to get a measurement of the

additional depth to which the dock had been carried. The section at the south end of the dock was as follows (fig. 2):—

	Feet.	Inches.
1. Forced Material, - - - - -	8	0
2. Bedded Trap, coarse grained, - - -	8	0
3. Volcanic Dust, the “China-clay,” - - -	7	2
4. Volcanic Dust, bluish coloured, - - -	0	11
5. Grey Banded Rock, fine grained, - - -	2	0
6. Water-of-Ayr Hone-stone (so far as seen), -	10	0

The great bulk of bed No. 6 is identical in structure with the well-known bed of the name, so long worked, and is of equally good quality, with the same characteristic marking or “mirl.” Bands of softer texture and lighter colour run through the bed, and with fainter marking. It also contains soft and thin irregular greenish bands and nodules with a little mica and iron pyrites. The nodules are often elongated, an elliptical one being 12 inches by 4, with its long axis vertical to the bed. A few show concentric bands towards the outside, and many become quite soft on exposure to the weather.

Fig. 2.—Section at South end of Dock.

Bed No. 5 shows the same peculiar “mirl” as the one below it which indicates that it probably belongs to the same series, although harder and coarser. The banding is irregular, and the bedding planes have a few particles of white mica on them.

Water-of-Ayr hone-stone has nowadays a great repute as a polisher, and this Troon stone has already gained a reputation as a whetstone amongst Ayrshire edge-tool users. A transparent section shows angular siliceous grains in position, and that the spots are made up of rings (globes with light-coloured dust centres) of black microliths. When a piece reduced to powder has the point of a magnetised needle run through it, some of the particles adhere, and under the microscope these are seen to be arranged round it like iron filings. It is probable therefore that these dark particles are magnetite and that the ponderosity of the hone-stone is due to the presence of iron in this form.

Its peculiar mottling, earning for it the name of "snake-stone," is doubtless due to these magnetic particles, which having been mutually attracted have congregated into clusters of small globes, and were unable, in most cases, to dislodge the fine particles of light-coloured dust which form their centres.

All the stratum exposed in the dock works below the trap is probably volcanic trap in a finely divided state, which was first sifted in the air and afterwards assorted in water.

The Survey officers describe the Water-of-Ayr hone-stone as a pale grey shale hardened by trap, but it is questionable if the trap has really had any influence in this way at Troon, there being 7 feet of soft beds lying between it and the hone-stone.

At the hone works on the Water of Ayr, south of Tarbolton, Carboniferous ferns are sometimes met with in the beds, but at Troon I saw nothing organic in those below the trap. On the bedding-planes of the "china-clay" there were light-coloured markings, probably worm-trails, and on the bedding-planes of the banded bed branching and light-coloured ones, somewhat like the Silurian fossil *Nematolites*, but they may be only dendritic. (See fig. 3, p. 243.)

The trap at the north end of the dock was much thicker than that at the south end, where it had apparently cut out the stratified beds to some extent. It is the existence of this bed which has enabled Troon (Gaelic, the Point), or *T'li' Trin* of common speech, to withstand the sea; at present it projects about 9 furlongs further seaward than the general coast-line.

The Water-of-Ayr hone-bed at Troon comes to the surface on the shore, south of this promontory and opposite the most westerly dwelling-houses, where it probably rests upon trap. It is in a very shivery condition but its various qualities can still be seen. One band has a "mirl" of larger pattern and more pronounced appearance than I have elsewhere met with, and had it been discovered when the old mine was opened it probably would have been quarried out to some extent, along with the overlying rocks, and Troon as we now know it would thus have been rendered unlikely, if not impossible.

That the "china-clay" exists under the trap at Troon Point seems very likely, as it is near there seen at one or two places, mixed up with trap, and converted into hornstone or porcel-

lanite, as was also the case at the dock. When broken it shows a conchoidal fracture. The trap here presents a very rough surface from weathering. Through it run, though rarely, veins up to a few inches thick, which resemble at first sight varieties of granite, though some have a line or division along the centre, and look like exfiltration veins. Material apparently similar in composition sometimes occurs interbedded with the trap and also as lumps or nodules which are mostly composed of largish felspar crystals, and also having cavities, with hair-like crystals, probably of asbestos, stretching across them. A good deal of magnetite is present in the trap and in the veins. The trap taken from the dock was used for a wall, and was soft enough to be easily cut with a chisel.

Fig. 3.—*a*, Markings on bedding-planes; *b*, *Nematolites* on Skiddaw Slates (p. 242).

No workable coal-seam has been met with in the strata of the coast district here stretching from the Irvine Water to beyond Troon, which consist of Coal-measure rocks, though they have often been bored, and the seams which have been worked in the adjoining field seem to be all more or less burned by intrusive traps, and probably also by contemporaneous lavas.

In the Ayr coal-field the workings were long ago stopped by a large fault running W.N.W. and it was then supposed that there was no coal beyond. However, pits since sunk north of the fault have proved that all the upper coal-seams occupy their regular positions, so that it is likely a large coal-field lies east of Monkton and Prestwick, and extends widely under the

sea there. These popular watering places may, therefore, become in the near future the centre of a large mining district.

During the deposition of the "china-clay" and the hone-stone beds exposed in the Troon dock, as also of those near Carreath 3 miles E., and those on the Water-of-Ayr 10 miles S.E., there was a large Carboniferous volcano in the district, the dust thrown by it going to form the beds lying below the trap.

The hone-stone bed at Carreath was worked at one time, though the quarry is now partly filled up, but the pieces of rock

Fig. 4.—Section at Carreath.
a, Pumice; b, Volcanic Dust in Trap;
c, Volcanic Dust.

lying about show that it is of fine quality. Above the dust-beds the trap is exposed to the extent of 12 or 14 feet. In it and conformable to its bedding there is a thin band of the dust, much hardened, and above, another of a few inches very much decomposed, which when seen in the quarry face resembles a bed of peat. The microscope shows the

unreduced particles to be pumice, with the vesicles mostly roundish or elongated. A few are partly or wholly filled, but the bulk look as if they had been always empty. (See fig. 4.)

This trap decomposes very readily, and its whole face in the Carreath quarry is in a rotted state, but showing much horizontal banding, probably flow structure. At Templehill, Troon, it is also much decomposed, the material thrown out of a drain recently cut in it resembling coarse brown sand. The Survey officers regard this trap as intrusive, but the beds interbedded in it at Carreath rather point to it having been the product of contemporaneous lava-flows after the accumulation of the volcanic dust-beds below.