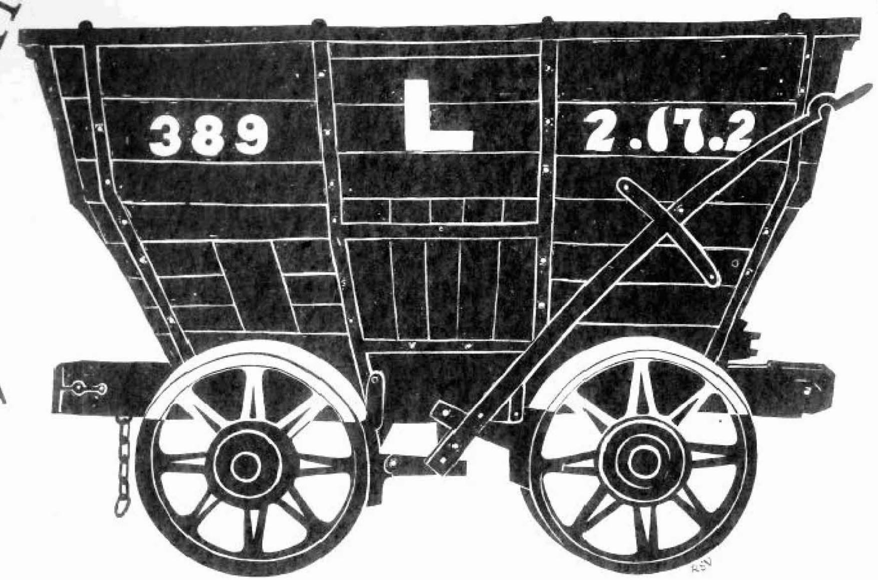
Nov/Dec 1968

The Industrial Archaeology Society For The North East



BULLETIN 7

EDITORIAL NOTES

We are pleased to welcome to the Society the Sunderland Industrial Archaeology Group, whose ambitious Winter Programme you will find, along with other Group programmes, in the centre pages.

Whilst on the subject of Groups' activities I have received some interesting notes from Mr. H.E.D. Beavis of the Tyne Group regarding their project at the Settlingstones Lead Mine in Northumberland. This was in production from the late 17th to the late 19th centuries and Mr. Beavis would welcome any information on this site that readers may possess. His address is: 36 South Bend, Brunton Park, Newcastle NE3 5TR.

In this issue we are pleased to show some more of Mr. J.K. Harrison's drawings, this time the Killhope Water Wheel and also details of the buildings and machinery at the Ingleby Greenhow Corn Mill. Mr. A. Stoyel has let us have further notes on the Pencil Mill at Cronkley and Mr. S.B. Smith of the new Sunderland Group is not wasting any time with news from his area.

Now to raise a subject that has caused discussion in some parts of the region covered by the Society: the front cover of the Bulletin, on which is shown a typical chaldron wagon of the Northern coalfield. Apparently some members think it is time we changed our cover, and to enable the Committee of the Society to look into this, I propose a competition among members of the Society: to design a possible new cover for this publication. Competitors are requested to bear in mind that the design should represent, if possible, the region as one unit, with not too much emphasis on local industries in any one area. The successful designer will receive a free membership for 1969, and the competition closes at the end of January 1969. The result will be announced in the March issue. All entries should be sent to me, at my home address, and I look forward to seeing all your bright ideas. One final point : do not worry too much about a well-finished design. If the idea is good we can get it redrawn.

Finally we must apologise for the delay in producing this issue due to several unforeseen difficulties. With any luck members will have this in their hands to read after their Christmas dinner, and I also take this opportunity of wishing everyone a Happy and successful Industrial Archaeological New Year.

Keith Chapman

Copy for next Bulletin (by end of January 1969), should be sent to Keith Chapman, 26, Springfield Avenue, Brotton, Saltburn-by-the-Sea, Yorkshire.

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Pencil Mill

Alan Stoyel

Frank Atkinson's interesting article on this subject (Bulletin 5, page 17) has prompted me to add the following notes which I hope will be of interest.

A sketch plan of the site is shown here in which the diagonally shaded positions represent the two feet thick, dry-stone walls of the mill. The bases of these walls remain up to a maximum height of three or four feet above ground level. It is evident that the mill was of one storey only and fragments from the stone-slab roof may be found in the ruins.

The main room measures 31'4" x 12'0" and the room at the east end is 10'0" x 12'0". There is no connecting door between the two. At the western end is a 10 feet wide extension (internal measurement) which appears to have housed the waterwheel. The approximate position of the wheel is confirmed by a slight depression which marks the course of the tailrace from the wheel back to the river Tees. The dry leat which used to bring the water to the mill may be seen to stop a short distance short of it, and this water must have been conveyed to the wheel by means of a wooden launder.

The position of the waterwheel in an extension is a common arrangement in this area and such protection is very desirable where freezing up is likely to be a problem - as indeed it must have been in this case (the mill being situated in an exposed, northerly-facing position at an elevation of over 1200 feet).

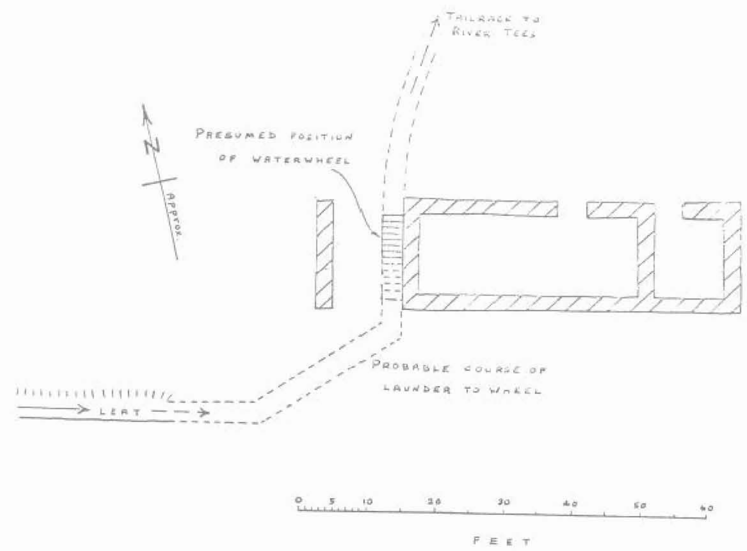
The western wall of the main room of the mill shows no signs above ground level of the hole by which the wheelshaft passed through it. It is unlikely that this was completely below ground level because the tailrace channel would have had to be such a large excavation and would, therefore, suffer from water "backing up" from the main river. There is the possibility that the grinding machinery was situated on the western side of the wheel, and that the main room of the mill was used for the subsequent processes in the manufacture of the slate-pencils. Careful excavation will be the only way of finding out the answers to questions such as this.

The form of the building suggests that only a single pair of millstones were ever employed to grind the shale. This theory is strengthened by the existence

of only two millstones lying on the site - one a bedstone (lower stone), and the other a runner (upper stone).

The head of water which was available, together with the construction of the western end of the mill indicate a small overshot wheel of perhaps twelve feet diameter. The gearing to drive a single pair of stones would have consisted of a large cogged wheel (pitwheel) on the wheelshaft, engaging a smaller one (stone nut) on the vertical spindle below the millstones so that the speed of the upper millstone (the runner), was considerably faster than that of the waterwheel. Assuming that a single pair of stones was driven by an overshot wheel in such a manner it may be seen that the runner would revolve clockwise if the stones were situated in the main room of the mill, and anti-clockwise if they were on the western side of the waterwheel. An examination of the furrows of the stones shows that the direction of the rotation was clockwise, thus strengthening the case for the former arrangement.

The millstones are 2 feet 4 inches in diameter and are of a dark vesicular lava which was quarried in the Mayen district of Germany. Millstones of this type were shipped down the river Rhine and exported via Cologne - hence their name of "cullen", or blue stones. The runner in this case carries a crude iron balance rynd in the eye of the stone and the appearance of the latter suggests that it is not of an earlier date than the middle of the 19th century.



The absence of any signs of other discarded millstones is surprising if the mill was in production for a long time, and Mr. H. L. Beadle has said that the mill is reputed not to have been a commercial success. Additional evidence in support of this is the absence of records and also the small amount of shale which appears to have been excavated. This shale was dug from an excavation in the bank a short distance to the west of the mill, close by the leat, and was the material that was ground between the stones. After this it must have been mexed with some binding agent and pressed into moulds to harden, but any details of the process will only be known after careful excavation of the site.

The mill was out of use by 1878, as the Quarterly Journal of the Geological Society of London, vol. 34, 1878 (p. 28) mentions the "soft shales which were formerly worked up into slate-pencils at the Old Mill." (Discovery of Silurian Beds in Teesdale by W. Gunn & C. T. Clough).

CONCLUSION

The available evidence suggests that a small overshot wheel in the westward extension of the mill drove a single pair of millstones at the western end of the main room. The mill probably dates from the middle of the nineteenth century and, having been a commercial failure, was disused by 1878.

Review

The Great Northern Coalfield. 1700-1900

by Frank Atkinson. Pub: University Tutorial Press, 1968. 17/6d.

A new and revised edition of the book first published in 1966. This is a very fine account of the structure of a coalfield - economically, technically and socially. It details the methods of prospecting for, working and processing coal in the Northumberland and Durham Coalfield, describing their historical and technical development over two hundred years. There is also an insight into the life of the pitman and a brief summary of the industries which developed as a result of coal production.

Although it is a book dealing with a scientific subject the text is straightforward and easy to read. There are many monochrome illustrations in the form of contemporary prints and photographs, with some modern photographs for comparison.

Simon A. Chapman.

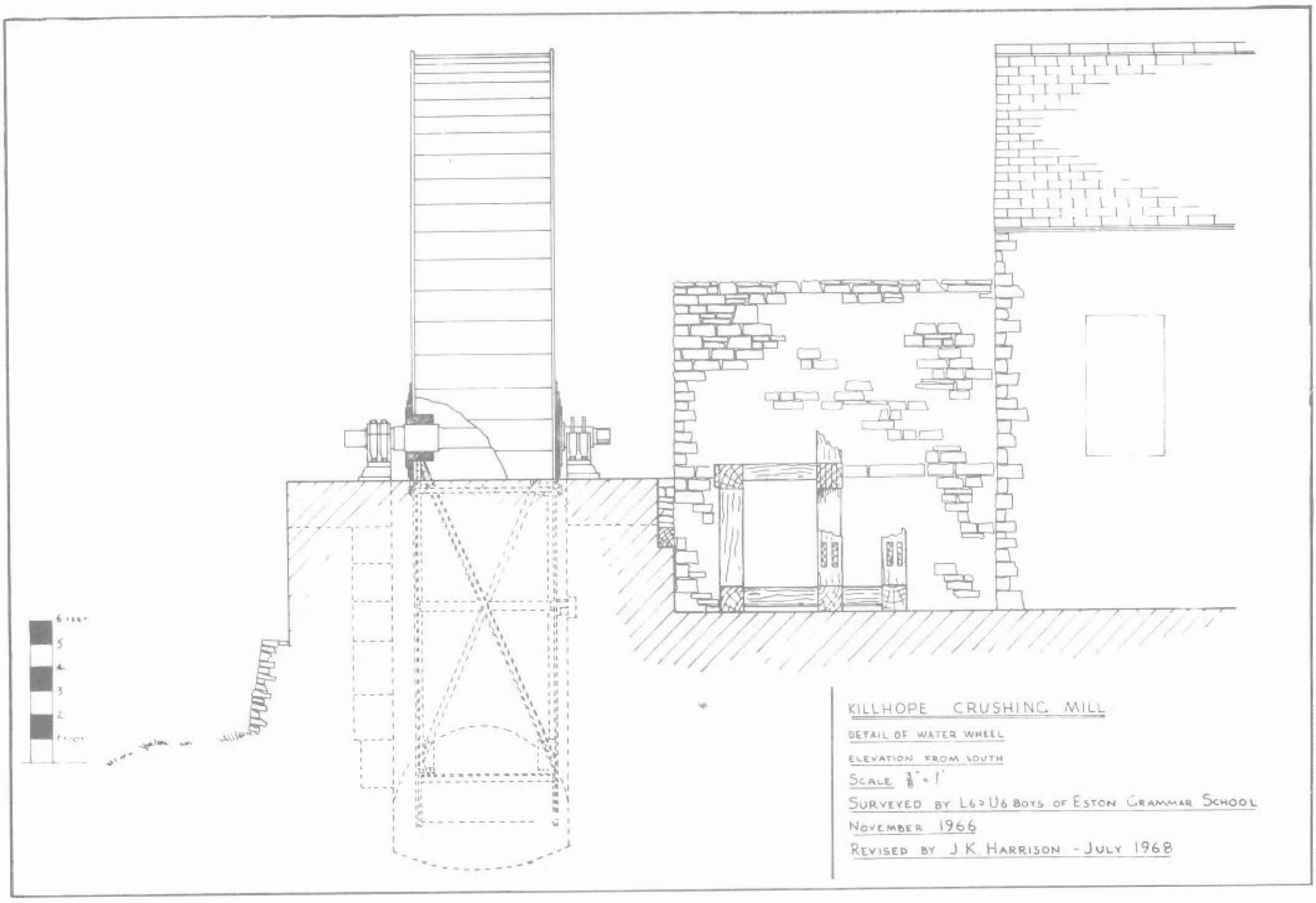
Killhope Lead Crushing Mill

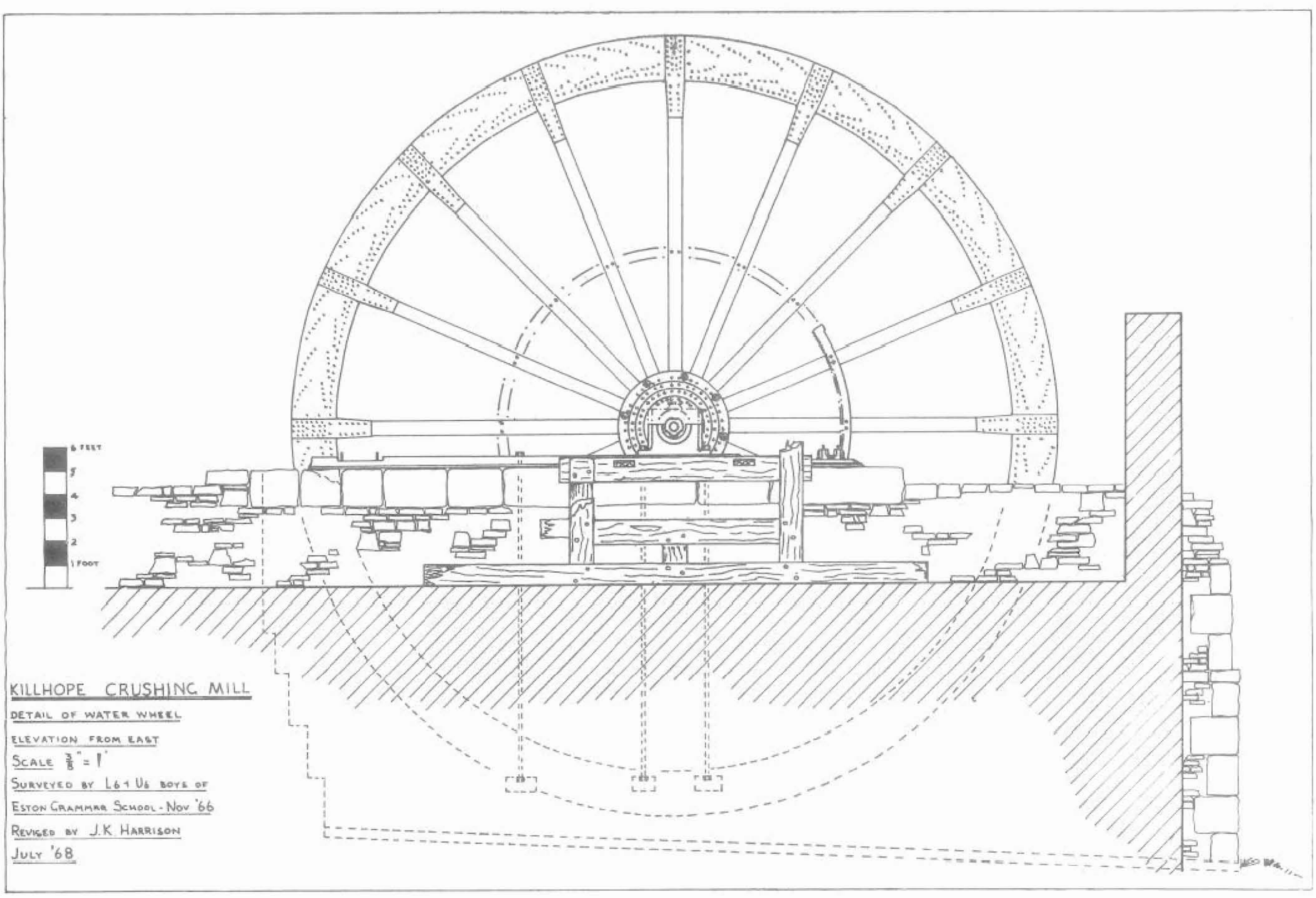
John k. Harrison

Reading through the excellent article on the Killhope Lead Crushing Mill in Bulletin No. 6, I am aware of only one omission in the detail given. I am referring, of course, to the water wheel to which the Killhope site mainly owes its fame. This, no doubt, is fully covered by photographs in the author's collection, but I am venturing to offer two drawings which may be of value since they both give views of the wheel, which it would not be easy to obtain with a camera. The original survey was carried out in very poor weather conditions by a party of Eston Grammar School sixth form boys some time ago, and the results have been revised recently. On both visits the water wheel as a prime mover was the chief concern.

The wheel is of very advanced design and construction. It is made entirely of rolled sections, channels, strips and sheets of wrought iron or steel rivetted together, the only castings being the bearing blocks, the hub plates and the ring gear segments. Its size of 33'8" makes it an impressive landmark, but it must not be thought of as being one of the largest in the Northern Pennines. An example of 45'0" existed on the Westmorland side of the fells, for instance. However, it probably developed as much power as some of the bigger ones. It is 'overshot', and Smeaton, as far back as 1752, had proved this to be the most efficient type. A great deal of care was taken in leading the water onto the wheel. Since the power was provided by the weight of the water alone, the idea was to get the water to run in smoothly and without shock. Allowance was made for the air, which was trapped in each wheel-trough by the in-coming water, to escape into a ventilation space behind the troughs. Some water would also be lost and would run down inside the wheel to empty out through the troughs again at the bottom, but in spite of this waste a considerable benefit to power was obtained. In addition to this the thin metal buckets held more water than wooden buckets of the same size, and they could be placed much closer together. There are in fact 74 of them.

Calculations on the power of the wheel gave us a torque of 133,000lb/ft. assuming that the wheel was completely filled and that there was no wastage because of shock. Assuming a speed of 6 r.p.m., this figure would give a theoretical horse power of 154, or a probable actual horsepower of 116, allowing 25% for friction. If the wheel made more than 6 r.p.m. the figures would be correspondingly higher.


KILLHOPE CRUSHING MILL
DETAIL OF WATER WHEEL
ELEVATION FROM SOUTH
SCALE 3/8" = 1'
SURVEYED BY L6 & U6 BOYS OF ESTON GRAMMAR SCHOOL
NOVEMBER 1966
REVISED BY J.K. HARRISON - JULY 1968
6 FEET
5
4
3
2
1 FOOT


KILLHOPE CRUSHING MILL
DETAIL OF WATER WHEEL
ELEVATION FROM EAST
SCALE 3/8" = 1'
SURVEYED BY L6 + U6 BOYS OF
ESTON GRAMMAR SCHOOL - NOV '66
REVISED BY J.K. HARRISON
JULY '68
6 FEET
5
4
3
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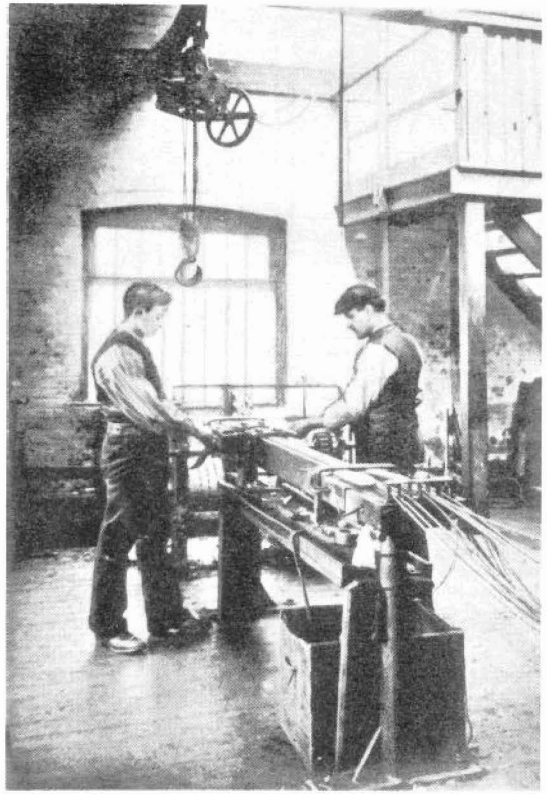
1 FOOT



Weaving flat rope
c. 1908

photo by courtesy of Messrs. Glaholm and Robson

Wire-Rope Making, Sunderland

Stuart Smith

Rope making has always been one of the important ancillary trades in many coastal towns, and in the North East where inaddition theré was mining, the production of wire rope has a long history.

Sunderland figures prominently in this story as it was here that Richard Fothergill, a local schoolmaster, invented in 1793 a machine, "of an entire new mode, method or art of dressing hemp and making the same into ropes and cordage." This was a forerunner of the sun and planet machine which by 1842 was being used in Sunderland by Webster & Co., for the manufacture of wire ropes. The full history of the industry is too long to be told here;* but includes much of interest to the student of mining, engineering, shipbuilding and railways. Rope was made in Sunderland for the Seaton Bank Incline of the York, Newcastle & Berwick Railway Co., in 1849; for many collieries; for the Runcorn-Widness Transporter Bridge; and for a sling of 15.7" circumference for putting the turbines in the Mauritania. This is reputably the largest wire rope ever made and a sample is in the Sunderland Museum.

Two firms have closed this year, Webster & Co., founded in 1793, and Glaholm & Robson, started in 1859. The records of the former firm unfortunately passed into private hands, and most of those belonging to the latter were destroyed, but luckily the museum managed to acquire a large number of photographs and samples. Glaholm & Robson made a wide variety of products, one of the most interesting being the manufacture of flat balance ropes for mine cages by a hand weaving process that has remained unchanged for at least a hundred years. Steel wire is wound on drums which are attached to a wooden vertical frame carrying ten drums. From this frame the wire passes to a work bench where two men weave in the weft, also of wire. (See photograph). This process requires the use of hammers with chisel-shaped heads which can be forced between the warp wires to separate them, and hooks to draw the weft through. From the bench the completed flat rope passes over a greasing roller and then on to a coiler operated by a winch. The whole of this machine with its hand tools was recently removed by this museum and put into store for eventual re-erection at the proposed Regional Open Air Museum.

*See "A History of the Wire Rope Industry of Great Britain" by E.R. Forestier-Walker. Pub. 1952.

Water-Powered Corn Mill Ingleby Greenhow

Adrian Zealand

The village of Ingleby Greenhow is situated at the western edge of the Cleveland Hills and on the fertile plain which stretches from the base of this escarpment to the Tees and across to the Pennine foothills. Two water corn-mills seem to have served this relatively small farming community for some time, but the one to which the attention of the Teesside Industrial Archaeology Group and the Dorman Museum, Middlesbrough, became directed in 1967 (N.R.577068), was first mentioned in an historical context in a Twelfth Century Charter as having been given to Whitby Abbey by Adam of Ingleby. The Charter is undated, but authorities place it between 1150 and 1155, but differ in opinion as to its precise dating. Whitby Abbey remained the owner of the mill until the Dissolution in 1539, when it was returned to the Lords of the Manor of Ingleby. Possession of the mill passed through the Balliol, Eure and Fowlis families before coming to the Baron of de Lisle and Dudley, who held the Manor towards the end of the nineteenth century. It is not known, at present, how long the latter lord retained the mill, and although a contemporary list of some of the millers exists, one cannot tell whether they were tenants or freeholders.

The mill is itself a tripartite range, consisting of the miller's house, the mill building, and an extension containing the wheelhouse and loading and storage space. The miller's house is a two-storey building 46½ ft. long by 20ft. wide, having a small outhouse on the end, and another of lean-to construction at the back.

Adjoining it is the mill building, 27 ft. by 25 ft. consisting of three storeys, having an entrance door to one end of the front wall and immediately above it a double inward-opening loading door. Between the two doors, a lintel bears the date 1817. Another door on the first floor at the back of the building gives access to the mill races.

The latest part of the range is annexed onto this, and comprises a stone built wheelhouse, and beside it a shed with a wide arched entrance large enough to take a waggon. Above this, a storage room is entered by a stone staircase flanking the outside wall, its only window had been blocked up and a small wooden doorway inserted in the front wall above the archway. The top floor was a continuation of the storage area of the mill building itself, where the dividing wall had been removed to enable two windlass-type hoists to be driven from the

TEESSIDE INDUSTRIAL ARCHAEOLOGY GROUP.

LECTURE PROGRAMME FOR 1969.

All lectures are held at 7.30p.m. in the Dorman Museum, Linthorpe Road, Middlesbrough, unless otherwise stated.

Monday, 27th January, 1969.	"Farmstead Surveys" by Mrs. V. Chapman, M.A., Dip.Ed.
Thursday, 20th February, 1969.	"The Making of Heavy Wrought Iron Shafts" by Mr. R. Benson. (Mr. Benson who has been a director of the Darlington Forge, will be talking about shafts like that forged for the Great Eastern Steamship of the 19th century).
Wednesday, 12th March, 1969.	"Potash - Yorkshire's Pink Gold" by Mr. L. Phillips, B.Sc., F.G.S.
Thursday, 24th April, 1969.	A.G.M. and Members' evening for discussion of current and future work.

TYNE INDUSTRIAL ARCHAEOLOGY GROUP

PROGRAMME OF 1969 MEETINGS

23rd January, 1969.	"The History of the Closet on Tyneside". Mr. Barrow of Adamsez.
20th February, 1969.	"Early Newcastle Printing". Mr. H. Davy of Hindson, Andrew Reid.
27th March, 1969.	"Ropemaking". Mr. G. Soppit of British Ropes Ltd.
24th April, 1969.	"Tyne Tugs". Mr. C. Cairns.
29th May, 1969.	A.G.M. and Guest Speaker.

All meetings will commence at 7.30p.m. and be held in Rutherford College of Technology, Newcastle.

DURHAM INDUSTRIAL ARCHAEOLOGY GROUP.

PROGRAMME OF ACTIVITIES JAN. 1969 to MAY 1969.

The following programme is provisional upon permission being granted to visits to various industrial sites.

The meetings will be held on Friday evenings at the Durham Technical College in Room B24, or the Lecture Theatre, the meetings to commence at 7.15p.m.

Saturday meetings will start at the Durham Technical College at 2p.m. unless otherwise stated.

Friday	Jan. 10th	Archives. Meet at County Hall 7.15p.m.
Friday	Jan. 17th	Mining. Speaker to be named later.
Sat.	Jan. 18th	Visit to Pumping stations at Ryhope & East Herrington, Sunderland & South Shields Water Coy. (Subject to permission being granted).
Friday	Feb. 7th	Glass Making. Illustrated talk with films.
Sat.	Feb. 15th	Visit to Consett Iron Works (Subject to permission being granted).
Friday	March 7th	Shipbuilding. Illustrated talk.
Sat.	March 22nd	Visit to the Causey Arch.
Friday	March 28th	Film show of work being done in the area by local Industrial Archaeology Groups.
Sat.	April 12th	Visit to Seaham Harbour. (Subject to permission being granted).
Friday	April 25th	Members slide evening of local slides.
Friday	May 23rd	Annual General Meeting.

SUNDERLAND INDUSTRIAL ARCHAEOLOGY GROUP.

PROGRAMME FOR 1969.

Friday meetings will commence at 7.17p.m. and will be held in the Art Gallery and Museum, Borough Road. All meetings will finish at 9p.m.

Saturday afternoon meetings will start at the side entrance of the Museum at 2p.m. unless otherwise stated.

	January 17th	-	Mining.
Sat.	February 8th	-	Historical Sources.
	February 21st	-	The rope industry of Sunderland.
Sat.	March 8th	-	The dating of buildings.
	March 21st	-	Sunderland Tramways.
Sat.	April 12th	-	Walk along the River Wear.
	April 18th	-	Members slide evening of local slides.
Sat.	May 3rd	-	Visit to the Docks.
	May 16th	-	Annual General Meeting.

Suitable clothing should be worn for Saturday meetings. Research groups will make separate arrangements for their meetings.

central mill-shaft and haul sacks of grain up through hatches cut in the floors of the two parts of the building.

The range was built with dressed rectangular blocks of local sandstone. The walls of the mill building and house consisted of extremely close fitting ashlar blocks, where all precautions had to be taken against dampness and the effects of vibration, but those of the wheel-house annexe were relatively crude and suggested the re-use of stone from some other building. The rafter beams of the pantiled roof were set on curved shoulder-braces, about 3ft. long, which ran the thickness of the wall at one end and rested on the supporting beams of the top floor of the building at the other, to relieve the outward thrust of the roof on the walls.

Water supply was brought through a leet, about 300 yards long, from a weir on the Ingleby Beck, and conducted around the edges of fields to the back of the mill, where it was delivered to the wheel at first floor level. The flow could be controlled by a screw valve on the weir sluice, and the main-and-tail race volume differential by similar valves at the rear of the mill. The two races were only a few feet away from each other, the tail-race directing the surplus water through a culvert under the building to the stream. The mill wheel could be stopped and started by moving a lever on the inside wall of the building, which operated a wooden flap adjusting the size of the aperture through which the water in the main race was delivered to it.

The water wheel was of the 'high breast' type, and turned towards the source of water, which was fed onto it at the 2 o'clock position. It was 16ft. diameter and 3ft. 6ins. wide. Its wooden axle was 12ft. long, including the metal bearings which were mounted at ground level, octagonal in section, and was clamped by 2 cast-iron collars, each having 8 seats to take the wooden arms of the wheel. The rim was also cast-iron, made up of 8 sections on each side, which were bolted together with half-lapping joints, and were fitted with flanges on the inner sides onto which the wooden buckets were bolted, 6 to each pair of sections.

At the other end of the axle, within the mill building into which it passed, was a cast iron crown-wheel, $9\frac{1}{2}$ ft. diameter, having 8 spokes and was made in 2 halves which bolted together. Like the water-wheel it revolved in a pit.

This drove the wooden vertical shaft and the mill machinery through a horizontal pinion 3ft. 6ins. diameter. The height of the main shaft was 15 ft. and the clearance between the crown wheel and pinion could be adjusted by moving the bottom bearing of the shaft, mounted in a wooden block, which was secured to projections in the floor with wedges.

Immediately above the pinion was a wooden spur wheel, $9\frac{1}{2}$ ft. diameter, its arms consisting of 3 timbers tenoned through a thickening in the shaft itself and half-jointed with each other in the middle. The rim was made up of 6 sections, with wooden teeth tenoned into its outer edge. This drove the cast-iron pinions of the mill stones, 20 in. diameter, which had been removed at the time the mill was surveyed. The stones, 3ft. 6ins. diameter, and mounted in the first floor could be started by operating a lever on the ground floor to drop the pinions into mesh. The slots for securing the posts of the HURST could be identified in the sandstone flags of the ground floor and showed that the third of the three sets of stones must at some stage have been removed, and a new floor laid.

On the first floor, apart from the millstones themselves, was a wooden crown wheel at the top of the main shaft, which drove 3 metal layshafts slung horizontally to the roof beams. It was 6ft. in diameter, and the six spokes were again made up of 3 timbers tenoned through an hexagonal thickening in the shaft. It had cast-iron teeth, secured in sections to the upper side of the rim, into which the cast iron layshaft pinions with wooden teeth could be meshed by lowering a lever.

The top floor contained the sack hoist, driven by a 9½ft. high continuation of the main vertical shaft, but narrower in section and bottom being located in a superslot at the top of the main shaft. Both shafts were secured at the top in wooden bearings. A small cast iron bevel gear at the top drove downwards onto 2 others of the same diameter on the ends of the windlass axles which ran the length of the building beneath the ridge beam of the roof in opposite directions. They could be worked independently by exerting downward pressure on a long counterbalanced lever, parallel to the axles, which lifted the gears at the ends into mesh. The grain was stored in sacks on the floor, and was fed to the mill-stones below through fabric chutes from hoppers which consisted apparently of hessian bags.

The oldest building of the present mill-range seems to have been the miller's house, and onto it had originally been built a single storey construction. This might have been a mill, in fact it did occupy the entire area between the end of the house and the existing water-wheel pit, but would seem inadequate for an effective and practicable system of working. It was probably entirely demolished and replaced by a new building of the same height as the house, but slightly wider, and its walls not bonded with those of the house. The lintel date 1817of the existing mill machinery may have been installed at this time, this having been introduced possibly about the period when the wheel house annexe was built, and in the latter half of the century.

RECORDING THE INGLEBY GREENHOW MILL

John K. Harrison

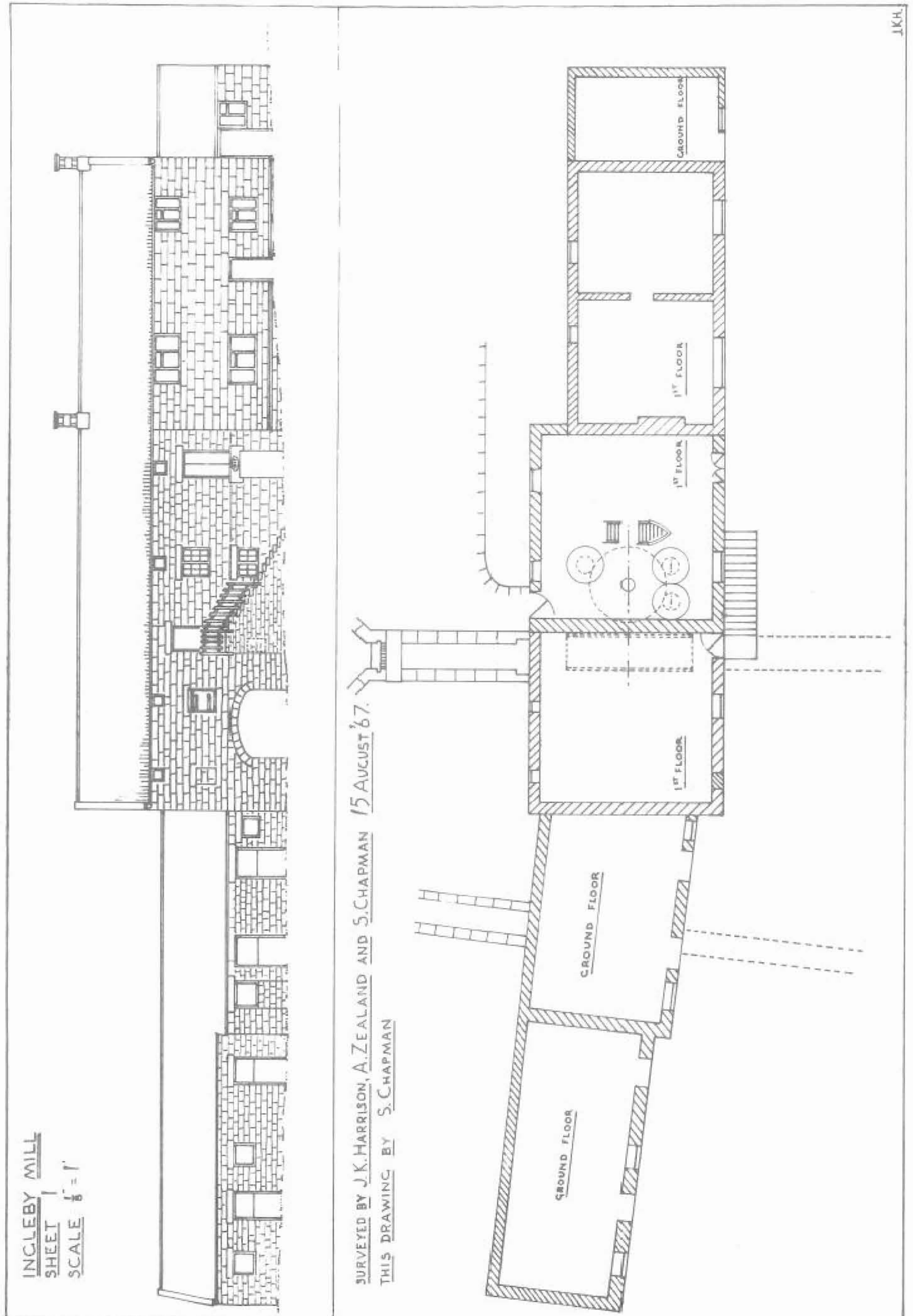
The burden of tracing the history of the mill and describing its main features rests with Adrian Zealand, who was also responsible for removing the water wheel and most of the machinery, for preservation.

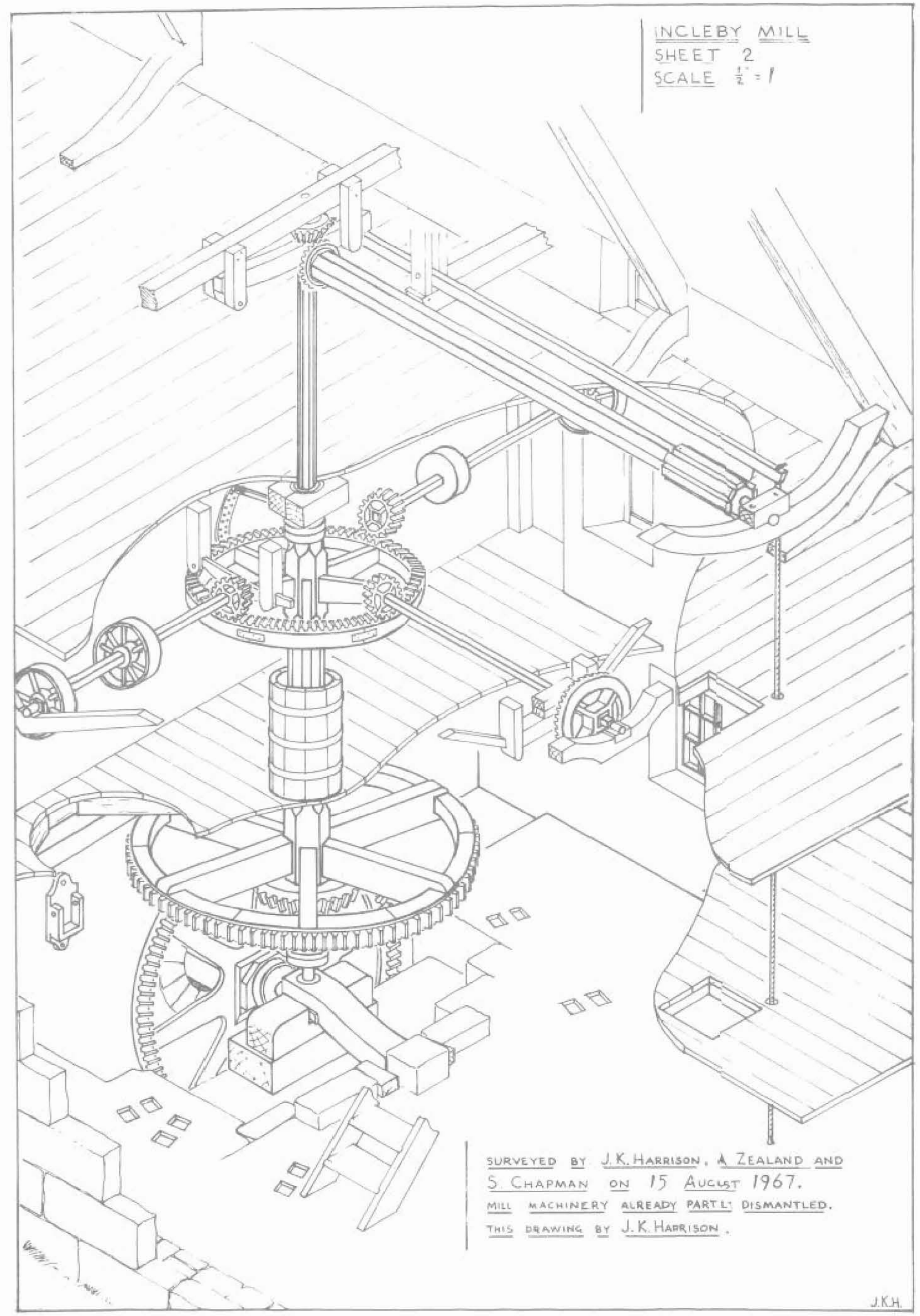
The drawings which accompany this article were made at the same time, and, although they are largely self-explanatory, one or two brief notes may be appropriate.

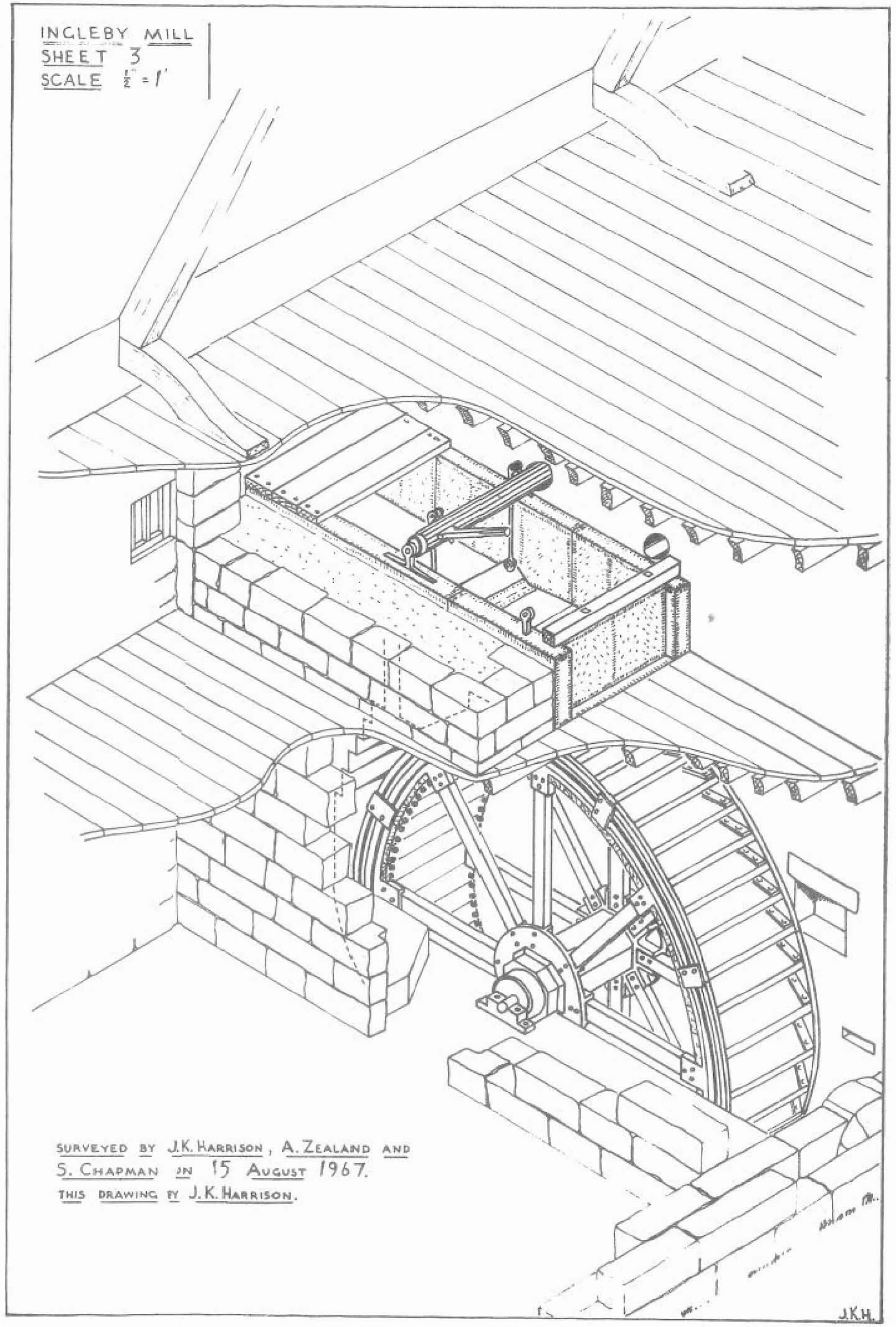
Sheet 1. Shows the exterior of the mill, which was recorded virtually stone by stone. It can be seen that, although the mill is integral with the other buildings, and the roof line is unbroken, details of the masonry show that the buildings are of different ages. Also revealed by the drawing were one walled up window and a second window concealed under the later outside stone stair. If we can imagine these open again, we can see the regular pattern of spacing of doors and windows which is a feature of many Cleveland water mills.

Sheet 2. Is a scale isometric drawing of what remained of the mill machinery. This projection gives a pictorial view, which is easily understood by the layman, while still giving accurate information. Such a method was perhaps only suitable in this case since the hurst and stones had already disappeared and the gearing was exposed. Normally both the hurst and the gearing should be recorded.

Sheet 3. Treats the water wheel and pent stock in a similar manner. One feature of this part was the fine quality of the masonry surrounding the wheel, the joints between the dressed stones being no more than one-sixteenth of an inch wide. Notice the slot in the wall in front of the wheel where is the remains of a second control lever from the inside of the mill, which seems to indicate that the wheel was originally overshot, and not a high breast. If such an alteration was made at some stage (perhaps when a new wheel was being put in) then the machinery would, of course, have to work in the opposite direction.


INCLEBY MILL
SHEET 1
SCALE 1/8" = 1'
SURVEYED BY J.K. HARRISON, A. ZEALAND AND S. CHAPMAN 15 AUGUST '67.
THIS DRAWING BY S. CHAPMAN
GROUND FLOOR
1ST FLOOR
1ST FLOOR
1ST FLOOR
GROUND FLOOR
GROUND FLOOR
J.K.H.


INCLEBY MILL
SHEET 2
SCALE ½" = 1'
SURVEYED BY J.K. HARRISON, A. ZEALAND AND
S. CHAPMAN ON 15 AUGUST 1967.
MILL MACHINERY ALREADY PART'L DISMANTLED.
THIS DRAWING BY J.K. HARRISON.
J.K.H.



Grinkle Mine Railway

Simon Chapman

With regard to the article on Port Mulgrave, in Bulletin No. 5, we now give further details concerning the 3ft., gauge railway which ran from Grinkle mine to Port Mulgrave and was opened by 1875.

This railway line was about 3 miles long and had some quite outstanding engineering features. From the mine it passed through a tunnel nearly half-a-mile long, which gave access to the next valley, and here the railway encountered the meandering Roxby Beck, which it crossed three times by means of substantial bridges of iron and timber. Nearing Port Mulgrave the line ran through a second tunnel a mile in length, which gave access to the harbour.

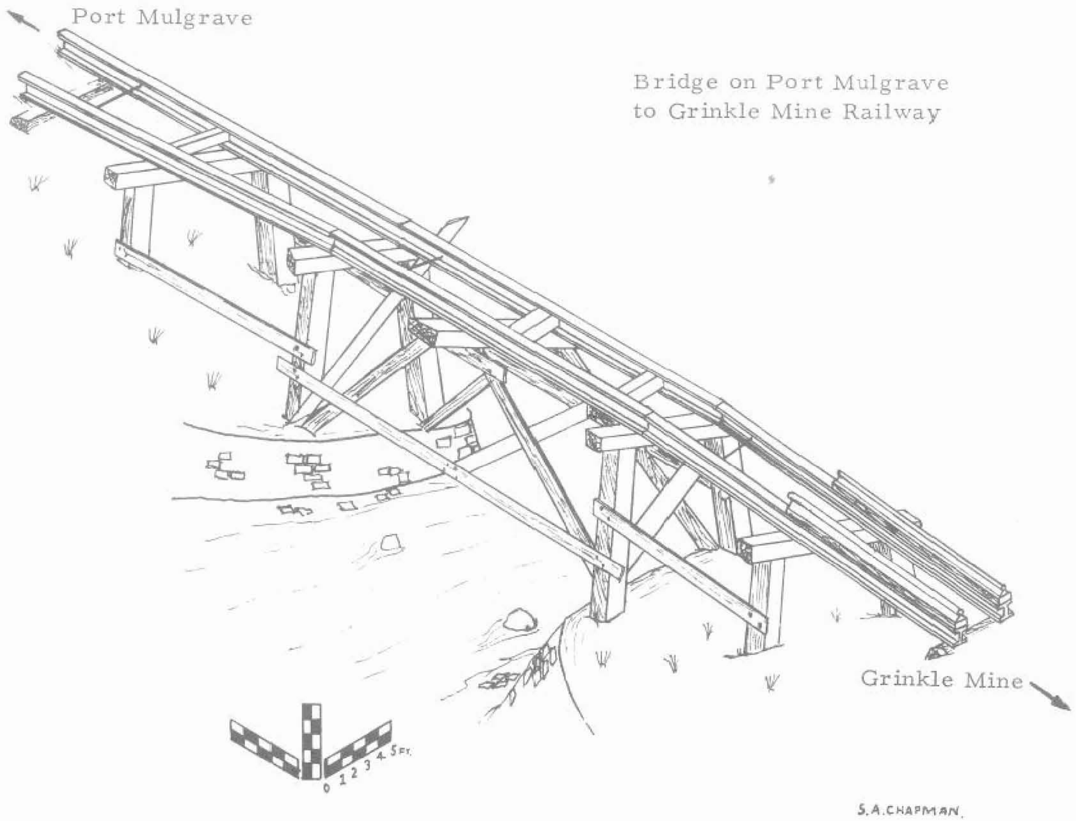
Apart from the remains of the two tunnels, one of the bridges survives relatively intact and the accompanying drawing shows the general details. It is constructed of six wrought iron longitudinal girders placed in two lengths of three pieces, connected together by fish plates, to provide support for the rails. These girders are supported by massive baulks of timber which came from the old Whitehall Shipyard at Whitby, and these timbers are further supported by smaller timber struts and stays. Since the line closed down in 1930, some of the timber supports have disappeared and by now even the main timbers are, in parts, in danger of collapse, aggravated by some flooding from the beck. The overall length of the bridge is about 70 ft., and the normal height above stream 16 ft.

The remaining two bridges over the beck of similar construction were burnt down deliberately some years ago, although in each case the iron girders remain lying on the bed of the stream where they fell.

Further down stream were two more bridges over the stream, and a road, but both bridges have completely disappeared. There is one other bridge on the line, at the Grinkle Mine end, and this is a small two arch stone culvert over which is a very large embankment.

The locomotive, 0-4-0 saddle-tanks, were squat and cabless to provide adequate clearance through the tunnels. Altogether four locomotive tanks were used on the line; two built by Fowler of Leeds; and two by Hudswell, Clarke. They were shedded at Grinkle, and at the Dalehouse end of the long tunnel. The eight-ton wagons were hauled through this tunnel by a steam haulage engine at Port Mulgrave on a main-and-tail rope system. A 'Bank-rider' accompanied each set through the tunnel; he sat on a plank placed across the buffers of the last wagon. A train or 'set' consisted of about eight or nine wagons.

The Dalehouse end of this tunnel is extremely overgrown and hardly anything is to be seen of the engine shed. The tunnel-end is open, but as the tunnel goes through old mine workings at the Port Mulgrave end it is very dangerous. The smaller tunnel at Grinkle is penetrable on foot and at one end, still in situ, is a short section of track.



Bridge on Port Mulgrave to Grinkle Mine Railway

Hodbarrow Mine

Nigel Chapman

During the early part of August, I had the pleasure of visiting the Hodbarrow Ironstone Mine of the Millom Ore & Hematite Iron Co., Ltd., This mine which is situated near the town of Millom in Cumberland, had closed down about a year ago. The point of interest about this mine was the fact that there were two Cornish Beam Engines still remaining on the site. One engine carried on its beam a maker's plate showing that the engine had been made by a firm called "Williams Perran Foundry Co., Cornwall, 1878" and the other engine bore the maker's plate "Harvey & Co., Ltd., Engineers, Hayle, Cornwall 1899". These engines had a cylinder diameter of about 70 inches each.

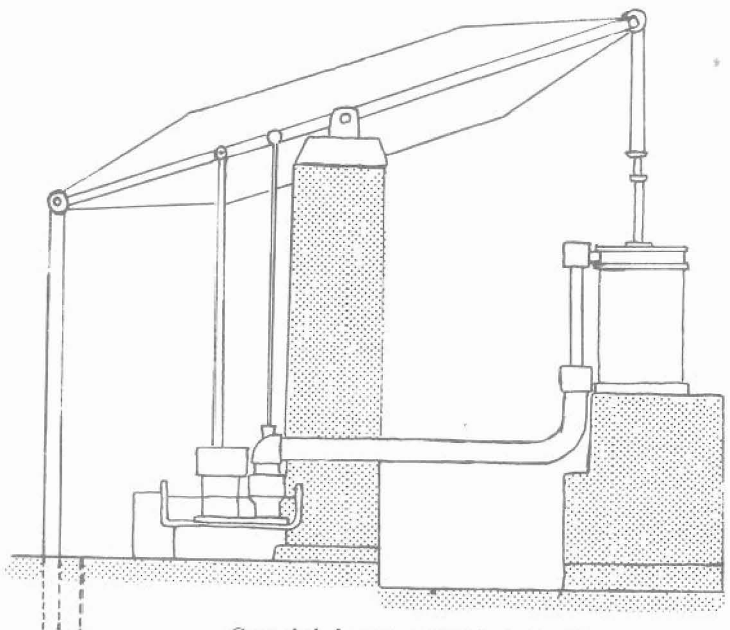
I understand these engines were used up to about 1960 for the purpose of pumping water from the mine. The workings extended under the sea and suffered severely from sea-water perculating through the super-incumbent strata. In about 1960 the local Electricity Board offered to supply electricity for working pumps at a more economic price than the steam unit, and so the engines and boilers became obsolete. The equipment was left standing until the mine closed, when demolition was commenced. By the time of my visit the Winding Engines, Boilers and other ancillary equipment had been removed, also brasses, valve gear, and most of the bolts were missing from the Cornish engines.

Attempts had been made to save the engines for preservation, but these, sad to say, have proved abortive and the future of these engines is probably very limited.

They were originally a fine pair of standard Cornish Pumping Engines developed by James Watt, each housed in red brick buildings decorated with red sandstone cornices. These buildings were tall, almost square in plan, with low hipped roofs.

A note on Cornish Pumping Engines

This type of engine (see sketch) consisted of a single cylinder, with its piston-rod connected to one end of a beam, the pump-rods being attached to the other. It was a single-acting engine, steam being admitted to the upper surface of the piston, causing the engine to make its in-stroke. An equilibrium valve was then opened, and steam passed to the lower side of the piston; the pressure was then equal on both sides. The weight of the pump-rods caused the outward stroke. Communication as next opened between the lower side of the piston and the condenser, a vacuum formed, and steam re-admitted to the upper side of the piston. This engine was designed by Watt, and remained in its original form until the very last engine of its type was built. The valves were opened and closed at the proper time by tappet rods, regulated by a cataract. Any number of strokes per minute could be obtained, although from the massiveness of the machinery, speed must necessarily have been slow; in addition a pause was made between the successive strokes, during which the valves, or clacks, had time to close, thus reducing any chance of shock. It was a large piece of machinery, very expensive to purchase, and also to work, but once in operation it required little attention, and had a very high efficiency. Its wearing capacity was almost unlimited.



Cornish beam pumping engine

Conference:
"The future of Industrial Archaeology"

A conference of this title was organised in November 1968 by the Centre for the Study of the History of Technology at Bath and was attended by the writer.

The main business of the Conference was a discussion of the theme: "The Future of Industrial Archaeology". This theme was introduced by Dr. R. A. Buchanan in his opening address to the Conference, and was developed by the three main speakers on the Saturday morning, Dr. E. R. R. Green, Mr. W. K. V. Gale and Sir David Follett. Each of these speakers made personal statements, but they were also able to represent particular points of view on the subject under discussion. Thus Dr. Green spoke about the CBA and the universities, Mr. Gale put forward the point of view of the Newcomen Society, and Sir David Follett gave an account of museum policy towards industrial archaeology. There was a wide-ranging discussion of the views expressed by these speakers, and on the following morning Mr. L. T. C. Rolt had the task of drawing together the diverse strands of this discussion in his concluding address. In the course of doing so Mr. Rolt presented the case for the formation of a national organization to promote the interests and objectives of industrial archaeology.

At the final session of the Conference a Resolution was formulated and passed unanimously. It read as follows:-

This Conference resolves to elect a steering committee of six members, with power to co-opt further members, to:

(a) discuss with the CBA and other interested bodies the possibility of strengthening the industrial archaeological functions of the CBA, or:

(b) consider the formation of a Council for British Industrial Archaeology to promote the interests and objectives of industrial archaeology.

and to refer back to the members of this Conference and to the societies represented here when they have done this.

The Conference proceeded to elect the steering committee and the members elected were: Dr. R. A. Buchanan, Mr. L. T. C. Rolt, Mr. J. K. Major, Mr. N. Cossons, Dr. P. N. Jarvis, and Professor Minchinton.

Frank Atkinson