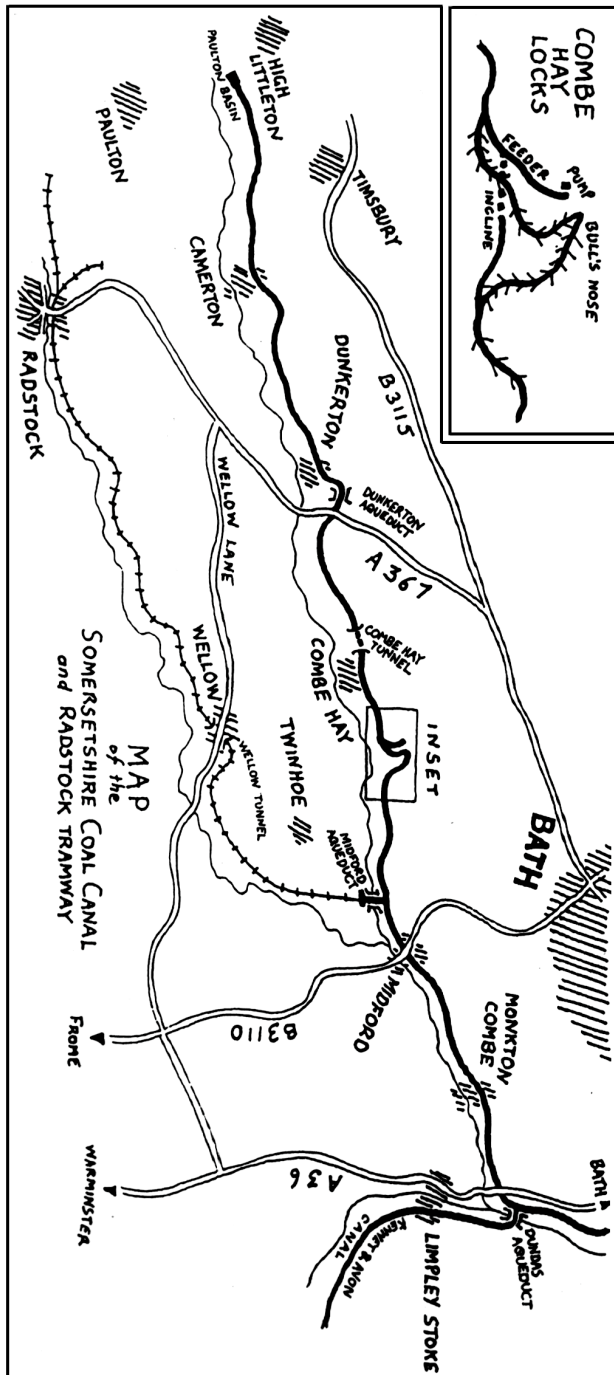


# WEIGH-HOUSE

THE MAGAZINE OF THE  
SOMERSETSHIRE COAL CANAL SOCIETY



Website: <http://www.coalcanal.org>



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The Somersetshire Coal Canal Society was founded in 1992 to:

'FOCUS AN INTEREST ON THE PAST, PRESENT AND  
FUTURE OF THE OLD SOMERSETSHIRE COAL CANAL'

The Society became a registered charity in 1995 and now has the  
Objects:

- 1) To advance the education of the general public in the history of the Somersetshire Coal Canal
- 2) The preservation and restoration of the Somersetshire Coal Canal and its structures for the benefit of the public

\*\*\*\*\*

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## MEMBERSHIP

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☎ (01761) 433418 *E-mail:* [membership@coalcanal.org.uk](mailto:membership@coalcanal.org.uk)  
*and on the Society Website:* <http://www.coalcanal.org>

The Editor welcomes letters, articles, photographs *etc* for inclusion in  
**WEIGH-HOUSE** and will try to include them in full, but reserves the right to shorten  
them if necessary. Author's guidelines are available at:

<http://www.coalcanal.org/wh/guidelines.htm>.

Please send articles and correspondence to:

Adrian Tuddenham 88, Mount Road, Southdown, Bath BA2 1LH

☎ 01225 335974 *E-mail (not HTML):* [adrian@poppyrecords.co.uk](mailto:adrian@poppyrecords.co.uk)

THE VIEWS AND OPINIONS EXPRESSED IN THIS MAGAZINE DO NOT  
NECESSARILY REPRESENT OR CONVEY THOSE OF THE SOCIETY

Thursday 20<sup>th</sup> April— 19:30

**SOCIAL EVENING — THE RADSTOCK BRANCH COAL CANAL AND TRAMWAY**

by Roger Halse

Meet: The Radstock Working Men’s Club.

For further details please see website or contact: *Steve Page* ☎ 01761 433418

Sunday 7<sup>th</sup> May —10:00

**WORK PARTY — Location to be advised**

For further details please contact: *Adrian Tuddenham* ☎ 01225 335974

Tuesday 16<sup>th</sup> May —10:00

**WORK PARTY — COMBE HAY LOCKS**

For further details please contact: *Richard Hignett* ☎ 01793 855631 [engineering@coalcanal.org.uk](mailto:engineering@coalcanal.org.uk)

Sunday 21<sup>st</sup> May —10:00

**WALK — BATHAMPTON TO CLAVERTON**

Meet: The George, Bathampton [5 km]

For further details please see website or contact: *Mike Chapman* ☎ 01225 426948

Sunday 4<sup>th</sup> June —10:00

**WORK PARTY — Location to be advised**

For further details please contact: *Adrian Tuddenham* ☎ 01225 335974

Thursday 13<sup>th</sup> June— 19:30

**ANNUAL GENERAL MEETING**

Meet: The Radstock Working Men’s Club.

For further details please see website or contact: *Patrick Moss* ☎ 07736 859882

Sunday 18<sup>th</sup> June —10:00

**WALK — BRASSKNOCKER TO CLAVERTON**

Meet: Brassknocker Canal Centre [4 km]

For further details please see website or contact: *Mike Chapman* ☎ 01225 426948

Tuesday 20<sup>th</sup> June —10:00

**WORK PARTY — COMBE HAY LOCKS**

For further details please contact: *Richard Hignett* ☎ 01793 855631 [engineering@coalcanal.org.uk](mailto:engineering@coalcanal.org.uk)

Sunday 2<sup>nd</sup> July —10:00

**WORK PARTY — Location to be advised**

For further details please contact: *Adrian Tuddenham* ☎ 01225 335974

Sunday 16<sup>th</sup> July —10:00

**WALK — BRASSKNOCKER TO FRESHFORD MILLS**

Meet: Brassknocker Canal Centre [5km]

For further details please see website or contact: *Mike Chapman* ☎ 01225 426948

**Walks**

These are all circular walks unless otherwise noted. You only need to arrange your transport to and from the meeting point. Where the distance is not shown, the walks tend to be in the form of detailed explanations of short sections of the canal and its relationship with the locality; and, as such, are less suitable for young children.

Dogs are normally welcome (except where indicated) and must be kept on leads at all times.

**Check the website: <http://www.coalcanal.org> for last-minute changes**

**WEIGH - HOUSE N<sup>o</sup> 72**

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**EDITOR’S NOTES**

Once again, Mike Chapman has filled the majority of our pages with a comprehensive article on a subject few people know anything about; this time he has researched the drainage adits (or ‘levels’) that were used to keep the mines free of water and the canal full of it. Water is the ‘life blood’ of any canal, but very little of the available literature deals with the management of it, so a lot of Mike’s information has come from his own painstaking research in the field.

John Sutcliffe has always been an elusive figure in the background during the early days of the S.C.C. ; attempts to find out more about him, even a picture, have drawn a blank, but there is little doubt that he made a significant input to canal design in those early days. Thanks to the researches of Mike Clarke, we now know a great deal more about Sutcliffe’s background and why his well-founded pessimism, in the face of the excessive optimism of the more highly-regarded canal engineers, condemned him to relative obscurity.

For those with an inclination to do their own research, the “Know Your Place” website opens up fascinating possibilities; it gives the viewer the ability to view both old and new maps of the same area and compare them with just the sweep of a wand across the screen. The entire length of the S.C.C. is covered by this project, which is described in more detail on Page 20 — happy sleuthing.

**ADRIAN TUDDENHAM**

## CHAIRMAN'S NOTES

Welcome to the first Weigh-House of 2017.

Canals across the country are experiencing increasing pressure for mooring space and the effects of this have become particularly apparent on the Kennet and Avon Canal and the River Avon in the Bath area. This lack of mooring space is one of several problems which the new Bath & North East Somerset Council's *Water Space Study* is intended to address. It originally covered the parts of the River Avon and the K & A Canal which fell within the B&NES area; the S.C.C. was not initially covered, but has now been included in the Study, following representations from this society.

The Water Space Partnership will be selecting the best ideas which "revitalise our waterways", and contribute to the five project themes in the Water Space Study recommendations. The S.C.C.S. has submitted a proposal for consideration; depending on the funding available, it could lead to improvements in the Brassknocker and Monkton Combe area, which would be the first step towards full restoration.

The Water Space Report should be published in late February 2017; the surveys and figures are already in the public domain and make it clear that there are more boats in the area than there are moorings, and this shortfall needs either new marinas, more canal, or both. Extension along the S.C.C. can relieve the pressure and B&NES are aware of this. Restoration to navigation remains our objective: compared to other societies we are still only just beginning, but a focus on extending navigation from the Kennet and Avon Canal to create more waterspace is an excellent opportunity for us to go forward.

**PATRICK MOSS**

For more information about the Water Space Study see:  
<http://www.waterspacebath.org.uk>

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## DONATIONS & SPONSORSHIP

The Society wishes to express its thanks to the following for their generous donations:

Mr. G. Blacker	Mr. K. Vassmusson
Mr. & Mrs. B. Roe	Ms. S. Flint
Mr. D. Ramsbottom	Mr. J. Smith
Mr. D. Francis	Mr. J. Fishlock

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## NEW MEMBERS

The Society welcomes the following new members:

Mr. C. Bennett,	Marcham, Oxon;
Mr. R. Powell,	Midsomer Norton;
Mr. T. Hughes,	Priston.

## DATES FOR YOUR DIARY — 2017

Thursday 16<sup>th</sup> February— 19:30

**SOCIAL EVENING — SCCS RESTORATION: THE NEXT MAJOR STEP**  
**The opportunities created by the "Waterspace Study"**

*by* Patrick Moss

*Meet:* The Radstock Working Men's Club.

For further details please see website or contact: *Steve Page* ☎ 01761 433418

Sunday 19<sup>th</sup> February —10:00

**WALK — CLEVELAND BRIDGE TO GROSVENOR BRIDGE**

*Meet:* Cleveland Bridge, Bath.

For further details please see website or contact: *Mike Chapman* ☎ 01225 426948

Tuesday 21<sup>st</sup> February —10:00

**WORK PARTY — COMBE HAY LOCKS**

For further details please contact: *Richard Hignett* ☎ 01793 855631 [engineering@coalcanal.org.uk](mailto:engineering@coalcanal.org.uk)

Sunday 5<sup>th</sup> March —10:00

**WORK PARTY — Location to be advised**

For further details please contact: *Adrian Tuddenham* ☎ 01225 335974

Thursday 16<sup>th</sup> March— 19:30

**SOCIAL EVENING — MAPS AND PLANS OF THE S.C.C. AND RAILWAYS**

*by* Roger Halse

*Meet:* The Radstock Working Men's Club.

For further details please see website or contact: *Steve Page* ☎ 01761 433418

Sunday 19<sup>th</sup> March —10:00

**WALK — CHURCHILL BRIDGE TO SYDNEY GARDENS**

*Meet:* Churchill Bridge

For further details please see website or contact: *Mike Chapman* ☎ 01225 426948

Tuesday 21<sup>st</sup> March —10:00

**WORK PARTY — COMBE HAY LOCKS**

For further details please contact: *Richard Hignett* ☎ 01793 855631 [engineering@coalcanal.org.uk](mailto:engineering@coalcanal.org.uk)

Sunday 2<sup>nd</sup> April —10:00

**WORK PARTY — Location to be advised**

For further details please contact: *Adrian Tuddenham* ☎ 01225 335974

Sunday 16<sup>th</sup> April —10:00

**WALK — SYDNEY GARDENS TO BATHAMPTON**

*Meet:* A36 road bridge, Sydney Gardens [4 km]

For further details please see website or contact: *Mike Chapman* ☎ 01225 426948

Tuesday 18<sup>th</sup> April —10:00

**WORK PARTY — COMBE HAY LOCKS**

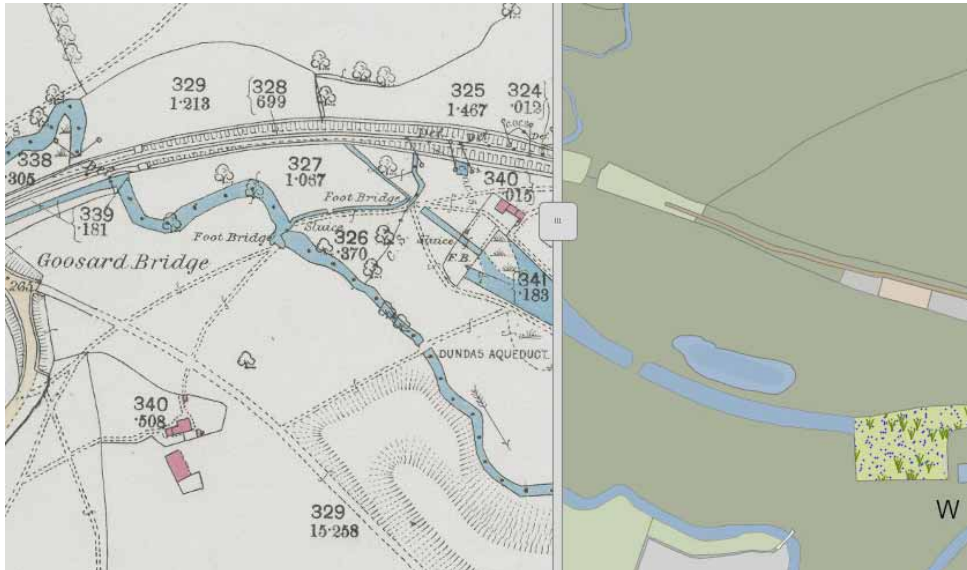
For further details please contact: *Richard Hignett* ☎ 01793 855631 [engineering@coalcanal.org.uk](mailto:engineering@coalcanal.org.uk)

## KNOW YOUR PLACE

*Know Your Place West of England is a digital mapping heritage project, funded by the Heritage Lottery Fund. It is building a free online research tool to map community heritage across the West of England.*

The project's website displays modern and historic maps simultaneously, along with archive images and links. The new and old maps are accurately aligned so that the user can 'wipe' a dividing line back and forth between them and see how a feature of interest has changed over the years.

The Know Your Place website is: <http://www.kypwest.org.uk>



**A SCREENSHOT OF THE TIMSBURY BASIN AREA FROM THE 'KNOW YOUR PLACE' WEBSITE**  
The older map, showing much greater detail, is on the left.

The maps currently cover Bath & North East Somerset, Bristol, Gloucestershire, South Gloucestershire and Wiltshire, with other administrative areas and counties due to be added later. The route of both branches of the Somersetshire Coal Canal is covered by the maps and there is much useful information to be gained by the careful comparison which this site makes possible. It is also worth taking a look at the site to see if the maps cover the area where you live, so that you can explore your own local history. There is a facility to participate if you wish.

We have not yet fully evaluated the potential for the S.C.C.S. and would like a member to be the Society's champion or expert on this project. Any offer of help would be appreciated.

**DERRICK HUNT**

## MEMBERSHIP RENEWALS

Thank you to all those who have renewed their membership during 2016 - your continued support is appreciated. Those of you who pay each year by cheque or online, and have not already renewed for 2017, please do so as soon as possible. If you have chosen not to renew, then you will not receive any further issues of Weigh-House. It is possible to renew online via the link in our website: <http://www.coalcanal.org> or if you prefer, cheques can be posted to me at the address inside the front cover of Weigh-House. Your annual subscription remains at the rate at which you joined, as a reward for your loyalty, but you may, of course, add something more as a donation if you wish!

**STEVE PAGE**

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## ANNUAL GENERAL MEETING

The next Annual General Meeting of the Somersetshire Coal Canal Society will be held on  
Tuesday 13th June 2017  
at the Radstock Museum, Waterloo Road, Radstock, BA3 3EP commencing 7.30 pm.

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## WEEKDAY WORK PARTIES

By concentrating all our restoration efforts in the Paulton and Timsbury areas during the past three years, we have made tremendous progress, but this progress has meant that other areas, where we used to perform regular maintenance, have had to be neglected. Several members of our regular weekend work parties have suggested that if we ran another work party on a weekday, it might prove more convenient than the weekend ones, especially for those who are retired or do not work a conventional five or six-day week.

A recent inspection of the lock flight has revealed that, although the re-growth of previously-cleared areas was not as bad as expected, there are already small saplings and other unwanted weeds beginning to get a foothold. If this growth is allowed to continue without check, the area could become heavily overgrown in another year or two, which would then require a major clearance effort. We do not want to divert our current restoration effort away from the Paulton and Timsbury area, so a second series of work parties seems to be the logical choice.

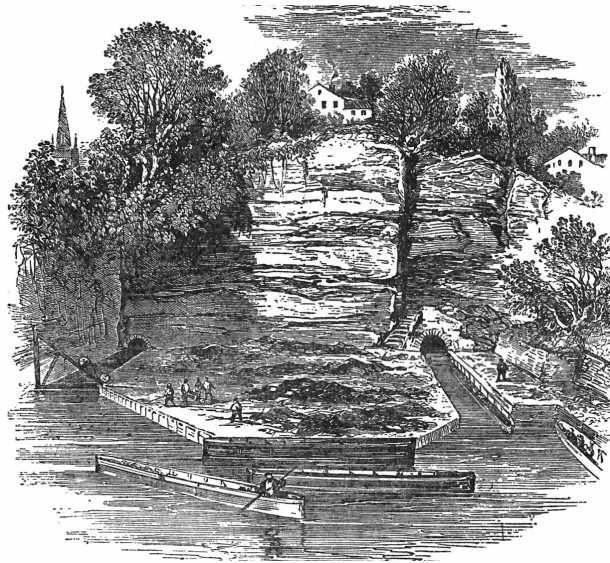
We are therefore starting a series of new weekday work parties in the Combe Hay area. The work will be mostly scrub bashing, weed clearance and grass cutting around the lock flight, with no heavy engineering or building work. Volunteers who would like to drive the Allen Scythe will be particularly welcome, because using it to keep down the weed growth in the lock pounds will be a regular task as Summer approaches. This is such an historic piece of agricultural equipment that we assume very few people will be conversant with it, so don't worry if you have never used one, we will give you the training you need.

The work parties will be held on the third Tuesday of each month, beginning at 10:00 (even if you can only manage part of the day, you will still be welcome) If you are interested in taking part or just want to know more, please contact Richard Hignett on: 01793 855631  
(E-mail: [engineering@coalcanal.org.uk](mailto:engineering@coalcanal.org.uk))

## ADITS ('Levels') AND THE S.C.C.

*One of the main obstacles to the extraction of minerals below the earth's surface has always been the accumulation of water in the workings. This can be removed using mechanical or animal power, but an alternative method (particularly in hilly terrain) is to drive out a tunnel known as an 'adit' or*

*'level' from a suitable depth in the mine to a lower level on the surface, thereby draining the water by gravity and lowering the water table in the surrounding district of the mine. There is an analogy here with natural drainage through the ground where water is conducted along the boundary between pervious and impervious strata to springs on the surface. On occasions there has been a close association between mine drainage and canals, most notably with the first purpose-built canal in this country, constructed at Worsley in Manchester in 1761 as an extension of the navigable drainage levels serving the Duke of Bridgewater's Collieries [Fig.1]. In the case of the Somersetshire Coal Canal, recent investigations have also revealed an unexpected relationship with the drainage levels of the surrounding coalworks.*



**Fig.1** The canal basin at Worsley, opened in 1761, showing the navigable adit tunnels into the Duke of Bridgewater's coal mine.

### The Construction of Adits

Records show that adits were in use in this country as early as the 14th century, and by the 18th century were widespread throughout all mining districts. A level was a major engineering work requiring a large capital investment, but other methods were expensive to operate, and a level lowered to as little as 40 feet or less could still be worthwhile. The building of new levels appears to end in the early part of the 19th century, presumably because most shallow coal had been removed by then and steam powered machinery was becoming progressively cheaper. However, even after all mining activity had ceased, the abandoned levels continued to function, and though some have been put to other uses, by their nature they remain hidden and therefore forgotten.

Since the level-building era ended two centuries ago, records of their layout and construction are rare. Fortunately, Society member Steve Grudgings came across a full account of the construction of the Ridgeway Level in the neighbouring Kingswood Coalfield from which he was able to make a detailed study assisted with survey information from his colleagues in the South Gloucestershire Mines Research Group. The findings from this study (published in the *BIAS Journal* 41, 2008-9), when compared with evidence of levels in North Somerset, show that methods and practices were common to both coalfields and would have followed the same basic principles.

## RUGBORNE – A Further Note

As a result of an error in the article on Rugbourn in Weigh-House 71, further information has come to light relating to William Smith's investigations into the coal works there. Smith's copy of John Strachey's cross-section was not, as stated, annotated with the date – the evidence that he was acquainted with Strachey's paper for the Royal Society by 1796 occurs elsewhere. Indeed, there has always been a puzzle about when and how he got hold of the cross-section from the original *Transactions*. Presumably this page was torn out of the original article and given to him by someone at Sutton or Stowey, or perhaps later on by one of his learned acquaintances in the Bath and West Society after he became a member in 1796.

It was also pointed out that, among Smith's memoranda, there was a further link between Rugbourn and Sutton/Stowey, as shown in the following extract:

Memorandums and observations concerning the Coal in the Lands rented by Corn<sup>s</sup> Harris on the South side the Gully at High Littleton ...

Mearns Batch (leas'd Land) over the Gully opposite Conegarth: Farmer Harris can remember when the Pitt in this Ground was sunk by Mr Jones & Co. about 47 years ago (which was the first year he came to Rugbourn Farm) and coal landed by times for 2 or 3 years but the Veins lying near the surface only a part of it was fitt for sale and the other part was burnt for Coke to dry Malt with -

Coneygarth (unleased Land) adjoining the Southeast side of Pease Close: In the lower side this Ground near the Gully is the plain appearance of a Pitt - Farmer Harris thinks there was no Work Batch here before the Pitt was work'd by Mr Jones & Co which he can remember was their next trial after that in Mearns Batch and Coal landed for about a Quarter of a Year which was brought down the Gully on pack horses.

The 'Jones & Co' mentioned here must surely be William Jones of Stowey, then owner of Rugbourn and the lands around Mearns until his death a few years after these events (about 1745) in 1748. Although John Strachey's lease to him in 1719 of land in Sutton for sinking for coal would suggest he was actively involved in the mining business, it now appears he was more interested in exploiting his land in High Littleton instead of his home estate around Sutton and Stowey – perhaps an 18th century instance of 'nimby-ism'. We do not know who the rest of the 'Company' were (almost certainly neighbours), Jones being the leading partner. Lady Jones, of course, would have known nothing about coal mining, and it is evident that she employed Smith as an 'expert mineralogist' to advise on how best to extend the productivity of the coalworks on her land.

**MIKE CHAPMAN**

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## STOP PRESS — WORLD HERITAGE DAY

The S.C.C.S. has been invited to take part in Bath's World Heritage day celebrations on 23 April from 11:00 to 15:00 at Parade Gardens, Bath. Volunteers are needed to help set up our stall and man it throughout the day; if you would like to help, please *contact* Derrick Hunt on 01225 863066.

He thought hydrostatic locks, such as Congreve's, would cost £2000 each at a minimum. With seven foot rise, 71 such locks would have been needed, making £142,000. A man was required to look after each at 31s 6d per week or £81-18s per annum, which multiplied by 71 is £5814-18s-0d, which at 5% capital is £119,000. Add to this the cost of annual maintenance of £1500, or £30,000 at 5%, plus £10,301-5s-0d for a quarter of the water required for locks. He estimated that, including maintenance, the total capital requirement for hydrostatic locks was £291,000, over twice that needed for conventional locks.

The book also looks in depth at the water supply to the Rochdale Canal, and states that Jessop and Rennie proposed that a 60 acre reservoir, on average 15 feet deep, would be able to supply the canal. However, the actual number of reservoirs built originally was five:

Hollingworth .. .. .	130 acres, 10 feet deep	.. ..	1,573,000 tons of water
Blackstonedg.. .. .	50 acres, 15 feet deep	.. ..	907,500 tons of water
White-holme .. .. .	92 acres, 13 feet deep	.. ..	1,447,160 tons of water
Chelburn .. .. .	16 acres, 15 feet deep	.. ..	290,400 tons of water
Light-hazzles .. .. .	30 acres, 6 feet deep	.. ..	217,800 tons of water

This gave a total supply of 4,435,860 tons of water. He used tons of water as the basis for his calculations probably because that was the best unit for calculating supplies to mills where power output needed to be calculated. Canal engineers more often used locks-full, a measure directly linked to canal usage, and probably more expressive than the current use of litres.

Traffic on the Rochdale was anticipated to be 10 boats per day of 35 tons, making 350 tons per day and, at 240 days per annum (presumably omitting Sundays, holidays and closure for drought or frost) this gave an annual total of 84,000 tons carried. Reservoirs were expected to fill with water twice per year, giving 8,871,720 tons of water or 26,170 locks-full. This suggested there were 106 tons of water needed per ton of goods carried. A lock 81½ feet by 15 feet by 10 feet requires 340 tons of water. For a boat passing along the canal, two locks-full are required to pass a summit, with a further three locks-full allowed for leakage, soakage, evaporation etc. Thus, with a 35 ton average cargo, 9.5 tons of lockage water were required in ascending or descending a lock, so 48.5 tons of water were needed for every ton of cargo, say 50 tons as some boats return light. He estimated that this was about half of the water available, questioning as to why the canal was short of water and where had it gone. He thought that evaporation of 0.5 inches per day in summer was equal to 577,170 cubic feet or 47 locks-full.

Sutcliffe's book was one of the earliest descriptions of canal engineering in English, and that alone should make it important. That it was critical of the current standards and of the financial implications makes it even more important for those interested in early canal promotion and construction. It is interesting to note how few English language books on canal engineering there were in the eighteenth century, with early engineers relying upon Belidor's *Architechure Hydraulique*, published in France in 1754. The first major English language work was the section on Canals in Rees' Cyclopaedia of 1819, though the section was written earlier.

Besides his work opposing the Rochdale Canal and as Engineer for the Somersetshire Coal Canal, Sutcliffe's only other involvement with navigable waterways was to report upon the proposed canal through Hexham, between Carlisle to Newcastle, in 1796-7. In the south west, he was also consulted on the Axe drainage scheme of 1801. It is surprising how little we know about him, given that his was one of the few voices suggesting caution during the Canal Mania. His views certainly deserve more consideration today when discussing canal history, and it would be interesting to discover more about why he became Engineer to, and why he left, the Somersetshire Coal Canal.

MIKE CLARKE

For example, the gradient of a level needs to be sufficiently steep to enable water to flow freely, but sufficiently flat to obtain maximum depth of 'free drainage'. An ideal gradient would be 1 in 200 or more (a fall of about 1 inch every 16 feet). The dimensions of a level are also a compromise, between being sufficiently large for men to work in and sufficiently small to minimise the work involved -

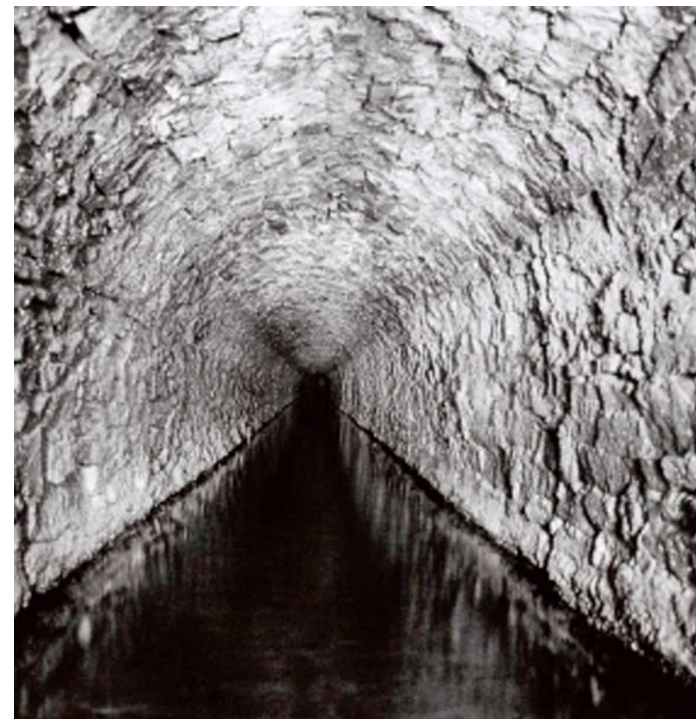


Fig.2 A main level in the Kingswood coalfield.

typical heights are understood to be between 3 and 4 feet, width about 3 feet. Where masonry was used, the tunnel was strengthened with an arched roof [Fig.2]. Intermediate shafts perhaps 100 yards apart along the line of the level were first sunk so that the tunnel could be excavated in short sections and linked up between the shafts. This required a great deal of skill to ensure that the correct depth was maintained and that the headings joined up accurately, the latter by the use of a 'miners' dial' (a compass divided into hours of the day instead of degrees).

Some of these shafts were kept permanently open for ventilation and maintenance access. Since the levels were normally constructed

under land held by the owner or lessee of the mineral rights, legal considerations might exclude the shortest or most direct route. Rates of progress were slow — typically 100 yards per annum or two yards a week in the case of the Ridgeway Level — and it was not unusual for construction of major levels to take ten years or more.

However, levels did not rule out the use of pumps, and in practice actually proved to be a stimulus to the employment of early Newcomen or atmospheric pumping engines. A pump enabled shafts to be sunk to a depth below the level, by raising the water to the level instead of the full height to the surface (at the same time ensuring that the water in the level did not return down the pump shaft!). This not only avoided the cost of pumping water to the surface but also the need to dig a surface discharge channel, and by the 1790s the construction of levels was accompanied by the installation of engines as part of the same project. Also, when a pit fell out of use, the pump could remain in operation because it still protected other pits connected to the levels system a considerable distance away. There is little doubt that the increased employment of levels in the period between 1650 and 1814, allowing access to the deeper coal measures, played an important part in the development of coal mining in this country.

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## Adits in the North Somerset Coalfield

The earliest evidence found so far for the use of adits in the North Somerset Coalfield is in a series of coal mining agreements made between the 1650s and 1690s involving members of the Hodges and Britten families, then principal landowners and coal developers in High Littleton. In April 1667 is the first mention of a '... level or gowte now brought up into one ground of the said Thomas Hodges the younger ... adjoining to the dwelling house & carrying on toward Gravell [Greyfield]'. Later, in December 1698, Hodges was approached for a lease and the need 'to set up a wheele & make a level for draining of the coal in Thomas Hodges' ground in High Littleton, called Broomehill'. This is presumably the origin of a level (here with water-driven pump) later known as the Broom Hill (or Bromhill) Level, which will be referred to again below.

However, further records do not occur until the 1780s when special drainage levels were driven to serve groups of mines around the Nettlebridge Valley (the Edford and Benter Levels) and at Timsbury. The 'Timsbury Level' was driven to Radford Bridge in 1791-92 at a cost of £1,200 to serve Old Tynning and Old Grove pits — extended to New Tynning and New Grove pits when they were opened nearby in the following year. A pumping engine was immediately installed at New Tynning, and the level at New Grove extended to Hayeswood Colliery further north for ventilation. It is highly likely that other pits were connected to this level, particularly Withy Mills colliery, opened in 1815, which was sited midway between New Tynning and Radford.

Unfortunately, no remains of the 'Timsbury Level' and its outlet at Radford Bridge have been found before now, but recent investigations by the Society work party into water sources in the region of the canal at Radford Mill may provide a clue. On the north side of the canal bed near Mill Lane is a private well pump supplied from the bottom of a 20ft-deep shaft by an adit carrying water in a west-east direction, heading towards Radford Bridge [Fig.3].

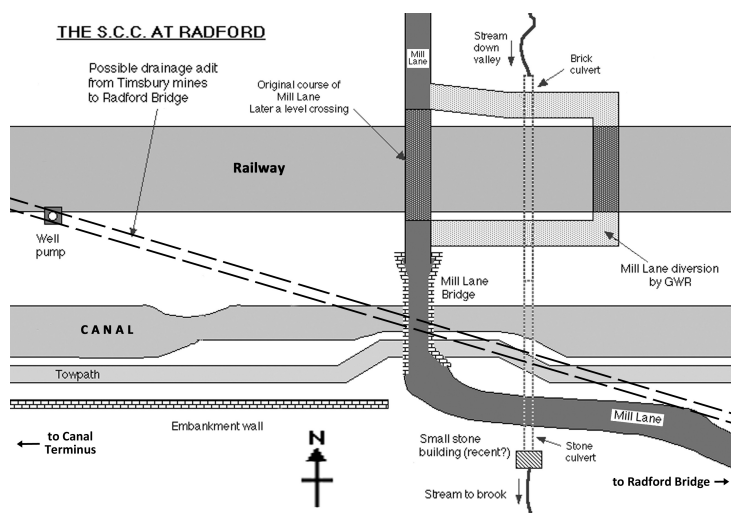


Fig.3 Conjectural sketch plan of water sources above Radford.

The volume of flow is not very great, but the adit is large enough to walk through in a slightly crouching position. Someone who explored it claims to have walked for 20-25 minutes in a westerly direction without finding the end. Although the outfall from this adit has not yet been identified, there is a high probability that this is the eastern end of the 'Timsbury Level'.

## JOHN SUTCLIFFE (1780-1816)

*John Sutcliffe's book, "A Treatise on Canals and Reservoirs" may not be well known, but it should be compulsory reading for all canal historians. (You can download a copy via Google Books.) History is usually written by the 'victors'; in the case of canals, the victors were the successful canal engineers (also promoted by Samuel Smiles) writing about how good they were, so as to advertise for further employment. Sutcliffe's book is rather different in that he was pretty critical of the then current engineering standards found on canals, particularly with regard to water. The book was also, to some extent, aimed at the works of the John Rennie, who in his younger days was over-confident regarding water supplies to his canal projects.*

Sutcliffe is quite a difficult person to research, given the number of people with this surname around Calderdale. What is known is that he was a millwright from Halifax, whose family, including brother William, were owners of local mills. John was responsible for Marshall's Mill in Leeds, and also worked on other mills for two of the largest late-18<sup>th</sup> century woollen businesses there.

Halifax was an important centre for early civil engineering, particularly canals. Smeaton having trained Halifax-born John Longbotham, who went on to be engineer for the Leeds & Liverpool Canal. There was also the Crosley family; William Crosley being closely involved with the construction of the Rochdale and other canals, and his son following in his footsteps.

Sutcliffe came to notice as a canal engineer in 1793, whilst he was involved with the *Rochdale Canal Bill*, appearing as an expert witness for the local mill owners with regard to the canal's water supply. He gave evidence to the Parliamentary Committee in London on February 17<sup>th</sup> & 18<sup>th</sup> and 20<sup>th</sup> & 21<sup>st</sup>, longer than any other witness, including engineers such as Rennie, Jessop or Outram, which suggests a wide knowledge of the subject. As a result of the committee's deliberations, engineers from both sides — canal and mill — were authorised to meet to make arrangements over the canal's water supply. John Sutcliffe and Thomas Bradley, both of Halifax, were appointed to look at the Lancashire end of the canal, with William Sutcliffe, of Fieldhead, Halifax, and James Drury, of Little Green, Middleton appointed for Yorkshire side. One of the Rochdale Canal committee wrote:

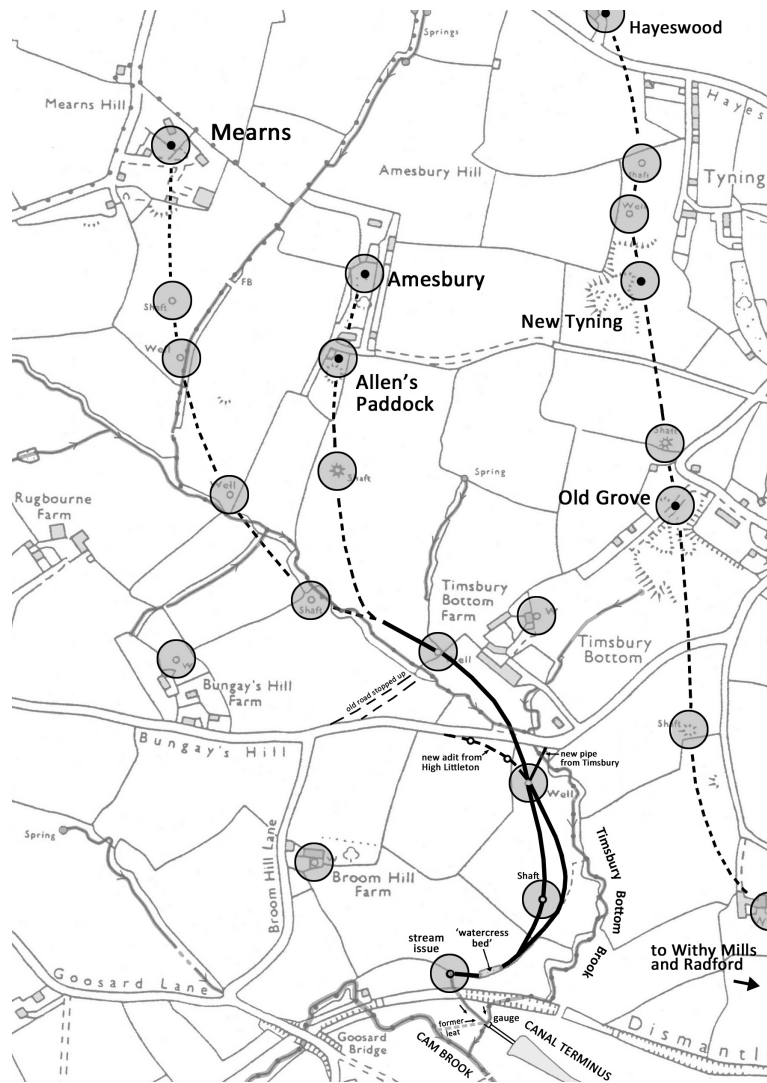
I hope Rennie will be on his guard what he says to Sutcliffe since if we cannot agree, with the millowners, I think it is very probable that he will be employed as their witness against us.

Despite this warning, Rennie seems to have got on the wrong side of Sutcliffe, who subsequently wrote *A Treatise on Canals and Reservoirs...*, published in 1816, but which had probably written some years earlier. The book is very critical of how canals were built at the time, as well as looking at some aspects of textile engineering.

With regard to the Somersetshire Coal Canal, the book includes a section with a comparison with the locks and lifts required for a 30 mile long broad canal, 6 feet deep with a rise/fall of 500 feet. For that, Sutcliffe thought 4.75 acres of reservoir, 15 feet deep would supply one mile of canal carrying 350 tons per day for 40 weeks per year, which makes collectively 130 acres. [Note: it should be 150 acres] If half were built on common ground at £10 per acre and the rest on enclosed ground at £65 per acre, plus £5 for fencing, this makes a total of £5200. Then £200 per acre was needed for the construction, which makes £36,000, giving a total cost for a reservoir of £41,200. Added to this were 83 six-foot-rise locks at £120 per foot, costing £60,000, making the total cost £101,200. To this could be added £20,000 extra for a pumping engine to supply the summit from one reservoir, giving a total of £121,200.

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**Fig.17** Shafts and wells in the neighbourhood of the canal terminus, together with known sites of former coalworks, as shown on a recent OS map. The distribution of these, together with the adit indicated by William Smith (bold lines), suggests a possible pattern of adits (pecked lines), e.g. Bromhill Level to the left - Timsbury Level to the right.

Smith's interest in the High Littleton drainage levels was soon to have significant results. Combined with his knowledge of natural drainage in rock strata, he soon acquired a considerable reputation throughout the country as a land-drainage engineer, reclaiming waterlogged ground and stabilising landslips. Indeed, his contribution to our understanding of the principles governing sub-surface water remains almost as important today as his geological discoveries.

**MIKE CHAPMAN**

The latest mention of the construction of a level in the coalfield is at Welton Hill Colliery. The lease of February 1813 stipulated that, for drainage, the first work was to be a 'new and compleat Level Adit or Drain' followed by the erection of a 'Fire Engine or Steam Engine'. Here the ground was reported to be very soft and gunpowder was unnecessary. The level met the shaft at a depth of 111ft, coal being found at 270ft, but despite the assistance of the level, the engine had difficulty with the quantity of water from the shaft which eventually reached 603ft.

However, the examples mentioned here are only those belonging to the proprietors of the High Littleton/Timsbury groups and the Duchy of Cornwall. Presumably the other large proprietors in the coalfield, such as the Waldegraves at Radstock were doing much the same (William Smith mentions one in 1798 used by the Writhlington Group). Most of the Paulton collieries, sited on the hillside, may also have made use of levels, and the two streams arising at Paulton Foundry (the 'dipping well' by the house and the culvert beneath the foundry workshop) are now 'under suspicion'. However, the two 'Engine Pits' at the bottom of the valley seem always to have relied on pumps. Despite the installation of Newcomen engines (the first to be introduced into the coalfield), these continued to be assisted by water-powered pumps supplied from local streams by an elaborate system of surface channels (also referred to as 'levels') into the early 19th century (a branch from one of these surface 'levels' also supplied water to the S.C.C. at Timsbury Basin).

### The Engine Wood Adit

Levels were not only used in coal mining — as was discovered on the S.C.C. during investigations



by the Society work party into the pumping engine site in Engine Wood, Combe Hay in 1999. In this instance the adit was not for drainage, but to supply the pump installed in 1805 to raise water to replace that lost through the Lock Flight. Its source was located by Society member Richard Hignett by identifying the intermediate shafts [Fig.4] which, by triangulation, he was able to trace back to a well fed from the Cam Brook via the canal basin at Platform Cottage (see *Weigh-house* 38, 2004) [Fig.5].



**Fig.4** Remains of one of the intermediate shafts in Engine Wood. In the background is the upper reach of the canal to the pump engine and Caisson House

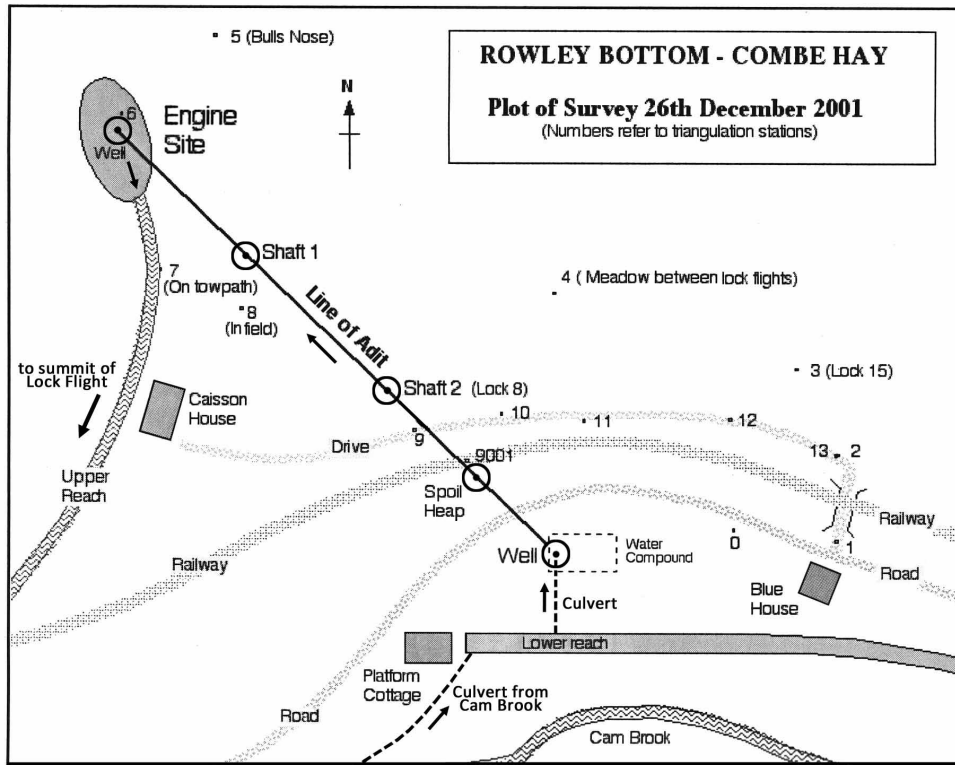


Fig.5 Triangulation plan of the adit supplying the engine at Combe Hay.

As it happened, the pump was removed in the mid 19th century and the supply stopped, leaving the adit to accumulate ground water instead. This has flowed out in the reverse direction towards the Cam Brook ever since, thereby serving as a drainage level which, in this case, came to be adopted for a public water supply system, disguising its original function. [Fig.6]

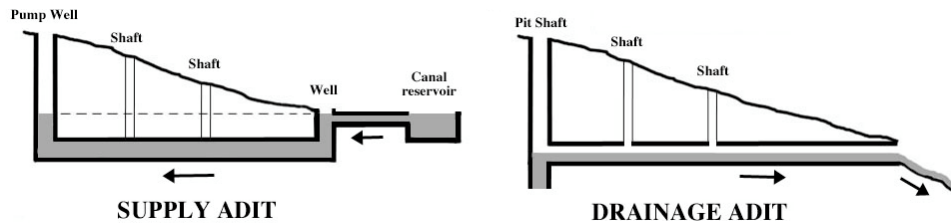


Fig.6 Comparison of adits for supply to Engine Wood pump [right] and drainage [left].

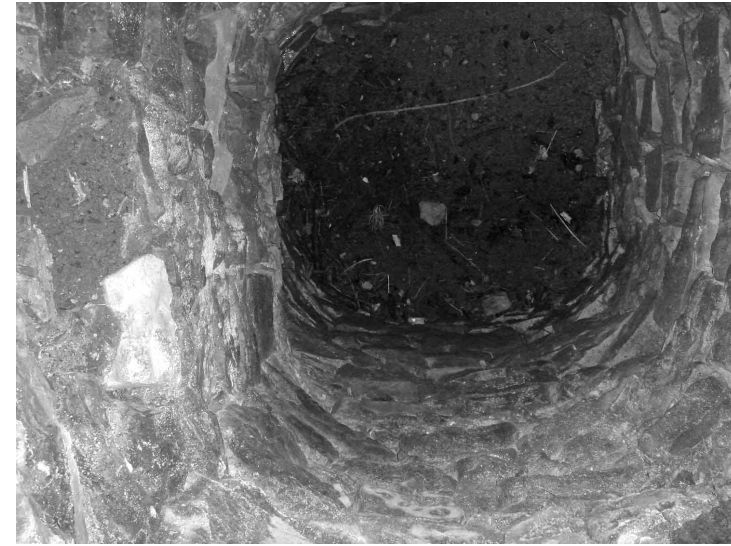


Fig.15 Shaft lining.



Fig.16 The 'watercress' pond (left) and stream issuing (right). The stream passes under the embankment of the abandoned B&NSR railway (visible in the background) before entering the canal basin.

on an old field boundary. Here it forms a linear pond along the hedge (at one time used as a watercress bed) before running in a stream towards the canal terminus. [Fig.16] Although the water from this source usually remains constant and clear, when functioning as a storm drain during wet periods the stream increases in volume and becomes turbid. [Fig.17] →



**Fig.13** The capped shaft where the adit is joined by the pipe from Timsbury and the storm drain from High Littleton (the latter indicated by similar capped shafts in the next field to the left).

Each of the intermediate shafts shown on Smith's plan is now provided with an iron cover, except for one remaining under a hawthorn bush which has been mostly filled in. [Fig.14]

Below the broken cap-stones of this shaft the stone lining, still visible to depth of about 4ft, was found to be in good condition. [Fig.15]

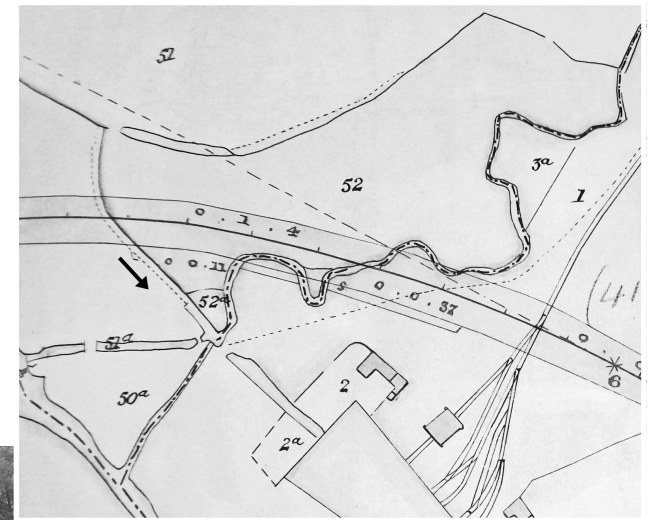
Beyond this shaft, continuing the alignment shown on Smith's plan, the level terminates about 100yards further on, arising through the ground



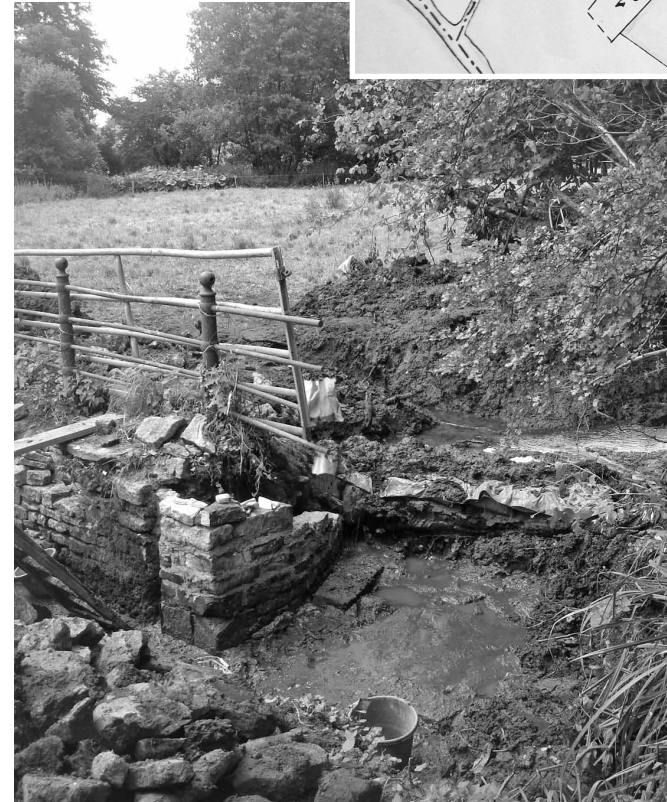
**Fig.14** An intermediate shaft of the Bromhill Level unaltered by the storm drain works.

### The Broom Hill Level

More recently, colliery adits have also become a subject of interest during restoration work by the Society around the terminal basin at Timsbury. It was here that the canal was supplied from three sources which all flowed together into a water gauge (now repaired) before feeding into the basin [Fig.7].



**Fig.7 [Right]** Detail taken from the plan of the proposed B&NSRailway near the canal terminus in the 1860s. The junction of the three water supply streams into the basin is shown next to plot 52a.



Two of these, the stream from Timsbury Bottom (now only intermittent), and an abandoned leat from the Cam Brook are presently unusable, but a small stream issuing as a 'spring' on the edge of a field a little way to the north of the terminus still provides a regular flow [Fig.8]. →

**Fig.8 [Left]** The water gauge at the junction of the three streams during recent repair work. At the bottom is the channel for the Timsbury Bottom stream, flowing from right to left, joined by the small stream centre right. Outlines of the channel from the Cam Brook can still be seen in the field beyond, leading from the trees in the distance.

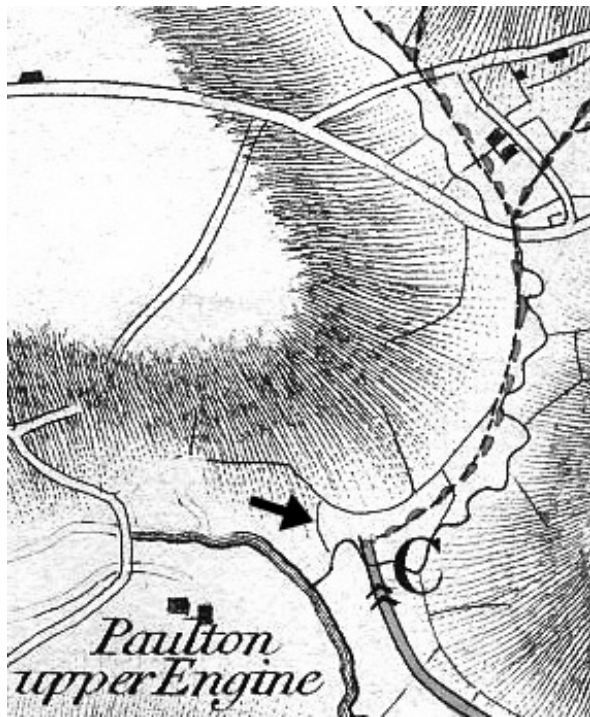


Fig.9 Detail taken from Rennie's 1793 survey of the proposed canal, showing the small stream (arrowed). Note that the canal terminus was eventually built on the east side of the Timsbury Bottom stream, not on the west as shown here.

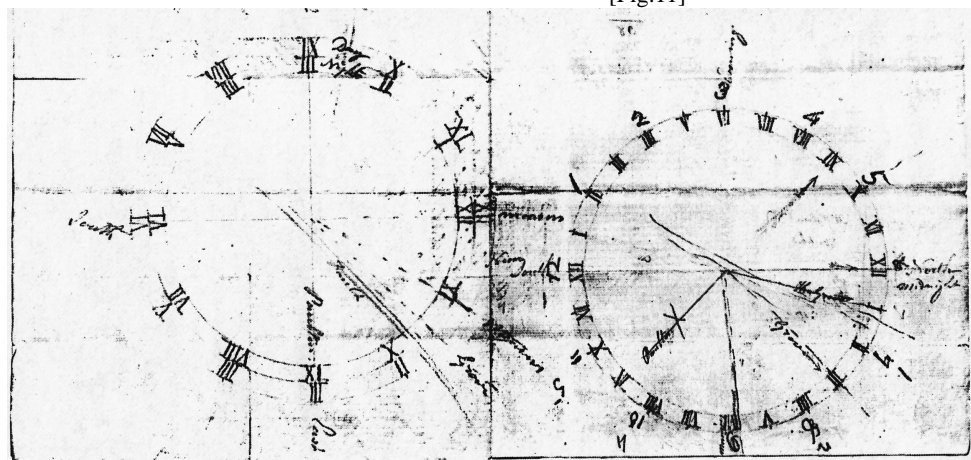


Fig.10 William Smith's drawing of a miners' dial, showing the direction of dip in the surrounding pits.

It was only during an examination of William Smith's 1792 notes on the High Littleton coalworks that it was realised that this stream was actually the outlet of a former colliery drainage level [Fig.9].

Smith's memoranda show that there was already a network of levels in operation in the Rugbourne Farm area which he was interested in exploiting to extend the productivity of Lady Jones's coalworks. He speculated that by making a short branch into one of these a new pit could be sunk 'with almost certain success, and if the Water should be found in sinking below the Level it may either be wall'd up or Pump't up to the Level by a Horse Engine at no great Expense'. Also included with the notes is a sketch plan entitled 'Copy of John Carter's acct. of Coal, Form of Dials, & Sketch of lower part of Bromhill Level, Friday Decr.28th, 1792' (a drawing of the miners' dial mentioned here is included in his later notes [Fig.10]). The sketch shows the route of what is described as 'the main level', passing under the High Littleton to Timsbury Road (Bungay's Hill) where it crosses the Timsbury Bottom stream below Broom Hill. [Fig.11]

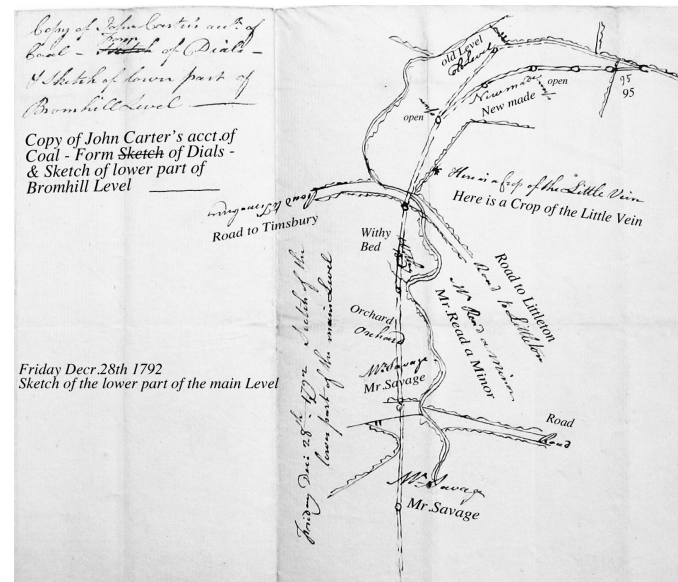


Fig.11 William Smith's sketch of the Bromhill Level near Timsbury Bottom (his annotations transcribed).

It actually shows two branches at this point, an 'old level' and 'new made', the former possibly the one mentioned above in 1698 which would have already been in existence a hundred years before Smith's time. Also marked are the intermediate shafts, several of which are shown 'open' [Fig.12].

A site inspection of this field showed that the 'new made' branch had been adapted in relatively recent times as a storm drain fed from a new adit descending from High Littleton and a surface pipe leading across the stream from Timsbury. [Fig.13]

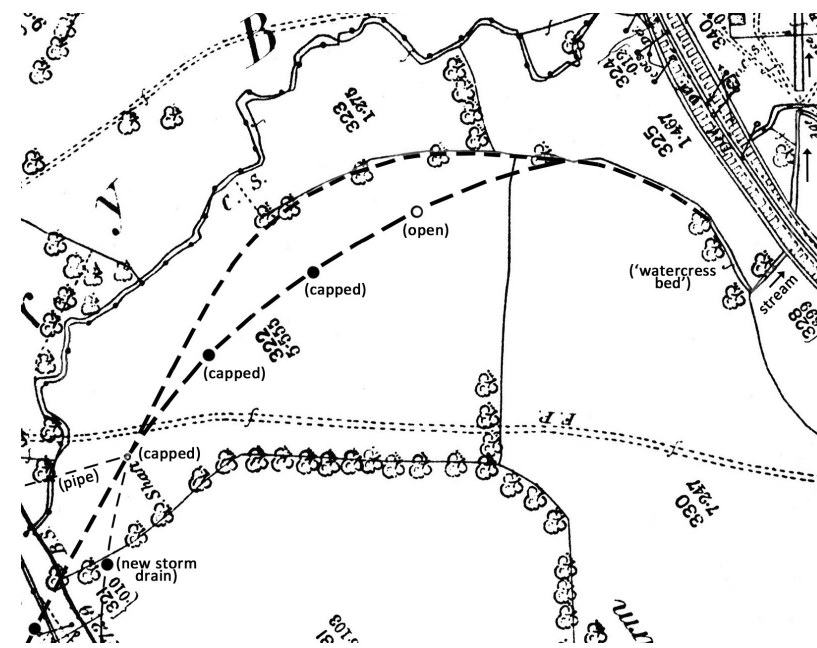


Fig.12 The same area on the large scale OS map of 1883 with Smith's details superimposed. Also shown are the recent storm drain connections.