ULSTER ARCHAEOLOGICAL SOCIETY

Survey Report: No. 26a

Survey of Gasworks, Bishop's Palace, Downhill,
County Londonderry
UAS/10/04

in association with

THE NATIONAL TRUST

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Downhill Palace Gasworks

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1. Summary

1.1 Background

The remains of the gasworks are located in the west yard of Downhill Palace and were surveyed as part of the project described in UAS Survey Report 26. The background to coal-gas making, both generally and in particular application to mansions, is discussed in UAS Survey Report No. 24 Castleward Gasworks. The sequence of figure numbers and appendices in this Sub-Report 26a is a continuation from Report 26.

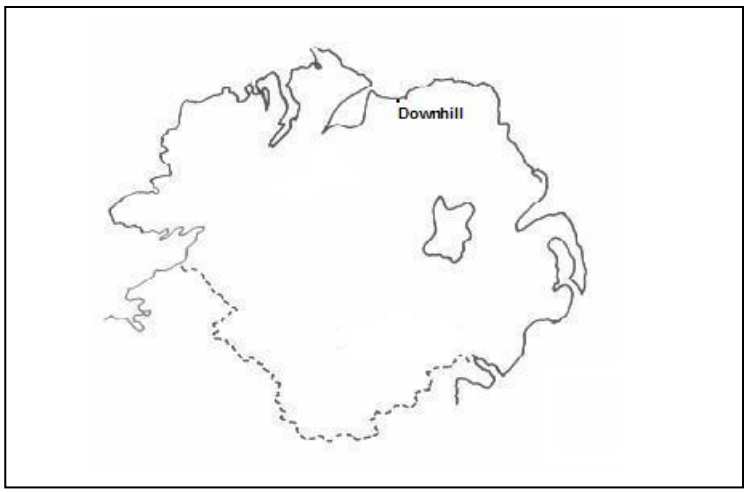

Fig. 37: Location of Downhill within Ulster

1.2 Survey

A plan of the gasworks structures was made.

2 Introduction

2.1 Background

For the background, objectives, and team membership see Report 26, paragraph 2.

2.2 Acknowledgements

UAS are grateful to Malachy Conway, Archaeological Officer of the National Trust, for all his support throughout the exercise and to the staff of PRONI.

2.3 Cartographic Evidence

Ordnance Survey 6-inch : 1 mile, Londonderry Sheet 2, 1857. Neither the retort house nor the gasholder is shown.

OS 6-inch : 1 mile, Londonderry Sheet 2, 1904.
The retort house and gasholder are both shown. Also, a roof is shown against the extreme north of the yard wall covering a segment. It is open to the yard. A rectangular building has appeared built against the yard wall between the

gasholder and the main access gate to the west yard. There is an annotation: "Gasometer".

OSNI 6-inch : 1 mile, Londonderry Sheet 2, 1923
The gasholder is not shown. The other structures are still in place and roofed. There is no annotation.

OSNI 1 : 10 000 Sheet 12, 1969
The retort house is roofless. The other rectangular building, the open roofed area, and the gasholder are not shown.

Fig. 38: North end of West Yard from SE

3 Survey

3.1 Methodology

The Society's Leica Sprinter 100 positioned the gasworks structures within the West Yard and details were measured using tapes. A plan was prepared on computer using CAD.

3.2 Photographic Archive

Photographs additional to the list given in Report 26 were collected from other members of the team (see Appendix C).

3.3 Description of Structures

3.3.1 Gasholder Tank

The northern end of the yard is dominated by the gasholder tank (Figs. 5, 19, 38). Portland cement covers its exposed surface. It may be reinforced concrete poured

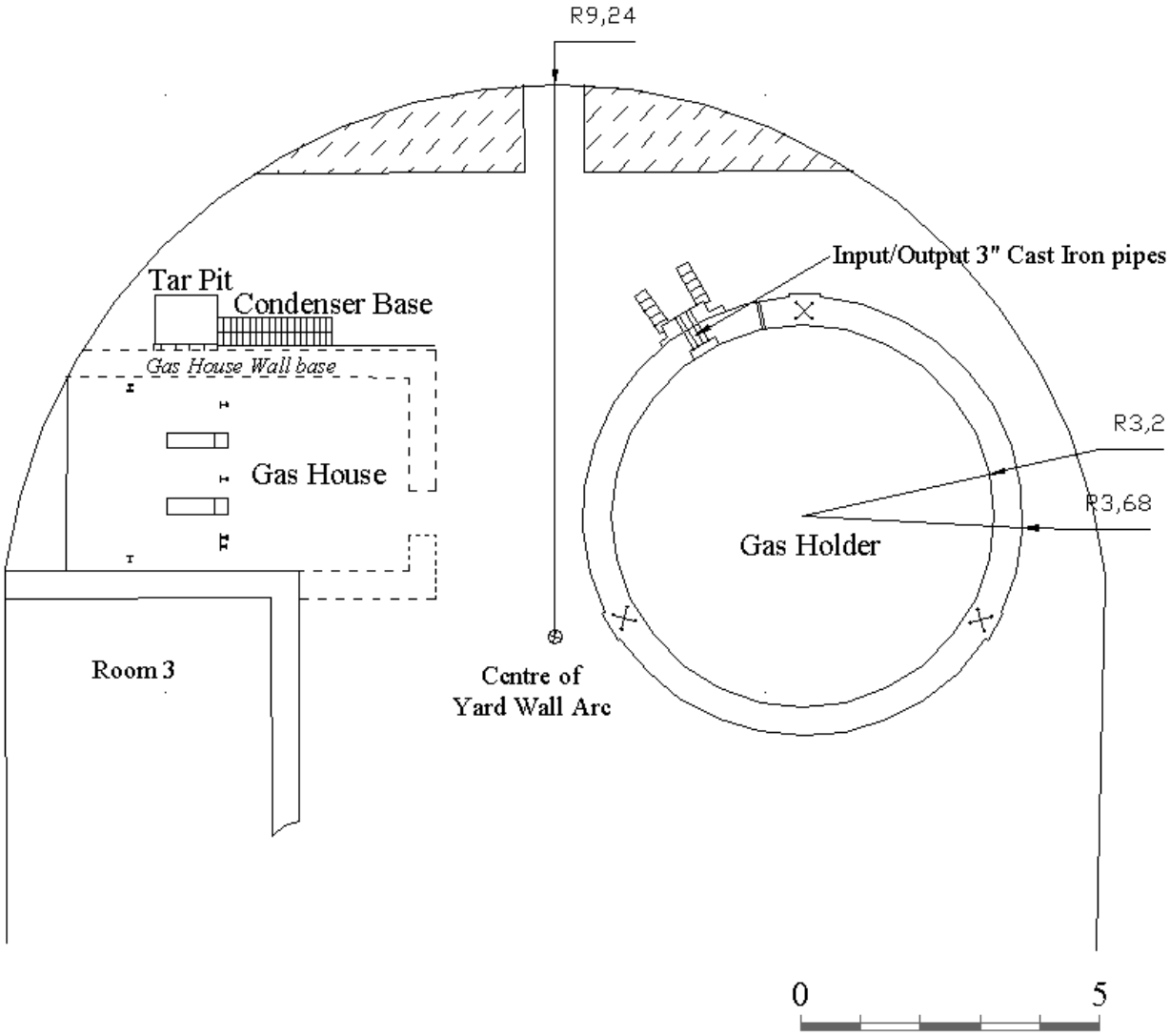

Fig. 39: Plan of gasworks structures, *MT Catney*

The roof as shown here is Michael Catney's interpretation of the OS maps as two roofs divided by a gap. George Rutherford's interpretation is different - a single roof without a wall on the southern side.

in-situ. The internal diameter is 6.4m and the exterior, 7.36m, but the perimeter is stepped wider to provide square platforms for guiding columns at three points: north, southeast, and southwest. At N 30^{o} W a vertical channel about 0.5m wide is moulded on the inside of the tank (Fig. 38). At a depth of about 0.25m two 3" diameter pipes enter the channel, probably for delivering and extracting the gas. Diagonally opposite a pipe pierces the tank immediately below the rim, and another likewise to the west of the north column platform. These could be overflows, but a lower pipe close to the channel coincides with the internal tide mark so appears to have effected this function. At least one of the pipes may have been intended for topping-up the water level. Against the outside of the tank next the channel two brick walls (about 0.5m apart) appear at ground level (Fig. 40). This feature was not excavated, but the position is where we would expect the valves to have been fitted. During the period of disuse the tank had been filled with spoil. Much of this was removed during the excavations of 2010- 2013, but the base had not been cleared before backfilling began.

Fig. 40: Gasholder tank unexcavated, from NW, *National Trust*

3.3.2 Retort House

The floor of the retort house is a pavement of brick; firebricks are strategically placed and red bricks fill the remainder. The red bricks have shallow frogs without the maker's mark. The fire bricks are plain. It is edged with black stone, presumably the line of wall (Fig. 41). The house was built against the north end of Room 3, but is stepped eastward to clear the curving yard wall. The western end is squared by a wall of split stone rubble and mortar. This does not survive as high as 2m and so nothing can be deduced here of the nature or slope of the roof. The entrance was in the east wall. A skim of cement across the gable of Room 3 displays a horizontal sinusoidal edge (Fig. 43). This wavy line is higher up the wall than a blocked doorway at first floor level, but does not extend over it.

No imprint of a chimney was seen against the yard wall. However a chimney stack of red brick sits in a crenelle above Room 3 (Fig. 31). It is possible that the flue from the gasworks furnace was directed sideways through the gap, which now looks like a blocked doorway, to issue at the chimney, but this seems an improbable route to vent smoke from the furnace.

Fig. 41: Retort House floor from NE, *National Trust*

Within the floor are two parallel sunken channels running east/west and formed in smooth cement. They are a metre long and 1.1m c/c. The western end of each terminates in a vertical face, the eastern in an incline. From the floor project heavily rusted stanchions. Their shape show that they are rails originally designed for carrying locomotives. Four are placed in a north/south row in line with the eastern end of the sunken channels; one of these between the channels, another 1.25m north of the first, and the other two, together 1.25m south of the first. Two more are 1.5m further back (west) with a gap of 2.74m between them. The railheads are 60mm wide, the feet 120mm and the web is 110mm.

Outside the north wall of the retort house is a pavement of red brick 1.93 x 0.46m separated from the house by a small gap (Fig. 42). The bricks are 230 x 100mm with 10mm grout.

Fig. 42: Retort House floor from N showing northern pan and rails

Fig. 43: North wall of Room 3 (exterior)

4 Discussion

4.1 Bruce Documents

The Hervey/Bruce Papers in the PRONI contain a tender document from Hanna Donald & Wilson of Paisley offering to supply and erect all iron work for a gasworks (see Appendix B). This is dated 28th November 1876 and the price asked is £280.

Fig. 44: Advertisement of 1852
http://www.gracesguide.co.uk/images/e/e2/Im1852Sl-Laidl.jpg

A second letter dated 6th December 1876 in reply to one of the 4th says " if you will kindly inform us how many lights you require we will be able to give you a more satisfactory answer to your enquiry and at the same time if you will mention what you consider would be the extreme number of lights and the longest number of hours they will be burning say when the day was at its shortest that is to say commencing to light at say 3.30 p.m. and continuing lit in the case of a party on to 2 or 3 in the morning, if we had the above information we would then show your greatest consumpt and we would be able to specify an apparatus to meet your demands. The great expense in the Gas Works is the Gasholder and the larger it is made the more costly the apparatus but in return for which you have the advantage of not being under the necessity of keeping a man making the gas every day or so." (D2798/9/34)

As only one side of the conversation is preserved we do not have Sir Henry Hervey Bruce's answer. However, another tender was sent on 16th December in response to a reply of the 12th and this specifies a gasholder of thirty foot diameter and two purifiers. The cost would be £460.

Two months later Richard Patterson of Belfast, the main contractor for the house, was writing to Sir Henry on the progress of work (D2798/9/42). On the gasworks he says :

"We received from Messrs. Laidlaw a few days ago a ground plan for your gas works but as there were some errors in it we returned it to them and we have now the pleasure of enclosing this revised plan which we hope will meet with your approval. The increased size of the roof of the retort house will not add to the price formerly quoted as it will be a 'lean-to' roof supported on one side by the high boundary wall. Before proceeding with the roof we would require to know if it is to be prepared for slates or sent complete with galvanised iron sheets, the latter is what we would recommend. We are proceeding with the 2 purifiers & centre valve …"

Two days later, on 24th February, Patterson wrote, "We are in receipt of your letter of yesterday giving instructions about roof …" (D2798/9/44).

The Messrs. Laidlaw mentioned by Patterson would be Richard Laidlaw and Son of Glasgow, a foundry that supplied the gas industry and much else.

Unfortunately, the surviving accounts do not include a payment for the gasworks, nor clear confirmation of who supplied the apparatus.

4.2 Gasholder tank

The thirty-foot diameter gasholder tendered by Hanna Donald & Wilson would not have fitted the space available within the yard. As the client was probably reluctant to approve such a view-spoiler outside the yard, he may have reconsidered the first tender, and we may have assumed he favoured the first

despite the prospect of impacting the wages bill for stoking, if it were not for Patterson's later reference to Laidlaw.

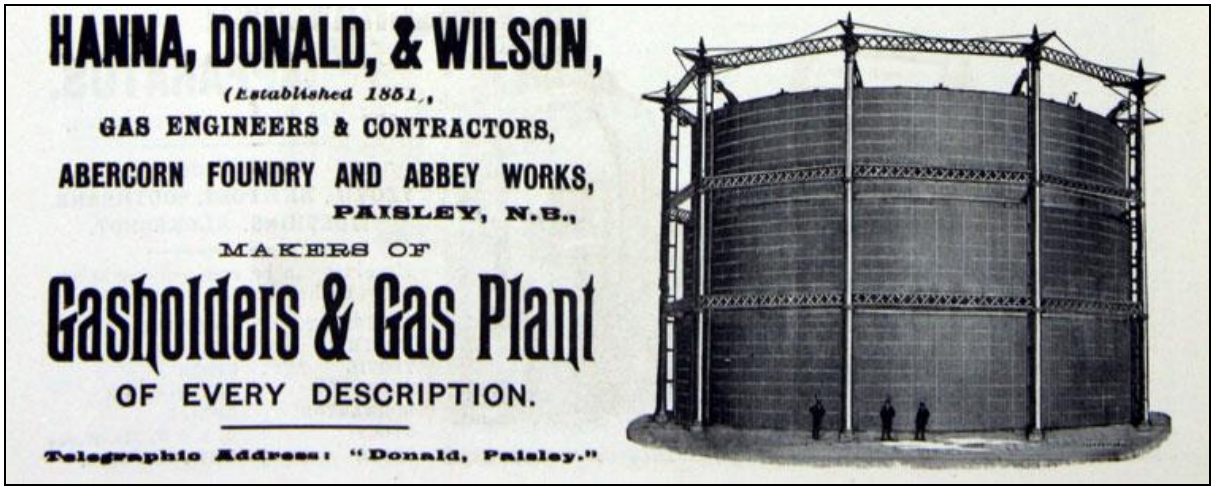

Fig. 45: Adverisement of 1909
http://www.gracesguide.co.uk/images/6/6a/Im19040209JGL-Hanna.jpg

We do not know which foundry provided the gasworks, but considering Patterson's letter of 22 February 1877, Richard Laidlaw and Son of Glasgow may well have provided metalwork.

4.3 Retort House

The two channels in the floor of the retort house conform to the longitudinal section shown in Clegg's drawing (Fig. 46). This is described as "a pan at the bottom of the ash-pit, for evaporating ammoniacal liquor, and the offensive unsaleable liquid products which cannot be disposed of otherwise" (Clegg : 68). Two evaporation pans means two furnaces. At least one retort would have been mounted above each furnace, as in fig. 46, but by the late 1870s two retorts would be more likely, off-set to maximise use of heat, as can still be seen at Mount Stewart (Carson : Pl. 65; Hamond : photo 6).

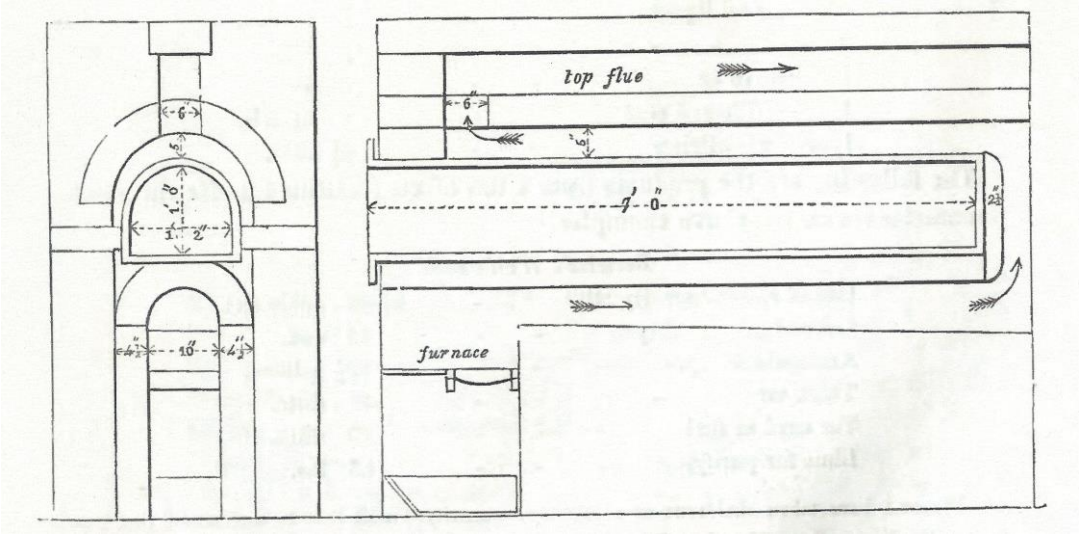

Fig. 46: Cross and Longitudinal Sections through a single retort setting (Clegg : 72)

It was normal practice to strengthen a retort setting with vertical and horizontal iron bars braced tightly around the brickwork. It is not unusual to see rails used as beams in buildings standing close to railway lines. The Londonderry and Coleraine Railway was constructed between 1845 and 1853 (Currie : 67-75) and passes through the demesne at Port Vantage. Michael Catney has drawn attention to the railway associations of John Lanyon, the architect employed for the improvements at Downhill Palace. He was architect for the stations at Downhill and Castlerock, built 1873-75 (Currie : 122), was engineer for the Limavady and Dungiven Railway 1880-83, and also engineer for the Draperstown Railway for much the same period (Currie : 281). During the 1870s railway companies were upgrading their iron rail tracks to steel. (Currie : 117 ; McCutcheon : 112).

The corrugated imprint on the north wall of Room 3 suggests a roof of galvanised iron sheeting leaned against the gable wall and covered the retort house as recommended by Patterson (see 4.1), but differing in orientation.

4.4 Condensers

The brick floor outside the north wall of the retort house was almost certainly provided for the condensers supported against the wall (see 3.2.2).

4.5 Purifier

After the condensers the gas would be passed through a purifier before being fed into the gasholder. Its position on this site is problematic. In the retort house the stoker needed adequate floor space to operate his long shovel and rake, though a small purifier is conceivable on the north side of this space. Other possible positions are: under the segmental roof at the extreme north of the yard; beside the condensers sheltered by an extension, or generous overhang, of the lean-to roof.

The segmental roof with one side open to the air would have been a good place to spread saturated lime from the purifier to allow its rejuvenation. (See Report 24, 4.1.2) Note: no evidence of supports for this roof was noticed during the survey.

4.6 Tar

Tar staining to the west of the condenser floor led to the supposition that a tar pit had been here. Staining is also seen on the yard wall north of the retort house spilling down to a crust of tar on the ground (Fig. 38). An elevated tar tank may have been placed here, to receive the condensate from the hydraulic main.

4.7 Coal

The Hervey/Bruce Papers do not contain accounts for coal. If the estate followed the usual custom of buying a year’s supply in summer considerable storage space

would be needed. If cannel coal was ordered for gas production there would be a need for segregation from household coal. The segmental roof may have taken a local supply, but Room 3 would have made a good coal store with its wide entrance and reduced windows (Fig. 28).

4.8 Labour

Unlike a town gasworks a "big house" gasworks did not need full-time staff. A labourer would have acted as stoker from time to time as required (Thomas : 3). For example: at Drum Manor and Castlestuart, both in Co. Tyrone, an estate worker would be deployed to "make gas". The record of wages paid between 1884 and 1895 show that a maximum of 9 working days in a month were spent in making gas (March) and little or no gas was made during summer months (PRONI, D1618/9/7).

5 Recommendations

If the National Trust decide to have a teashop or interpretation/display centre in the north end of the West Yard a construction design should be chosen which avoids damage to the gasholder tank. A glass floor allowing the visitor a view into the tank would turn it into a memorable feature.

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APPENDIX B

Tender for gas apparatus : PRON(NI) D2798/9/33

HANNA DONALD & WILSON
Engineers & Contractors
LONDON OFFICE
FENCHURCH ST. E.C.

ABBEY WORKS
Paisley

28th Novr. 1876

In reply to Sir Henry Bruce's kind enquiry of 25th inst. Messrs Hanna Donald & Wilson hereby offer to make deliver + erect at Downhill Coleraine all the iron work of a Gas Apparatus consisting of 2 Cast Iron Retorts in 2 ovens with all necessary mountings for same complete including Retort Mouths, doors, Cross Bars Ears + Screws, 2 Furnace fronts, bars, bearers, dead plates, Bench Binders Tie rods + washers, Ascension H + dip pipes 3" dia with suitable length of Hydraulic Main. 1 Condenser filled with 6 – 3 inch Stand pipes. Washer 3' 0" dia x 18" deep 1 Purifier 4 ft sqr x 2' 6" deep fitted with seives and Wrot Iron Cover. Work Connexions + Valves 3inches dia leading to Gasholder
Gasholder 16 feet dia x 10 feet deep sheet Iron for crown + sides No. 16 BNG with suitable internal framing guided + suspended by 3 Cast Iron Cols. Chains pullies and counterbalance weights 3 inch inlet + outlet pipes dreep chest + valves all complete including an Iron Roof for Retort House prepared for slates, the whole to be of first class workmanship + fitted up to the entire satisfaction of any competent party who may be appointed to superintend and examine the same for the sum of £280 say Two Hundred and Eighty pounds Stg

If Iron Roof is not required the price would be £270 say Two Hundred + Seventy pounds Stg.

APPENDIX C

PHOTOGRAPH RECORD FORM 2

Site: Downhill Palace Gasworks

Photo No.	Direction	Description
RIMG 0026	N	North wall of Room 3 (exterior)
RIMG 0443	SE	North end of West Yard