### SOUTH WILTSHIRE INDUSTRIAL ARCHAEOLOGY SOCIETY

## FLOATED WATER MEADOWS IN THE SALISBURY AREA

MICHAEL COWAN



Cast iron sectional aqueduct, part of the West Harnham system.

Floated water meadows were a significant feature of the agricultural revolution in the Wessex chalk area during the seventeenth century. As an irrigation system they remained in general use until well within living memory. The purpose of this Monograph is to place on record the physical aspects of a number of examples in the Salisbury area and to make possible a clearer understanding of their characteristics.

This Monograph should be read in conjunction with an Ordnance Survey map of the area; preferably 1:25,000 First Series sheets SU12 and 13.

All grid references are SU.

All references to left and right of a watercourse are to be read as facing down stream.

### INTRODUCTION

An extensive, highly visible but frequently overlooked aspect of industrial archaeology in South Wiltshire, as well as more widely in the south west, is provided by remains of floated water meadow systems. A glance at the Ordnance Survey 1/25000 First Series sheets covering the area north and south of Salisbury shows a network of water courses, standing out in blue, along all the river valleys. Those shown are only the main elements of an intricate irrigation system, the fine detail of which is only to be seen on the larger scale maps. Even on them the details are liable to be incomplete, misleadingly titled and difficult to interpret. They are becoming increasingly difficult to interpret as the visible remains on the ground are steadily destroyed by river maintenance and agricultural development.

It is the intention of this monograph to record in detail the one remaining local example in full working order and some representative elements of other systems now abandoned. Most of what is described can be seen fairly easily from roads or public footpaths. The general locations are shown in Figure 1 and grid references are given to locate the other features in detail. The figures are not generally to scale because much of the detail is disproportionately enlarged for the sake of clarity. An appropriate overall distance is given in each case as a guide.

The bibliographical note shows that the subject is covered well in general terms from the point of view of both agricultural development and economic history. By way of introduction for the general reader however the adjacent quotation admirably summarises the reasons for and the manner in which these meadows were developed in the 17th century. They remained as part of this near perfect sheep/corn system until late in the 19th century when corn production fell and artificial fertilizers began to displace the 'golden hoof' of the sheep (1). Thereafter the irrigation system alone remained in use until the need for men rather than machines to maintain it forced abandonment in recent decades (2).

### Diagrams and Definitions

Many works dealing with this subject include a diagram to illustrate how a floated meadow system works. These are usually intended to illustrate principles rather than to be realistic and should be treated with some caution when it comes to relating them to any example on the ground. In this work principles are explained in context as they arise but, for an introductory statement, that of Thomas Davis writing at the beginning of the 19th century cannot really be improved upon; particularly as he took the precaution of prefacing his notes with the remark that 'It is impossible to give any intelligible description of the mode of making these meadows; this operation must be seen to be properly understood'. His attempt none-theless is as follows:

The land applied to this purpose being frequently a flat morass the first object to be considered is how the water is to be carried off when once brought on; and in such situation this can seldom be done without throwing the land up in high ridges, with deep drains between them. A Main Carriage is taken out of the river, at a level high enough to command the tops of the ridges, and the water is brought by small trenches, or Carriages along the top of each ridge, and, by means of moveable stops of turf or earth is thrown over or on each side, and received by the Drains below, whence it is collected into a Main Drain and carried on to water other meadows . .'

There is little agreement about terminology, which varies from farm to farm and book to book. I have generally followed Davis but distinguished between water courses that usually only convey water along their length (Carriages) and those that spill it over their sides (Carriers); I have also used the more usual modern term of 'Tail Drain' instead of 'Main Drain'.

### HISTORY

The main agricultural wealth of the south west derived, until the late nineteenth century, from its corn. In the days before modern fertilizers this in turn depended on the dung and urine of sheep, dropped directly onto the arable land from after the harvest until sowing and sometimes later. The sheep were grazed on the downs by day, then concentrated night by night on successive areas of the arable in the hurdled sheepfold to perform this function.

The amount of corn produced therefore depended mainly on the size of the flock that could be kept through the winter on the downland grazing. Corn output was increased from the early 17th century when flocks were able to make use of the extra grass provided by bringing 'bottom meadows' into more productive use. This was done by developing the rudimentary systems of irrigation then in limited use into the more complex floated system eventually to be found throughout the chalk area.

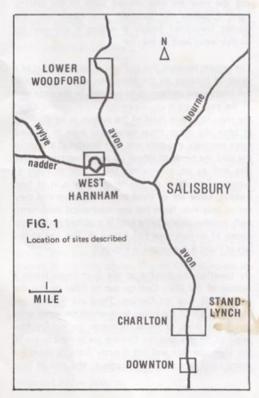
The system was essentially the means of controlling the distribution of a thin sheet of water flowing continuously over the meadows during periods of the winter and early spring. This provided both insulation and sedimentary deposit. Not only was the soil enriched but the grass was protected and its early growth encouraged; there was high quality grazing available when the downs were bare (the 'early bite') and further growth later for hay.

Thus in the south west the floated meadows became an integral part of the sheep/corn cycle. The resultant near perfect system survived until late in the 19th century when corn production fell and artificial fertilizers began to displace the 'golden hoof' of the sheep (1). Thereafter the irrigation system alone remained in use until the need for men rather than machines to maintain it forced abandonment in recent decades (2).

### DATING

There is ample evidence that most of the systems were created in the seventeenth century and of our examples all except Harnham have known dates in that period. The Harnham meadows were part of the Pembroke estates which were in the van of this form of agricultural development from the early 1600s.

While the systems will have remained virtually unchanged in layout the hatches and other related features will have been modified and renewed. There is



a fair amount of dressed stone and brick, some of which might date from the original construction. There is a suggestion that all the early reinforcement was of wooden cladding packed with chalk and only later replaced by stone or brick. In many places now stone has been replaced by or repaired with concrete. The woodwork of the paddles and footbridges will have been replaced at frequent intervals but the iron reinforcement, lifting machinery and retaining devices have been re-used on successive timbers. Some of the simple ironwork may be the work of local villages' forges; the more substantial cast items will have come from iron foundries further afield in the area. With more research some of these might be dated with precision.

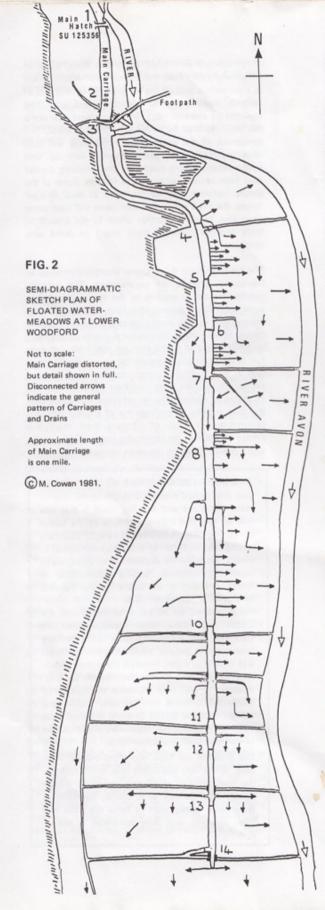
The hatch at Point 9 at Lower Woodford provides an interesting example of regeneration. The wooden paddles are set in grooves in the stone piers and at some stage these grooves have been reinforced on the downstream side by angle iron secured to the stone by means of lead plugs. The modern planks of the footbridge are secured to the piers by steel bolts but have had to be cut to accommodate the old (original?) bolts, still in place, which formerly secured much thicker planks. These older bolts held their planks in position by means of wedges. The forged iron claws which hold the four paddles in position are of slightly different patterns and probably of different dates; there is a similar variation in the reinforcing strips on the paddles into the holes of which the claws locate (Fig. 8).

### THE DUTCH CONNECTION

Ask any farmer about the origin of his floated water meadows and the likelihood is that you will be told that they were 'made by the Dutch about two or three hundred years ago'. There is a strong oral tradition to this effect reinforced in recent years by its appearance in print, particularly in technical farming publications. A recent example is an article in the Farmers Weekly of 16 November 1979.

There appears to be no evidence to link the Dutch with these water meadows and the tradition may stem just from an instinctive connection in peoples' minds between the Dutch and control of water. However there were Dutchmen in Wiltshire in the seventeenth century; prisoners of war were housed in the cloisters of Salisbury Cathedral in the early 1650s and refugee clothiers settled in north Wiltshire from 1673. It is clearly not impossible that prisoners of war were used as a labour force.

The tradition has been reinforced from time to time. A not very old Dutch coin found recently has been adduced as evidence; while the solidly British iron foundry of B Dutch, operating at Warminster during part of both the 18th and 19th centuries, may have something to answer for!



### LOWER WOODFORD

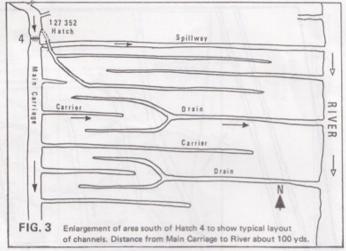
This system, still drowned regularly, is outlined in Figure 2 and references are to the numbered points in that figure. Most of the area can be seen clearly from one or other of the roads running along the valley and from the footpath across it. A good panoramic view is obtained from some points on the eastern road, most usefully when the system is drowned. From the western road a clear view can be had of some of the detail and this is most useful when the system is dry.

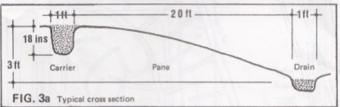
The system appears to be part of that dated (Victoria History of Wiltshire Volume VI p 225) as circa 1665. It lies in a long loop of the River Avon above and below the village of Lower Woodford. It is bounded on the east by the river and on the west by successively, the village, the road and rising ground. The spine of the system, which leaves the river under a footbridge at Point 1, is the Main Carriage. The flow of water into this is controlled by the Main Hatch at Point 1 which can be used to control the river flow (3). This hatch is of three wooden paddles operated by iron ratchets and set between stone piers. The drop, when water is fully diverted into the Main Carriage, is some three feet, representing also the total fall over the whole system shown in Figure 2.

Point 2 is the first of a series of culverts under the Main Carriage to allow the water used in the field on the right hand side to flow back to the river. This field and the narrow strip on the left between the Main Carriage and the river are now disused parts of the system. Point 3, below the footpath, is a Hatch with one ratchet controlled paddle providing a spill-way for surplus water back to the river.

The system becomes live at Point 4, with the first of a series of Hatches on the Main Carriage which enable the intervening sections to be isolated. In the early part of the year there is usually enough water coming down the river to enable most of the system to be drowned at once. At other times water may have to be used more sparingly and only one part flooded at a time. In the past the needs of others up and down stream have also had to be considered. The Hatch at Point 4, typical of all those on this Main Carriage, is of four paddles; some are of three and at the lower end they are of only one. None has any mechanical movement, each wooden paddle being held in a desired position by means of an iron claw (see Figure 8). The area to the left of Point 4 is enlarged in Figure 3.

By lowering the paddles at the next lower Hatch a section of the Main Carriage can be filled so that the water spills into the Carriers. These are trenches cut along the top of the ridges from which the water spills down the sides, or Panes, to create the moving film required. In this case the Carriers are at right angles to the Main Carriage and fed directly from it; there are many other possible configurations. The rate of flow





into the Carriers and along their length can be controlled, if the gradient requires it, by stops of turf put in or taken out by the Drowner (4). The water is recovered in Drains or trenches cut along the bottom of each furrow between the ridges and which, in this case, lead directly back to the river; again there are many possible configurations.

Immediately below the Hatch at Point 4 there is a further spillway to the river controlled by a single-paddle Hatch which has no controlling devices; when down it is held in position by the pressure of water in the Main Carriage. Immediately above the Main Carriage Hatch a piped culvert carries water to a small wooden box section aqueduct over the spillway to feed some Carriers. This characteristic of feeding Carriers down stream from a Hatch recurs in a variety of forms although the use of an equeduct in this fashion is unusual.

The remaining characteristic to note at this point is the 'Bow and Arrow' configuration of some Carriers and drains. This is a common form that does not actually feature in the field chosen (Figure 4) to illustrate the variety of forms that Carriers can take.

Dimensions at this point are fairly typical and some are shown in Figure 3a. Filled Carriers give a false impression of their width because of the profile caused by water spilling over the edges. In disused systems both Carriers and Drains rapidly become grassed over and the ground is blurred into a misleadingly smooth ridge and furrow pattern.

From Point 4 to Point 14 the complete detail of the Main Carriage is shown including all the water courses fed directly by it. Beyond this the general lie of Carriers and Drains is shown by disconnected arrows. The area between Points 10 and 11 is enlarged in Figure 4.

At Point 6 some of the area down stream to the left of the Hatch is fed from above it. Up stream of the Hatch at Point 7 there is a Tail Drain under the Main Carriage and then a diagonal Carriage feeding the system to the left. The term Tail Drain is explained below. The term Carriage is here used to describe a water course that is not supplied direct from the river and is thus not a Main Carriage but nonetheless does not itself normally spill the water over its own edges. Its function is to feed Carriers.

At Point 8 there are the remains of a footbridge which appears as if it may have been a Hatch at one time. Local information is that it was not but it is now used to divert water into the Carriage immediately above it. Further up stream there is a single-paddle Hatch controlling a spillway.

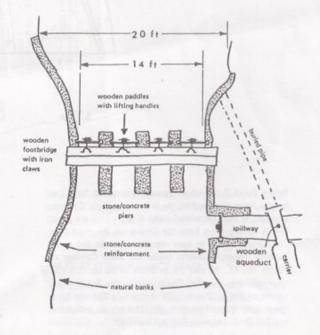
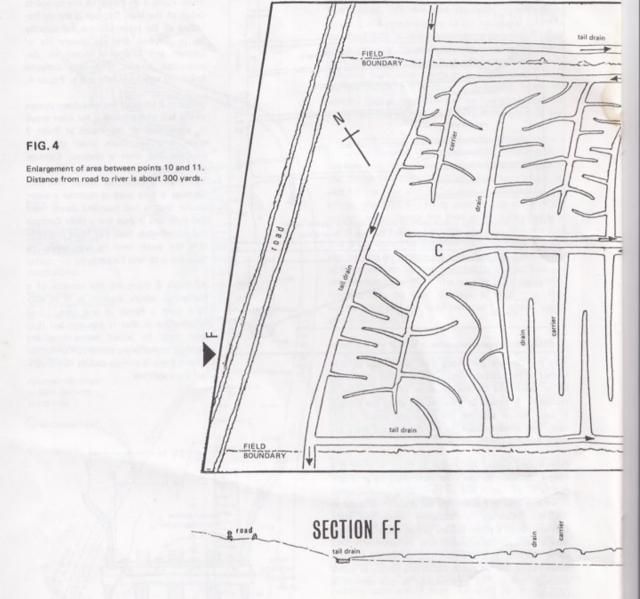


FIG. 3b Detail of Hatch 4

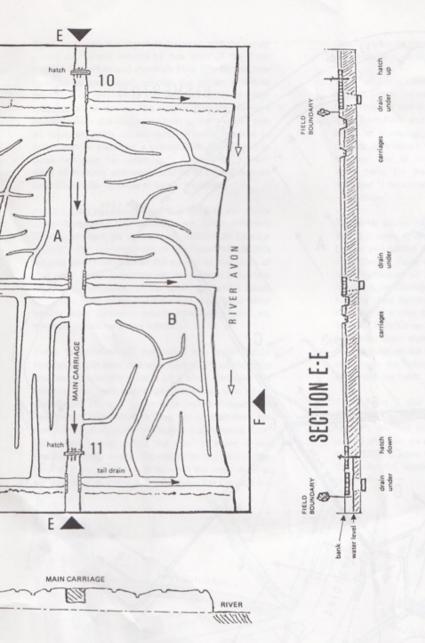


Below Point 8 the whole system widens. So far it has largely been confined to the left of the Main Carriage and Drains have recovered water directly into the river. Down stream from here the Drains on the right feed Tail Drains which in turn recover water to the river, running through culverts under the Main Carriage at Points 10, 11, 13 and 14 in order to do so. It is not clear whether the Tail Drain leaving the South West corner of Figure 2 eventually becomes a Carriage for a lower now disused section. (5). There is an independent Tail Drain between Points 10 and 11.

Below Point 11 the Main Carriage narrows until at Point 14 it is about a quarter of its original width. Any

residual water not required below the Carriage formed by the T junction is drained off at the single-paddle Hatch controlling the spillway into the Tail Drain at Point 14.

The area between Points 10 and 11 enlarged in Figure 4 shows more clearly the hierarchy of water courses — Main Carriage, Carriage, Carrier, Drain and Tail Drain. However the definition of each has to be qualified. While Carriages do not usually spill direct onto panes they do here — for example at Point A from the Main Carriage and at Point B from a Carriage; and at Point C a Carriage spills directly into an adjacent Tail Drain without any intervening drain.



The sections through this area shown in Figures 4a and 4b indicate the very slight gradient from the North to South but the greater drop from West to East to enable the Tail Drains to pass under the Main Carriage.

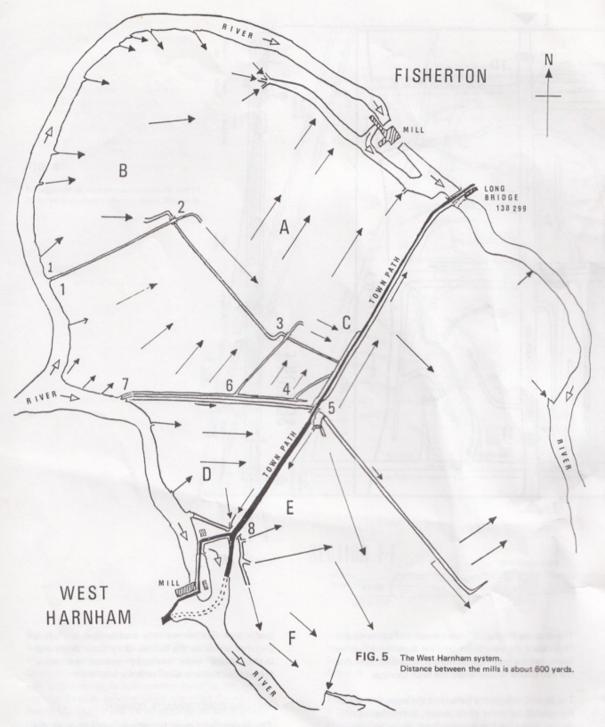
The Main Carriage, the banks and the bottom of which are natural for most of its length, is re-inforced with dressed stone and sometimes brick above and below the Hatches and where Tail Drains pass under it. The culverts carrying these appear to be of rectangular section and generally of stone construction.

The Main Carriage, when full, resembles a small river (Figure 2 has unnaturally straightened it) and the Tail

Drains look like normal field ditches especially when they run alongside the hedges. Only the Carriers and Drains appear more obviously unusual man-made features, particularly when recently emptied.

### NATURE CONSERVANCY COUNCIL

The system at Lower Woodford coincides with the larger part of the Lower Woodford Meadows Site of Special Scientific Interest (SSI). This was first scheduled in 1971 in recognition of the biological importance of the habitat associated with one of the last remaining examples of working irrigated water meadows.



### **WEST HARNHAM**

This system, only part of a formerly more extensive one along this stretch of the River Nadder, is illustrated in Figure 5. It is included because of unusual features and the fact that it is quickly and easily accessible from Salisbury. Most of what is described can be seen from

the Town Path which connects the city and West Harnham. The north west part of the area is shown as it was before the removal of Fisherton Mill and the construction of what is now Fisherton Island. Use of the system was stopped circa 1968.

Apart from a small element at the south end the Figure covers the 'Island' formed by two arms of the River Nadder, Fisherton and Harnham Mills (the former now replaced by two weirs) pre-date the system and their position thus determined the lowest points from which water could be drawn. The notable features therefore illustrate how the designers chose to carry water over an unusually wide system with virtually no drop to either east or west and a conventional fall of two or three feet over the north/south distance (6). Dimensions of Hatches and water courses in this system are generally similar to those at Lower Woodford.

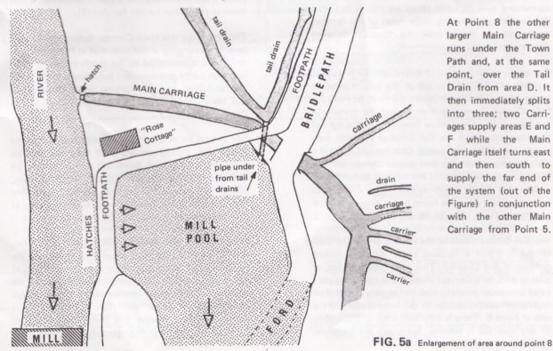
As at Lower Woodford there is a need to run drains under Carriages. The solutions are quite different. There is at Harnham one obvious visible Main Carriage passing under the mid point of the Town Path but this actually only feeds part of the system to the south of that path. There is another less obvious Main Carriage feeding the remainder of the south side which passes under the path at the Harnham end and several other smaller Main Carriages, mostly now lost, around the northern perimeter of the 'Island'.

These latter were all controlled by single paddle Hatches on the river and were thus much smaller than one would normally expect of a Main Carriage. The Hatches and their stone piers together with short stretches of stone or concrete or walled channel have now mostly been filled in with silt dredged from the river bed in the course of routine maintenance. One, still partly visible, leaves the river at Point 1 and eventually feeds area A. To reach this it is carried over the Tail Drain from area B by what the maps show as an 'aqueduct' at Point 2. At this point the Carriage is a concrete box section some nine feet wide with, at right angles under it, an eighteen inch pipe for the Drain.

This Tail Drain continues to Point 3 where it is again crossed by an 'aqueduct' before joining the spillways from Points 4 and 5, turning north-east, passing under the Town Path and rejoining the river. This second aqueduct is unusual and is illustrated on the cover. It consists of a square section (side 32 inch) iron trough fourteen feet in length bridging the Drain between stone piers. On the west side it has an oval plate inscribed 'J Armitage - Maker - Fisherton Iron Works - Salisbury'.

The water course crossing the aqueduct is a Carriage in that it is carrying water for area C but it also acted as a Carrier and spilled water along its own length. It was controlled at Point 6 either by a wooden Hatch that has disappeared or by a turf stop. Point 6 is on a narrow Main Carriage (now only a shallow depression) running close beside the wider Main Carriage which is still used as a river overflow. Both were controlled by adjacent Hatches on the river at Point 7 but the brick and stone lined channel of the former has been filled in. The ruins of the wider three-paddle Hatch are best seen from the other side of the river (from Middle Street playing field).

From Point 5 this wider of the two central Main Carriages, having passed under the Town Path, formerly divided in four directions of which three remain and two are visible. The field to the north-east was ploughed some years ago when pipes were laid to the industrial estate and all traces of the system removed.



At Point 8 the other larger Main Carriage runs under the Town Path and, at the same point, over the Tail Drain from area D. It then immediately splits into three; two Carriages supply areas E and F while the Main Carriage itself turns east and then south to supply the far end of the system (out of the Figure) in conjunction with the other Main Carriage from Point 5.

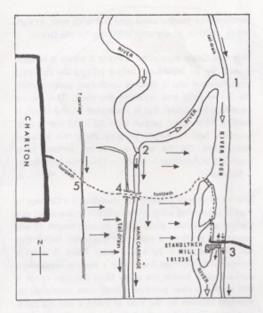


FIG. 6 Charlton to Standlynch Mill. Distance is about 700 yards.

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FIG. 7 Part of the Downton system.

Main Carriage is about 250 yards
from River.

### STANDLYNCH AND CHARLTON

This section is illustrated in Figure 6. Although long disused it nonetheless illustrates the way in which some features are incorporated in the modern river and agricultural systems while others are rapidly lost once the practice of drowning stops. Most of the features mentioned are visible from the footpath between Charlton and Standlynch.

The area is at the junction of several sections of floated meadow. At Point 1 the tail of the system between Longford and Standlynch rejoins the river. At Point 2 a Main Carriage leaves the river to feed the systems to the right down to and below Downton. To the right of this Main Carriage is the Tail Drain of a system, now largely lost, above and beside Charlton. At Point 3 a Main Carraige leaves the river beside Standlynch Mill (7) to supply the system to the left past Barford as far as Downton. All these systems date from the later 17th century; details are to be found in the Victoria History of Wiltshire (Vol. XI pp 55, 58, 65, 71, 75 and 77).

The Tail Drain crossed by the western of the two footbridges at Point 4 recovers water from the system between it and Charlton. This must have been fed, at least in part, by a Carriage (hierarchical status and start point uncertain) possibly now visible only as a shallow depression running parallel to the fence crossed by the stile at Point 5. There is little indication of this system on any map but it remains, overgrown but traceable, on the ground (8). The Tail Drain is some three feet below the level of the Main Carriage running from Point 2 but eventually feeds into it about half a mile down stream below further Hatches (9).

The flow into this Main Carriage (which would have been competing for water with that at Point 3 and the mill itself) is controlled by the Hatch at Point 2. This has been partly reconstructed but ironwork is marked 'B Dutch/War' and this marking recurs elsewhere on this Main Carriage near New Court Farm. (See 'The Dutch Connection'.)

The general lie of Carriers and Drains is shown in the Figure and throughout the area they can just be followed on the ground. Below this area the systems on both sides of the river are being lost to development, mainly fish farming but the Main Carriages controlled by Hatches at Points 2 and 3 survive as integral parts of that development.

Dimensions in this system reflect the much greater flow of water in the river below a confluence of the rivers Nadder, Ebble and Bourne with the Avon at Salisbury. The Main Carriages from Points 2 and 3 are up to thirty feet wide; Hatches and the ironwork are correspondingly larger and more substantial. The remaining water courses and their controls are of standard dimensions as illustrated at Lower Woodford.

### DOWNTON

A small part of the Downton system is illustrated in Figure 7. It is easily accessible from the centre of Downton and is included to show how an existing route could affect the development of a system.

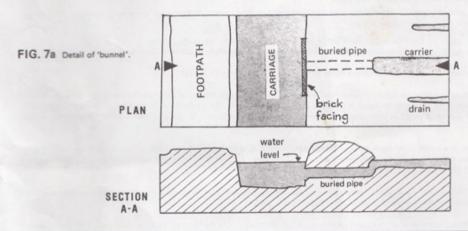
The direct pathway from Charlton to Downton, joining The Borough at Downton by the River Avon bridge is as old as the two settlements. Unlike the paths at Woodford, Harnham and Standlynch which join settlements on either side of the river this path is on the same axis at the river and, also unlike the other examples, affected the basic design of the system from the point where it crosses the Main Carriage from Charlton near New Court Farm. (This is the Main Carriage which originated in Figure 6 Point 2.) From this point the path runs diagonally between that Main Carriage and the river which are roughly parallel.

A Carriage left the Main Carriage at the same point and ran immediately alongside the east side of the path until it reached the river. Only the Southern part remains in its original form. In the area illustrated the triangular segment to the west of the path is watered in a normal way; the Carriers and Drains, mostly still to be traced, running generally south west into a Tail

Drain. Water could then be recovered through a triple hatch, at Point 1, back into the Main Carriage or, after turning east, under the path and into the river at Point 2. The Carriers were fed initially from several culverts (some possibly with a Hatch) running under the path.

To the east of the path the system shows two different sets of characteristics above and below a stone dam at Point 3 (10). Above the dam a single take-off point from the Carriage fed a further Carriage (thus a third level in the hierarchy) running parallel and to the left of it. This in turn fed Carriers and Drains from which water was recovered direct to the river.

Below the dam each individual Carrier is filled directly through a culvert, known locally as a bunnel. To the unaccustomed eye it looks from the dry system as if water runs from the Carrier on top of the ridge, westwards, through the culvert into the Carriage rather than the reverse. The section drawing in Figure 7a indicates how the water level has to be visualised. The culvert itself is a pipe of some twelve inch diameter set, at the Carriage end, in a brick facing. It is not clear why the simpler system north of the dam could not have been used. The maps show the system in fair detail to the west of the path but not at all to the east.



### NOTES

- There is apparently evidence that below Salisbury some of the floated systems were used from the beginning to support dairying (See article by N. Steel in Hatcher Review No. 12).
- 2. Country Life for 30 April '70 quoted a report that in 1958 there were 1930 acres still used in the traditional fashion in the Avon valley between Salisbury and the see; there had been some 560 acres in use but poorly maintained and some 880 acres derelict. It was estimated that a total of some 6500 acres had been irrigated in the past in this area.
- It is debatable whether the western and wider watercourse above the hatch is the original course of the river in view of the fact that the parish boundary runs along the eastern, narrower and lower course.
- The Drowner seems to have vied only with the Shepherd for superiority in the hierarchy of farm workers.

- It would be consistent with Davis' generalized description if this became a Carriage for a lower section.
- There is no published date for this system but it predates enclosure (c 1783) and the watercourses are closely reflected in later property, tenancy, field and parish boundaries.
- The Main Carriage does not pass through the mill as stated in the Victoria History of Wiltshire Volume XI p 71.
- The probable line of the Carriage does not appear on any map including the largest and earliest based on a survey date of c1874; the whole area is only superficially shown in contrast to the systems up and down stream which are mapped in detail.
- This is an example, although on a vastly different scale, of the illustration on p 57 of A Guide to the Industrial Archaeology of Wiltshire.
- This dam seems unlikely to be part of the original system and may have replaced a hatch.

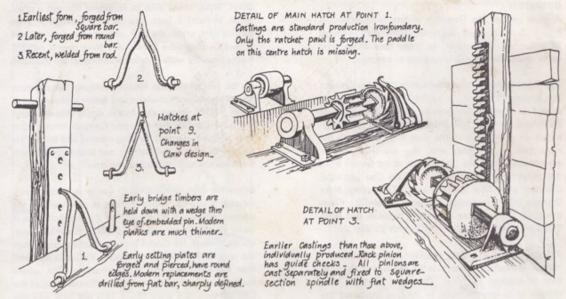


FIG. 8 Ironwork details at Lower Woodford.

### **BIBLIOGRAPHICAL NOTES**

The subject is well but repetitively covered in general terms but lacks published work on specific examples. The basis of much modern work is three articles:

Kerridge E. - The Floating of the Wiltshire Water Meadows - WAM Volume 55 (1953)

Kerridge E. — The Sheepfold in Wiltshire and the Floating of the Water Meadows — Economic History Review Volume 6 (1954)

Atwood - A Study of Wiltshire Water Meadows - WAM Volume 58 (1963)

Much of the detail of the first two articles is repeated in *The Victoria History of Wiltshire* Volume 4 but the most comprehensive work is now to be found in Chapters 2 and 6 of Kerridge E. *The Agricultural Revolution* — Allen and Unwin 1967. This also has a very full bibliography including all the early treatises and, in the footnotes, a mass of references to local primary sources — although few of relevance to the systems described here.

There is a summary of the subject in Bettey J.H. — Rural Life in Wessex 1500 - 1900 — Moonraker Press 1977 and Dr. Bettey also contributes the entry on agriculture which covers the topic in A Guide to Industrial Archaeology of Wiltshire — WCC Library and Museum Service 1978.

The Institute of Agricultural History (co-located with the University of Reading) holds or has access to most published material and also has a collection of photographs and cuttings.

Anecdotal material of any substance is limited. Ralph Whitlock in *The Folklore of Wiltshire* (Batsford 1976) has references to the sheep/corn aspects but not to drowning. W.H. Hudson in his well-known *A Shepherd's Life* (Futura Edition 1979) is writing mainly about Martin which has no floated meadows and does not refer to them. Similarly, in *Damerham and Martin* — a study in local history by E.H. Lane-Poole (Compton Russell 1976) there is a comprehensive local study of sheepfarming which did not incorporate the floated meadow system. However, useful descriptions of a drowner's work, albeit in the 20th Century and in the context of cattle are contained in two works by A.G. Street: *Round the Year on the Farm* (1935, reprinted OUP 1946) pages 30/31 and 69 and *Farmer's Glory* (many editions) Part 1 Chapter 5.

### **ACKNOWLEDGEMENTS**

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The Series is edited by Antony Barrington-Brown, Turner's Chapel, Weaveland Road, Tisbury, Wilts. Tel: Tisbury 870500.