

THE ASSOCIATION OF DRAINAGE AUTHORITIES

312 Normanton Road,
Derby.

DE3 6WE

31st January, 1968.

Circulation:
All Members.

Dear Sir,

Engineering Technical Sub-Committee Report

1. The Executive Committee, when approving the enclosed Second Report of the Engineering Technical Sub-Committee, congratulated that body upon the production of a most informative Report which it now commends for the consideration of your Board.
2. To facilitate the future work of the Sub-Committee, a Technical Secretary has been appointed, namely:—

Mr. W. D. Miles,
Engineer to Deeping Fen,
Deeping House, Welland Terrace,
Spalding, Lincolnshire.

and in future all correspondence concerning this Sub-Committee should be sent direct to him.

3. The Executive Committee, in thanking Members who submitted the information upon which the Report is based, draws particular attention to Paragraph 5; because if the Sub-Committee is to be of the most service to the Association, it is essential that Member Boards should put forward their suggestions for its future activities.
4. All such suggestions and questions, together with information on new machines and methods not already mentioned, should be sent to Mr. Miles as soon as possible. Those received by the end of April will be considered in time for a further Report to the Annual Conference on the 13th June.
5. Additional copies of the Report can be obtained from me upon payment of 3/- per copy. Cheque to A.D.A. sent with order.

Yours faithfully,

R. C. Treadgold,

Secretary.

ASSOCIATION OF DRAINAGE AUTHORITIES

SECOND REPORT OF ENGINEERING TECHNICAL SUB-COMMITTEE

1. The Sub-committee was convened under the Chairmanship of Captain P. H. E. Welby-Everard to implement the resolution passed at the 1967 Conference to provide a clearing house for the dissemination of information on new methods of land drainage engineering work and maintenance. The following engineers were initially invited to form the Sub-committee:—

| | |
|--------------------|------------------------|
| J. Barnatt .. | Upper Witham I.D.B. |
| T. A. D. Farran .. | Went I.D.B. and others |
| L. F. Fillenham .. | Middle Level I.D.B. |
| W. D. Miles .. | Deeping Fen I.D.B. |
| P. J. Stamp .. | North Welland I.D.B. |

and all except Mr. Fillenham were able to attend meetings held.

In addition L. C. Fitchett .. Upper Medway I.D.B.
and T. T. Hodges .. South Gloucestershire I.D.B.

were asked to represent the South East and South West respectively but not to attend the first meeting. Mr. Hodges attended the second meeting but Mr. Fitchett was unable to do so because of illness.

2. In considering its terms of reference the Sub-committee was unanimously of the opinion that its activities must necessarily be limited to providing a means of exchange of information between member Boards; in particular the Sub-committee could make no attempt

(i) to provide any comprehensive lists of machinery or of the manufacturers of machinery, suitable for land drainage purposes nor

(ii) to recommend any particular machine or method for any particular purpose.

3. The value to be obtained from such an engineering 'clearing house' is therefore wholly dependent upon the information supplied by member Boards and for this reason the Sub-committee's first action was to circulate a questionnaire to all Boards; from the returns received, machines and methods actually in use by individual Boards could be listed, together with brief descriptions of their purpose, so that a Board interested in a particular machine or method could apply direct to the user Board for detailed information.

The variations in conditions throughout the country, and the difference in the problems presented to large and small Boards, are such that only the Board concerned can decide whether any particular machine or method will suit its own purpose; the Sub-committee is not therefore in a position to make recommendations.

4. Completed questionnaires received from 136 Boards have been summarised by the Sub-committee and an Analysis on a regional basis is attached as Appendix A together with some observations on the Analysis as Appendix B. In Appendix C the mechanical equipment and chemicals at present in use have been tabulated against the Boards using them so that member Boards wishing to obtain further information about any item can readily see which is the nearest Board with experience in its use.

5. The Sub-committee appreciates that this report is but the first stage and that there is scope for giving further help to member Boards in this field. With this in mind suggestions will be welcomed from individual Boards on any particular problems that might be investigated.

P. H. E. WELBY-EVERARD,
Chairman.

November, 1967.

APPENDIX 'A'

1. Number of 'Returns' received
(Number of Boards)
2. Area of Districts
3. Number of men employed on maintenance work:—*Direct Labour*: Unskilled ..
Skilled ..
Contract: Unskilled ..
Skilled ..
4. Is difficulty experienced in obtaining the labour force?
5. Length of watercourse maintained:
(a) Ditches (4 feet deep and less)
(b) Main Tributary drains (6 feet deep)
(c) Main Drains (over 8 feet wide waterway)
6. Is weed-cutting carried out once or twice per year?
7. Approximate cost of weed-cutting per chain:
(a) Ditches
(b) Main tributary drains
(c) Main drains
8. Method of weed-cutting or control—*Hand labour (scythe)*: Ditches ..
Tributary drains ..
Main drains ..
Mechanically: Ditches ..
Tributary drain ..
Main drains ..
Chemically: Ditches ..
Tributary drains ..
Main drains ..
9. (a) Mechanical equipment used on Weed-cutting and Vegetation Control ..

(b) Chemicals used on Weed and Vegetation Control
10. Methods of cleansing watercourses

Analysis of the Returns of Member Boards to the Questionnaire

1. FENS

41
(46)
Varying from 230 to 172,000 acres
Total area: 874,328 acres.
327
87
26
Nil.
Yes: 18 Returns. No: 23 Returns.

342 miles approx.
1,643 miles approx.
1,042 miles approx.
17 twice. 22 once.
1 part once and part twice. 1 Nil.

Varying from 3/- per chain twice per yr.
to 13/6 per chain once.
Varying from 5/- per chain twice per yr.
to 25/- per chain once.
Varying from 7/6 per chain twice per yr.
to 30/- per chain once.
249 miles approx.
1,390 miles approx.
656 miles approx.
80 miles approx.
220 miles approx.
350 miles approx.
50 miles approx.
163 miles approx.
262 miles approx.

| | Used by Number of Boards |
|-----------------------------|-----------------------------|
| Howard & Dennis Weed-cutter | 6 |
| Wilder-Powell Weed-cutter | 2 |
| Barford Rotary Cutter | 3 |
| Lupat Bank-cutter | 1 |
| Allen Motor Scythe | 1 |
| Trioxone | 1 |
| Methoxone | 1 |
| Econal | 3 |
| Delacide | 3 |
| Reglone | 2 |
| Copper Sulphate | 8 |
| Grass Retarder | 3 |
| Regulox | 1 |
| Dalapon and Dowpon | 9 |
| B.B.H. 43 | 2 |
| M.C.P.A. | 2 |
| Gramoxone | 3 |
| 2,4-D | 2 |
| Barford Ditcher | 1 |
| Draglines | 27 |
| Priestman Beaver | 6 |
| Smith Hydraulic Excavator | 1 |
| J.C.B. | 1 |

2. NORTH

28
(43)
Varying from 1,378 to 70,200 acres
489,359 acres
213
57
42
9
Yes: 18 Returns. No: 10 Returns.

373 miles approx.
1,148 miles approx.
534 miles approx.
5 twice. 20 once. 3 Nil.

Varying from 4/6 per chain twice per yr.
to 28/- per chain once.
Varying from 5/6 per chain twice per yr.
to 40/- per chain once.
Varying from 10/- per chain twice per yr.
to 80/- per chain once.
347 miles approx.
856 miles approx.
328 miles approx.
7 miles approx.
135 miles approx.
70 miles approx.
11 miles approx.
102 miles approx.
120 miles approx.

| | Used by Number of Boards |
|-------------------------------------|-----------------------------|
| Allen Motor Scythe | 1 |
| Lupat Bank Cutter | 2 |
| Power-driven Rotary Hedge-cutter | 1 |
| Floating Weed Elevators | 1 |
| Howard & Dennis Weed-cutter | 1 |
| Weedagol T-L | 1 |
| Shell D.50 | 1 |
| Aquacide | 1 |
| Bordermaster | 2 |
| Regulox | 2 |
| Dalapon and Dowpon | 5 |
| Reglone | 2 |
| Gramoxone | 1 |
| Draglines | 18 |
| Priestman Beaver | 1 |
| J.C.B. Excavators | 3 |
| 3 R.B. Hydraulic Excavator | 1 |
| Massey Ferguson Ditcher | 2 |
| Smith Hydraulic Excavator | 4 |
| Webb '360' Universal Ditcher | 1 |

Analysis of the Returns of Member Boards to the Questionnaire sent out by the Technical Sub-Committee

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41
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Varying from 230 to 172,000 acres
Total area: 874,328 acres.

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87
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350 miles approx.
50 miles approx.
163 miles approx.
262 miles approx.

| | Used by Number of Boards |
|-----------------------------|-----------------------------|
| Howard & Dennis Weed-cutter | 6 |
| Wilder-Powell Weed-cutter | 2 |
| Barford Rotary Cutter | 3 |
| Lupat Bank-cutter | 1 |
| Allen Motor Scythe | 1 |

| | |
|--------------------|---|
| Trioxone | 1 |
| Methoxone | 1 |
| Econal | 3 |
| Delacide | 3 |
| Reglone | 2 |
| Copper Sulphate | 8 |
| Grass Retarder | 3 |
| Regulox | 1 |
| Dalapon and Dowpon | 9 |
| B.B.H. 43 | 2 |
| M.C.P.A. | 2 |
| Gramoxone | 3 |
| 2,4-D | 2 |

| | |
|---------------------------|----|
| Barford Ditcher | 1 |
| Draglines | 27 |
| Priestman Beaver | 6 |
| Smith Hydraulic Excavator | 1 |
| J.C.B. | 1 |

2. NORTH

28
(43)
Varying from 1,378 to 70,200 acres
489,359 acres

213
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42
9

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534 miles approx.
5 twice, 20 once, 3 nil.

Varying from 4/6 per chain twice per yr.
to 28/- per chain once.
Varying from 5/6 per chain twice per yr.
to 40/- per chain once.
Varying from 10/- per chain twice per yr.
to 80/- per chain once.

347 miles approx.
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11 miles approx.
102 miles approx.
120 miles approx.

| | Used by Number of Boards |
|-------------------------------------|-----------------------------|
| Allen Motor Scythe | 1 |
| Lupat Bank Cutter | 2 |
| Power-driven Rotary Hedge-cutter | 1 |
| Floating Weed Elevators | 1 |
| Howard & Dennis Weed-cutter | 1 |
| Weedagol T-L | 1 |
| Shell D.50 | 1 |
| Aquacide | 1 |
| Bordermaster | 2 |
| Regulox | 2 |
| Dalapon and Dowpon | 5 |
| Reglone | 2 |
| Gramoxone | 1 |

| | |
|------------------------------|----|
| Draglines | 18 |
| Priestman Beaver | 1 |
| J.C.B. Excavators | 3 |
| 3 R.B. Hydraulic Excavator | 1 |
| Massey Ferguson Ditcher | 2 |
| Smith Hydraulic Excavator | 4 |
| Webb '360' Universal Ditcher | 1 |

3. SOUTH-EAST

11
(29)
Varying from 1,509 to 34,379 acres
259,881 acres.

251
81
34
0

Yes: 7 Returns. No: 4 Returns.

56 miles approx.
505 miles approx.
806 miles approx.
2 twice, 9 once.

Varying from 10/- per chain twice per yr.
to 15/- per chain once.
Varying from 10/- per chain twice per yr.
to 21/- per chain once.
Varying from 9/3 per chain twice per yr.
to 21/6 per chain once.

49 miles approx.
383 miles approx.
631 miles approx.
7 miles approx.
120 miles approx.
133 miles approx.
10 miles approx.
95 miles approx.
147 miles approx.

| | Used by Number of Boards |
|-----------------------------|-----------------------------|
| Bomford Flail Mower | 1 |
| Lupat Bankcutter | 1 |
| Wilder-Powell Weed Launch | 1 |
| McConnell Cutter | 1 |
| Howard & Dennis Weed-cutter | 1 |
| Bomford Mott Rotary Mower | 2 |
| Dalapon and Dowpon | 9 |
| Dalacide | 2 |
| 2,4-D | 3 |
| Gramoxone | 1 |

| | |
|---------------------------|----|
| Draglines | 11 |
| Priestman Beaver | 7 |
| Barford Ditcher | 1 |
| J.C.B. Excavator | 1 |
| Hy-Mac Excavator | 1 |
| Smith Hydraulic Excavator | 1 |

4. SOUTH-WESTERN

8
(18)
Varying from 2,500 to 40,000 acres
152,457 acres.

42
21
51
3

Yes: 5 Returns. No: 3 Returns.

101 miles approx.
403 miles approx.
63 miles approx.
3 twice, 2 once, 3 part once part twice.

Varying from 5/- per chain twice per yr.
to 16/9 per chain once.
Varying from 3/6 per chain twice per yr.
to 16/9 per chain once.
Varying from 9/- per chain twice per yr.
to 16/9 per chain once.

24 miles approx.
203 miles approx.
10 miles approx.
77 miles approx.
119 miles approx.
51 miles approx.
Nil miles approx.
94 miles approx.
30 miles approx.

NOTE: In many cases
chemicals are
used in con-
junction with
machines or
hand-labour.

| | Used by Number of Boards |
|------------------------------------|-----------------------------|
| Bomford Hedge-maker Weed-cutter | 1 |
| Fleming Hydraulic Cutter | 1 |
| Dalapon and Dowpon | 1 |
| Weedazol T-L | 1 |
| Delacide | 1 |
| 2,4-D | 1 |
| Aquacide | 1 |

| | |
|------------------------------|---|
| Draglines | 4 |
| Smith 12 Hydraulic Excavator | 1 |
| Fleming 9H Hydraulic Ditcher | 1 |

SECOND REPORT OF ENGINEERING TECHNICAL SUB-COMMITTEE

OBSERVATIONS ON THE ANALYSIS OF RETURNS

Weed and Vegetation Control

The analysis of 'Returns' shows that the large majority of this work is still undertaken by hand-labour methods (scythes). It is evident that the growing shortage of labour available for this type of work is creating an increasingly urgent need for the development of new labour-saving techniques.

1. Mechanical Cutting of the Banks

An assortment of mowing machines are used for cutting the weeds and grass on the bank. Where access is possible along the top of the bank, tractor-mounted mowers, including flail and rotary types on arms that reach to some distance from the tractor are used. Of these, the Lupat flail type mower and the Barford rotary cutter, are being operated by a number of Boards. Information on the capabilities of these machines can be obtained from the Upper Medway Internal Drainage Board and the South Holland Drainage Board respectively.

The South Gloucestershire Internal Drainage Board operate three tractor mounted units, two Bomford 'Hedge-maker' weedcutters, and a Fleming 9H hydraulic cutter. The Hedgemaker comprises a twenty-foot long boom with a 'Petter' engine on one end, with a belt drive to the cutting head on the other. It is mounted on the front of the tractor. A five-foot cutter bar is used to trim the banks and an eighteen-inch cutter extension is fitted to cut the weed in the bed of the watercourse. The Fleming 9H has an hydraulic arm with a reach of fifteen feet, and a hydraulic motor at the end to drive either a cutter bar, or a ditching bucket.

2. Mechanical Cutting of the Waterway

(a) The most commonly used machine is the Howard and Dennis Weedcutting Launch which has been available for many years. The cutting mechanism is a serrated V-shaped knife attached to the stern of the boat, which can be lowered into the water to the required depth of cut. The launch is propelled and steered by an efficient system of paddles at the forward end which do not become fouled by cut or floating weeds. A number of different models are available with cutting widths from 3 ft. to 24 ft.

(b) A relatively new machine for this type of work is the Wilder/Powell aquatic mower. It has a wide U-shaped spring-steel blade mounted on the stern of a light-weight fibre-glass boat. Its main advantages are the curved reciprocating cutter bar that cuts the plants

cleanly and can be raised, lowered and tilted while operating to meet unevenness in the channel and even to cut weeds on the lower part of the bank. It has an 8-foot wide cut and can operate in 12 inches of water. Its lightness enables it to be moved easily from channel to channel. The boat has recently been modified and is now available with paddle propulsion and with complete hydraulic control. Particulars can be obtained from the manufacturers, Messrs. John Wilder, Ltd., Wallingford, Nr. Oxford, Berks. The Deeping Fen Internal Drainage Board is using one of these machines and will be pleased to give information on its capabilities.

(c) The S.B. Water Weedcutter, supplied by Watermill Trout Farms, Ltd., Westgate Mill, Louth, Lincolnshire, has recently become available. The mechanism is quite simple and the cost is approximately 175 guineas.

The water weedcutter is mounted by two clamps onto the gunwhales of a boat, the cutting blades being driven by a 120 c.c. Villiers four-stroke engine which is very economical. By simple adjustments, the operating depth of the blades is easily altered, this depth being between 2 ft. and 5 ft. below the surface of the water. In operation, the machine cuts a 9-foot swathe at the rate of up to 3 m.p.h.

Propulsion of the boat should be by an outboard or inboard engine of between five and fifteen horse-power with non-fouling propellers. Johnson and Evinrude motors are found to be the most suitable. If required suitable boats or fishing punts can be supplied by the manufacturers, the ideal boat costing approximately 125 guineas (a light but rugged boat is essential).

3. The removal of weeds from a watercourse.

(a) Quite a number of Boards use a specially designed rake or drag attached to a dragline for the removal of algae (blanket weed) or dead weeds from the bed of a watercourse. The rake being about 6 feet wide with 2 feet long curved teeth. This method is very effective and, depending on easy access, the dragline can cover a considerable distance per working day.

(b) In the larger channels, cut weeds are allowed to float down to a boom placed at a convenient point, where they are removed by mechanical weed elevators or draglines with rake attachments. One Board uses an Allen Truck Mounted Crane for this purpose.

4. Chemicals used on weeds and vegetation control.

In recent years certain chemicals have been adopted as a routine measure of control, but most are still in the experimental stage. Only those herbicides that have been cleared under the Pesticides Safety

sent out by the Technical Sub-Committee

3. SOUTH-EAST

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259,881 acres.

251
81
34
0

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505 miles approx.
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| | Used by Number of Boards |
|-----------------------------|-----------------------------|
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| Lupat Bankcutter | 1 |
| Wilder-Powell Weed Launch | 1 |
| McConnell Cutter | 1 |
| Howard & Dennis Weed-cutter | 1 |
| Bomford Mott Rotary Mower | 2 |
| Dalapon and Dowpon | 9 |
| Dalacide | 2 |
| 2,4-D | 3 |
| Gramoxone | 1 |

| | |
|---------------------------|----|
| Draglines | 11 |
| Priestman Beaver | 7 |
| Barford Ditcher | 1 |
| J.C.B. Excavator | 1 |
| Hy-Mac Excavator | 1 |
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4. SOUTH-WESTERN

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Varying from 9/- per chain twice per yr.
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24 miles approx.
203 miles approx. NOTE: In many cases
10 miles approx. chemicals are
77 miles approx. used in con-
119 miles approx. junction with
51 miles approx. machines or
Nil miles approx. hand - labour.
94 miles approx.
30 miles approx.

| | Used by Number of Boards |
|--------------------------|-----------------------------|
| Bomford Hedge-maker | |
| Weed-cutter | 1 |
| Fleming Hydraulic Cutter | 1 |
| Dalapon and Dowpon | 1 |
| Weedazol T-L | 1 |
| Delacide | 1 |
| 2,4-D | 1 |
| Aquacide | 1 |

| | |
|------------------------------|---|
| Draglines | 4 |
| Smith 12 Hydraulic Excavator | 1 |
| Fleming 9H Hydraulic Ditcher | 1 |

Precautions Scheme for use in water should be used on aquatic weeds. It is understood that these include Dalapon, 2,4-D., Gramoxone and Maleic Hydrazide (Growth Retardant). In all cases where the use of chemicals is contemplated reference should be made to the Code of Practice and the Agricultural Chemicals Approved Scheme issued by the Ministry of Agriculture, Fisheries and Food.

(a) Dalapon

Dalapon appears to be used extensively, mainly for the control of *Phragmites communis* (common reed). Spraying is usually done in July and August and the treatment is normally effective for two or three seasons or longer.

(b) The Upper Medway Internal Drainage Board consider it has gone beyond the stage of experimentation with weed control by chemical means and are operating quite successfully power sprayers using Dalapon and Gramoxone and selectively 2,4,5.T. The chemicals are changed alternate years to ensure that the plant growth does not become resistant to any one type of chemical.

This Board has recently fitted to a long-armed Lupat Bankmaster, an Allman spray unit with a spray boom attachment to the flail head of the mower. This machine is now a self-contained unit and, subject to access being available without undue detour, can effectively deal with three to five miles of watercourse per day. The work this machine would do in that period would be to mow both banks of the watercourse and spray the emergent weed growing in the bed of the channel.

(c) 2,4-D/Maleic Hydrazide

(Combined herbicide/grass growth regulator)
(BBH 43 supplied by Burt, Boulton and Haywood Ltd.)

This chemical is used to control the growth of grasses and weeds on the batters of watercourses and on flood banks. The rate of application is 2½ gallons of chemicals in 100 gallons of water applied to one acre (1 mile of batter 8 ft. wide).

The Upper Witham I.D.B. have constructed a trailer unit for attachment to a tractor on which is mounted a 200 gallon tank and a diaphragm pump discharging 1,000 gallons per hour. Hand-operated light-weight lances are used with one flood jet nozzle to each lance, each lance being fitted with a pressure gauge. Supporting arms are provided to carry the hoses clear of fences, hedges, etc. and both batters of a drain may be sprayed at the same time.

The correct spraying pressure is 20 lb. per sq. inch at the lance head and a constant check is obtained by reference to the pressure gauge on each lance. The flood jet nozzle used will cover a width of up to 10 feet at each pass and is held about 15 inches above the vegetation.

With proper application weeds are killed and grass growth is suppressed over a period of from 8 to 10 weeks. Spraying is carried out between March and mid April if weather conditions permit. To obtain the best results it is essential that the treatment is carried out over a number of years.

The average cost per acre, including chemical, plant and labour, is £7 6s. 2d. per acre and is equivalent to 3/8 per chain for spraying both batters of a drain, each batter being treated over a width of 8 feet.

(d) *Brushwood Killer*
(Econal 2.4.5.—T/2.4-D) (Burt, Boulton and Haywood, Ltd.)

This chemical is used to kill bushes and roots on drain banks as an alternative to hand cutting and particularly to prevent re-growth from roots. Tree stumps may also be killed.

Econal is normally mixed with diesel oil as per manufacturer's recommendations and is applied by knapsack sprayer.

(e) *Copper Sulphate*

The Deeping Fen Internal Drainage Board has adopted regular copper sulphate treatment as a routine control measure for filamentous algae, known as 'blanket weed' or 'cott', in thirty miles of large drainage channel. It is maintained in the spring at a level of at least 1 p.p.m. copper for a period of seven days and this may be repeated later if there are signs of the algae developing. It is applied by towing bags containing the chemical through the water by motor boat.

5. Biological Method

(i) At Deeping Fen, where the batter of a watercourse and adjoining flood bank is of some area, 'Spring-wire' back fencing has been erected and the resulting area let for sheep grazing. The sheep have controlled the growth of grass and reeds very successfully.

(ii) As a point of interest, the possibility of using fish, the herbivorous Chinese grass carp (*Ctenopharyngodon idella*) in British waters is being considered by the Freshwater Fisheries Department of the Ministry of Agriculture, Fisheries and Food and the A.R.C. Weed Research Organisation. In initial field trials the Chinese grass carp has shown promise against submerged weeds and has kept Canadian pondweed in check by defoliation. During four months they gained on average 50% in length and 300% in weight (Pentelow, 1964).

6. Methods of cleansing or improving watercourses.

It is assumed that all Boards are familiar with the numerous makes of dragline excavators, which are used by many Boards to undertake this type of work.

(a) *Hydraulic Diggers*
Track Machines

In recent years these machines are being used more extensively by drainage authorities. The Priestman Beaver hydraulic digger, designed specially for land drainage work, is being used by a number of Boards. Although this machine has not the 'reach' of a dragline excavator, it has many advantages, particularly on maintenance and excavation work where a 'reach' in excess of 26 feet is not required. The positive nature of the digging control gives a high output of work where the machine is in the hands of a skilled operator. With the special extension drainage arm and 6-ft. bucket, it can be worked over hedges and fences up to 4 ft. 6 in. high and in watercourses up to 6 ft. bottom width, with 12 in. to 18 in. of sludge, the machine can cleanse at least one mile per week.

The Smith Hydraulic Excavator is used by a number of Boards in the North.

(b) *Wheeled Machines*

Hydraulically operated J.C.B. Excavators and similar are used for cleansing smaller watercourses. The machines' mobility is a big advantage in moving from site to site.

(c) *Tractor Mounted Units*
Massey-Ferguson Digger/Loader.

The medium sized 2,203 tractor, 207 loader, 220 digger with ditch cleansing bucket manufactured by Messrs. Massey-Ferguson has proved to be a useful machine for the maintenance of minor watercourses and for the trimming of batters on improvement schemes. The 4 ft. bucket can be used effectively for cutting purposes and with the addition of two 1 ft. sections at each end a 6-ft. sludge bucket is available. With batters of $1\frac{1}{4}$ to 1 to $1\frac{1}{2}$ to 1 the limiting depth of ditch would appear to be approximately 6 ft.

In this field there are also the Barford Ditcher and the Fleming 9H Hydraulic Ditcher.

POSTSCRIPT.

Weed and Vegetation Control

Messrs. Priestman Bros. Ltd. of Hull, the excavator manufacturers, have very recently demonstrated a HERDER (Dutch design) weed and grass cutter which can be attached to the Priestman Beaver or Mustang machines.

It consists of an 8-ft. long cutter blade, hydraulically operated, attached to which is a steel basket or cage for collecting and removing the cut weeds, etc. Depending upon the 'reach' of the machine, the

cutter can efficiently cut down the opposite 'batter' of a watercourse, across the bed of the channel (under the water) and up the 'batter' on the machine side. It is estimated that the weeds and vegetation in a watercourse, approximately 26 ft. wide at the top and 8 to 10 ft. deep, can be cut and removed efficiently at the rate of approximately 5 to 6 chains per hour.

There appears to be no reason why the cutter blade cannot be widened to say 12 feet, which would increase the 'out-put' further.

Without doubt this machine is a very big 'step-forward' in the mechanisation of watercourse maintenance.

Hydraulic Excavators on Wheels

A new type of excavator has now become available. They are in effect true hydraulic excavators on wheels and from demonstrations appear to be as stable and as mobile over rough ground as 'tracked' machines, but have the added advantage of being able to travel from site to site under their own power, at speeds of up to 15 m.p.h. Manufacturers are Priestman, Smith, Hy-Mac and Poclain, together with some other continental manufacturers.

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