EARLY DAYS OF HYDROMETRY

Professor John C. Rodda

CEH Fellow

Streamflow data are required for:

- Design and operation of water supply systems
- Control of pollution
- Design of highway bridges and culverts
- Management of flood plains
- Forecast and management of floods
- Production of power—hydro and thermal
- Design and maintenance of canals
- Allocation of water for competing uses
- Development of recreational facilities

R.W. Herschy in :Hydrometry---principles and practices
1st Edition 1978

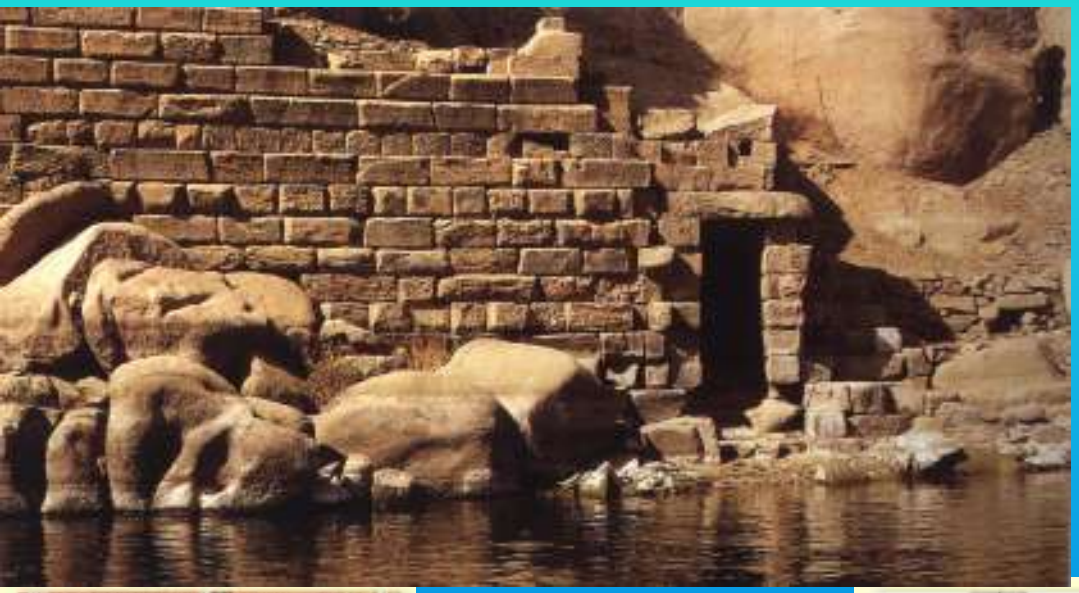
Requirements for streamflow data emerging since 1978

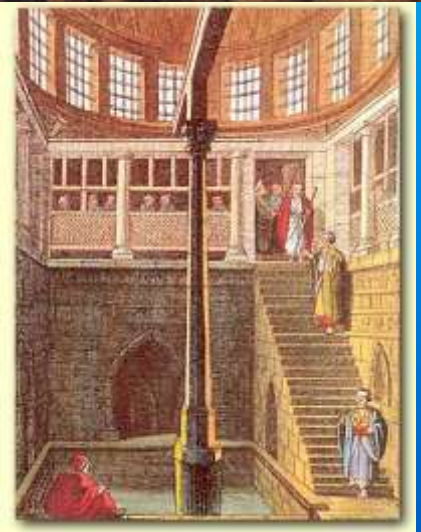
- Acid rain studies
- Environmental obligations
- Insurance purposes
- Development control
- Climate modelling
- Low head hydropower investigations
- Others

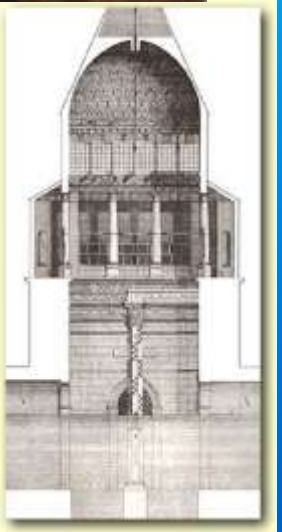
Where did it start?

- Egypt 3000BC
- Mesopotamia
- Indus
- Sri Lanka
- China 500AD
- Other early civilisations?
- Incas
- Mayan
- Aztec 1500AD

Nilometers







Roman Water Supply Engineering

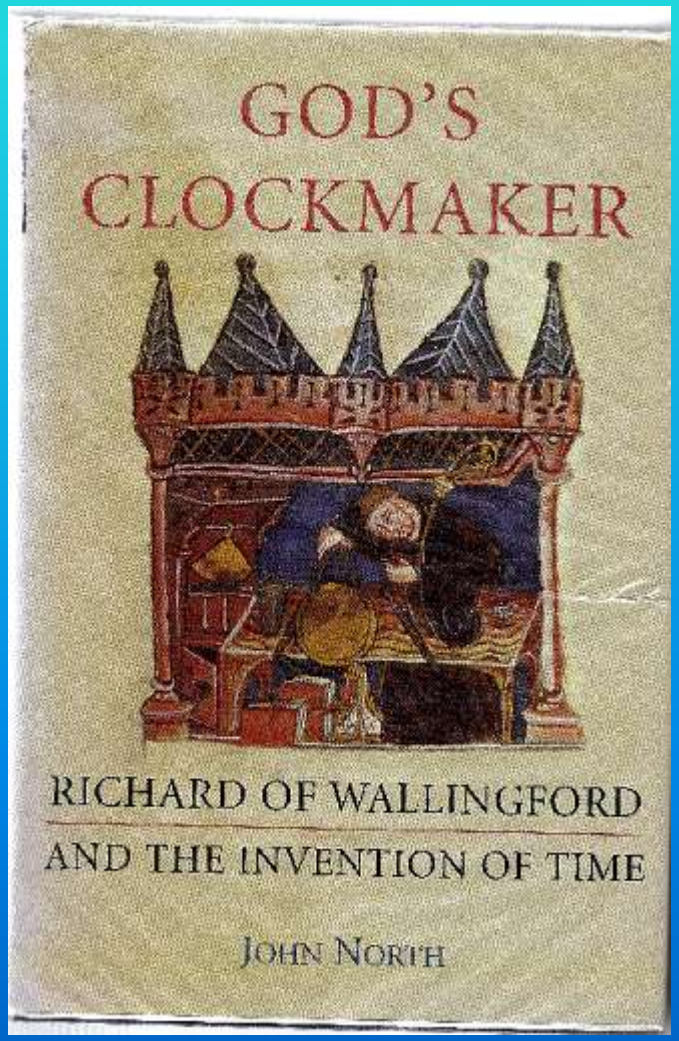
The remains of a Roman Sewer

No Flow Measurements!

- *"Although many of the ancient civilisations depended for their wealth and power on the conservation and control of water for irrigation, it is remarkable that flow measurements were based solely on water level and duration of flow. Discharge was assumed to be a function of the cross sectional area of flow only, the influence of speed on flow was not considered . Even the Romans, excellent practical engineers, continued in this severely limited approach"*

F.G. Charlton, Chapter 2: Current Meters, in: Hydrometry–Principles and Practices, 1978.

Measuring Time



The Start of Scientific Hydrology

C.N.F.S.H.

Comité National Français des Sciences Hydrologiques
Commission de terminologie

Série : Textes fondateurs de l'hydrologie n°2

De l'origine des fontaines

Pierre PERRAULT
1674

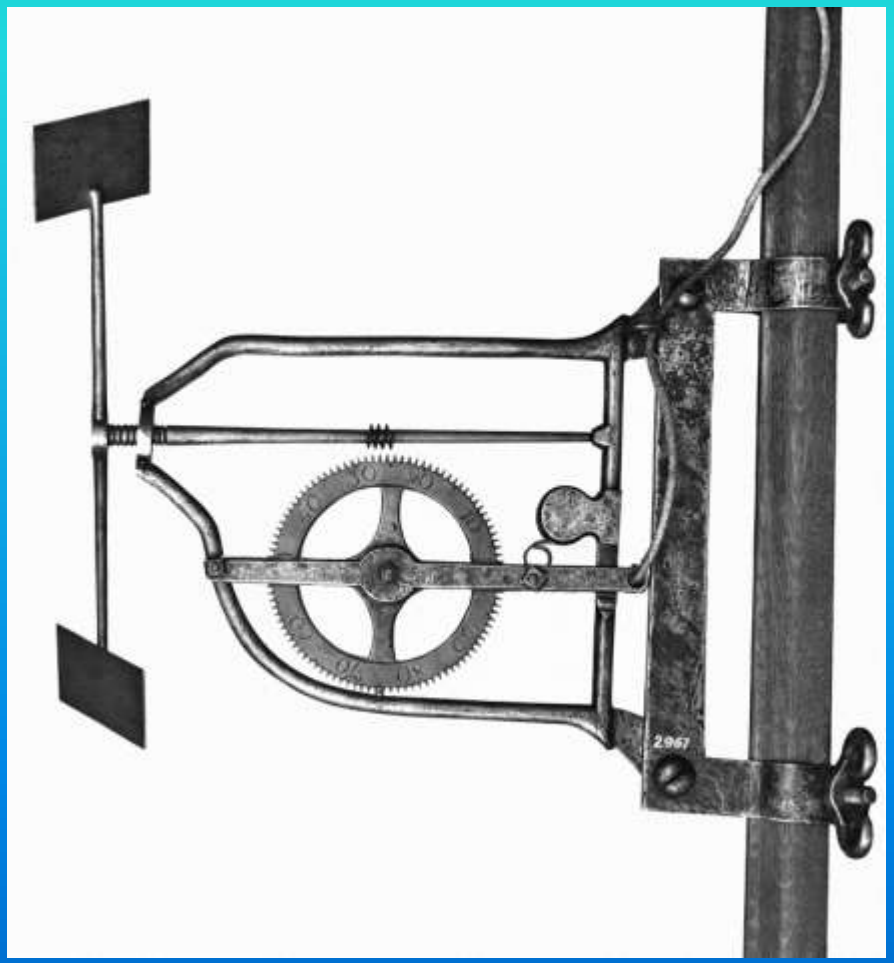
IAHS AISH

Who invented the Current Meter?

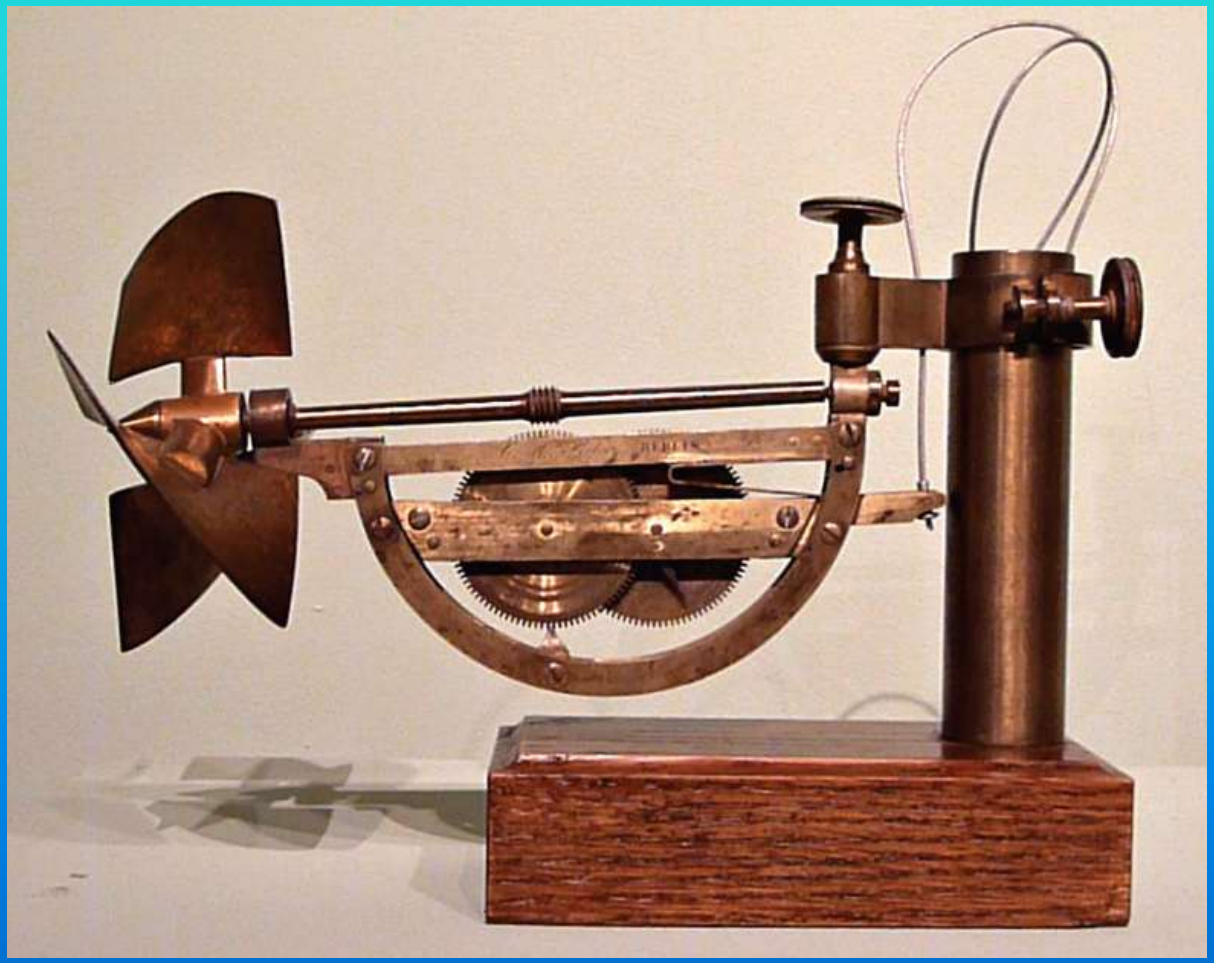
- Leonardo da Vinci, Gallileo, Castelli, Hooke,
- Marsigli, Michelotti, De Saumorez, Smeaton, Woltman, Baumgartner, Cabral , Herschell, Henry, Ott, Price, etc, etc, etc.

- Floats, Helixes, Balances, Pendulums, Tubes, Paddles, Propellers,

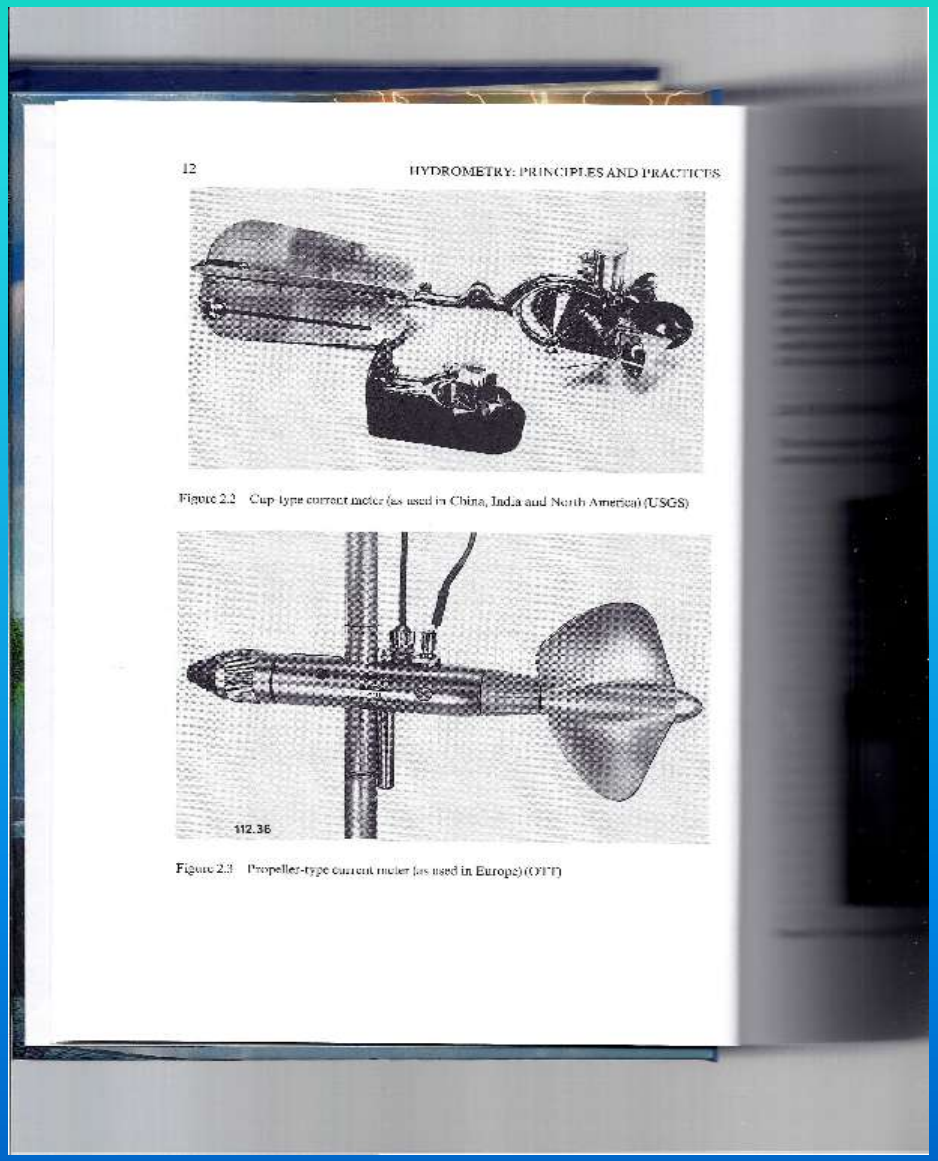
An Early Current Meter



A German Current Meter



Contemporary Current Meters



12 HYDROMETRY: PRINCIPLES AND PRACTICES

Figure 2.2 Cup-type current meter (as used in China, India and North America) (USGS)

112.36

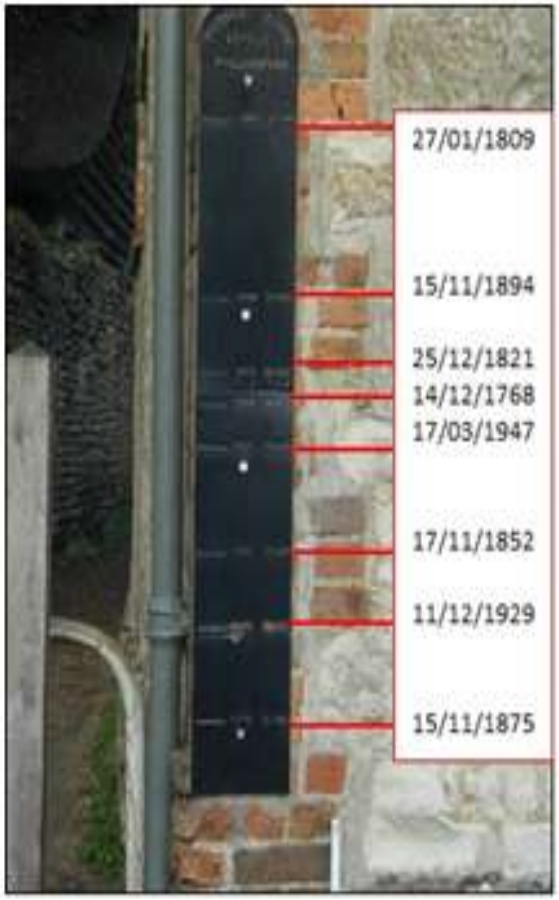
Figure 2.3 Propeller-type current meter (as used in Europe) (OTT)

Starting the Systematic Collection of Levels and Flows

- River Levels from 18th Century
- Amsterdam 1684?
- Elbe, Magdeburg 1727: Rhine, Oder etc 1770
- Vlatva, Prague 1775,:Danube, Vienna 1784:
- Rhine , Nijmegen 1770; some records were published
- Flow Records from the 19th Century
- Individual measurements on the Danube, Elbe, Garonne, Meuse, Rhine, Mississippi , Thames and other rivers.
- Late 19th Century establishment of National Hydrological Services fostered systematic collection of records and their publication: Switzerland 1863, Russia 1874, Hungary 1886, Austria 1893

Extreme Water Levels on the Danube

Flood marks at Shillingford

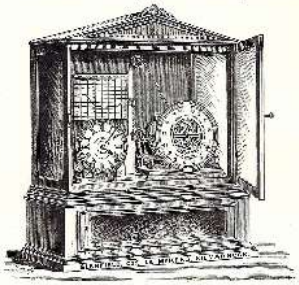


Water Level Recorder

Transmission of Water Levels

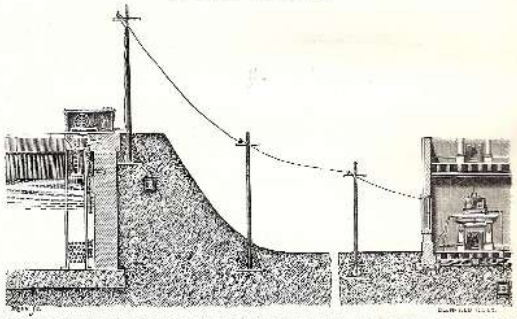
GLENFIELD COMPANY, Limited, KILMARNOCK.

Patent Electric Water Level Indicator and Recorder.



RECEIVING INSTRUMENT.

Patent Electric Water Level Indicator and Recorder.



Above is a general illustrative view showing Transmitting Instrument at Reservoir; Receiving Instrument in Office or Engine House.

TRANSMITTING INSTRUMENT.—A battery of a few cells (depending on length of line wire) is placed at reservoir. This transmits a current every 1 inch (or 2 or 3 inches if desired) of rise or fall of water in reservoir, the contacts being made by means of the float.

RECEIVING INSTRUMENT. The relay (shown underneath in glass panel) operates (by battery in office) the Receiving Instrument with dial, and actuates the pen which marks the water level on diagram.

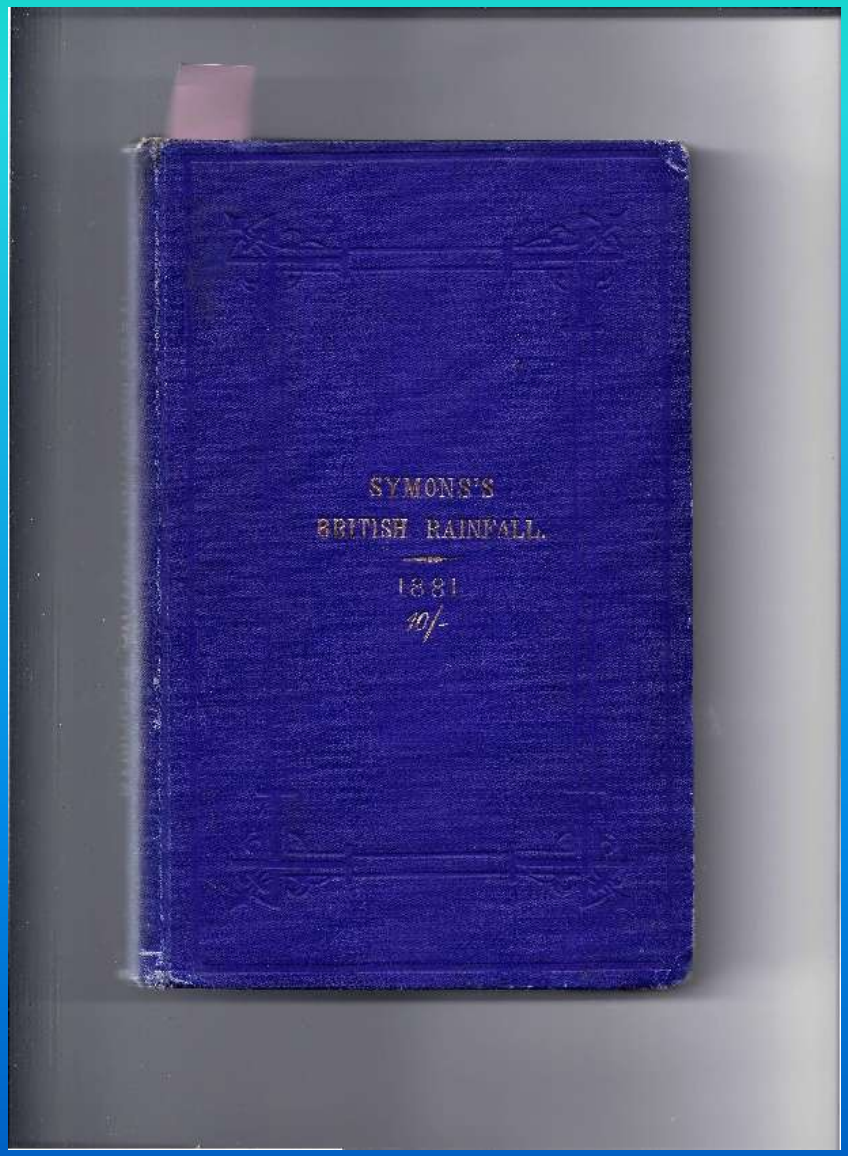
The drum with diagram is carried and driven by a strong 30-hour spring pendulum clock with dial showing the time. The clock may be an 8 day one for weekly diagram if desired. The whole instruments are well finished and mounted in a neat mahogany and glass case. All parts are strong, substantial, simple, easily got at, and not liable to derangement. The whole can be fitted up and set to work by an ordinary skilled mechanic.

Instruments are in use in Aylesham, Scarborough, Perth, Chatham, Berkhampsted, &c. **Price on Application.**

Sapperton Tunnel on the Thames-Severn Canal completed in 1789

Brunel's Maidenhead Bridge completed 1838

British Rainfall From 1860



What was happening in the UK?

1815 Observations of rainfall began at Greenwich and Radcliffe Observatories

1835 Geological Survey founded

1851 Records of flow of the Lee at Feilds Weir

1854 Meteorological Department established in Board of Trade

1860 British Rainfall Organisation founded by Symons

1883 Records of flow of the Thames at Teddington

MINISTRY OF PUBLIC WORKS, EGYPT.

Report on Investigations into the Improvement of River Discharge Measurements

PART III.

By E. B. H. WADE, M.A.,
Director of Research.

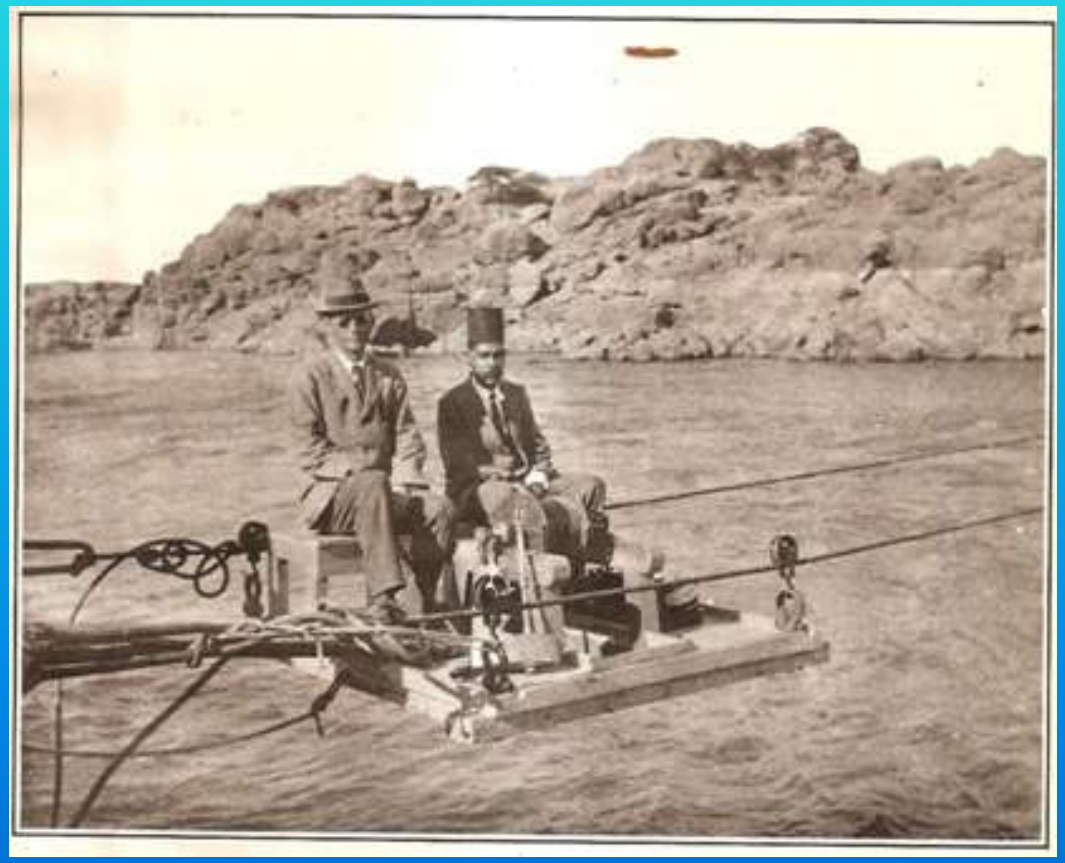
PHYSICAL DEPARTMENT PAPER No. 7.

Government Press, Cairo, 1922.

To be obtained, either directly or through any Bookseller, from the GOVERNMENT PUBLICATIONS OFFICE, Ministry of Finance, Bowaki P.O., Cairo.

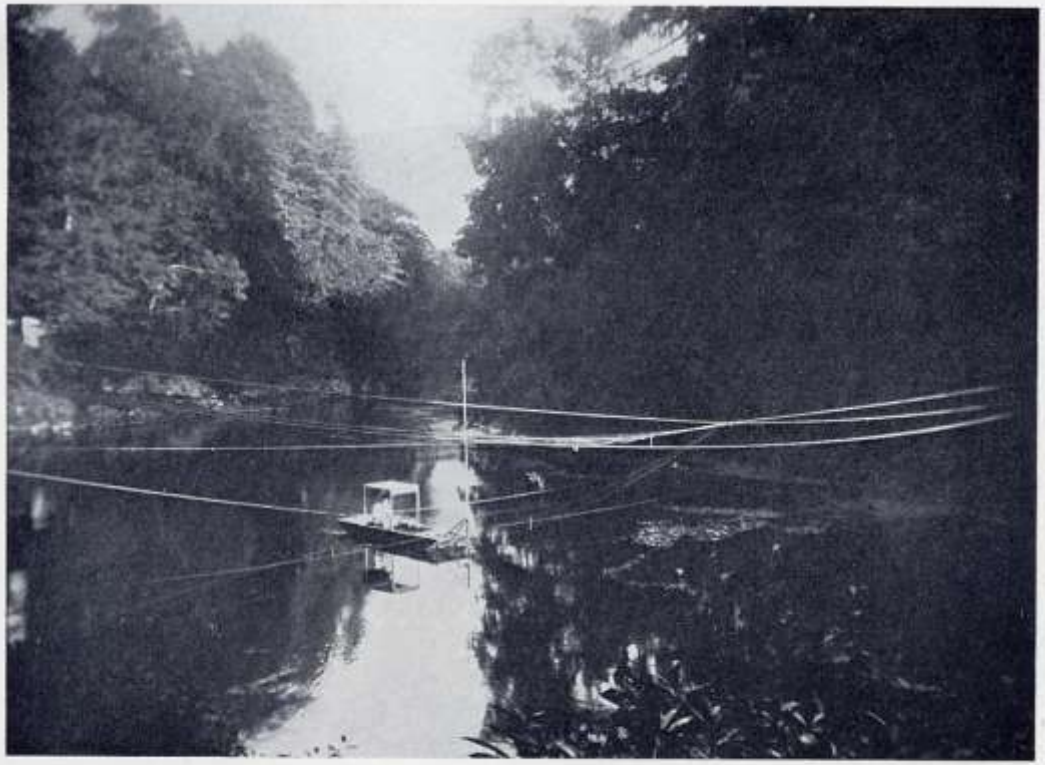
Price - - - - - P.T. 5.

River Gauging on the Nile



Early River Gauging in the UK

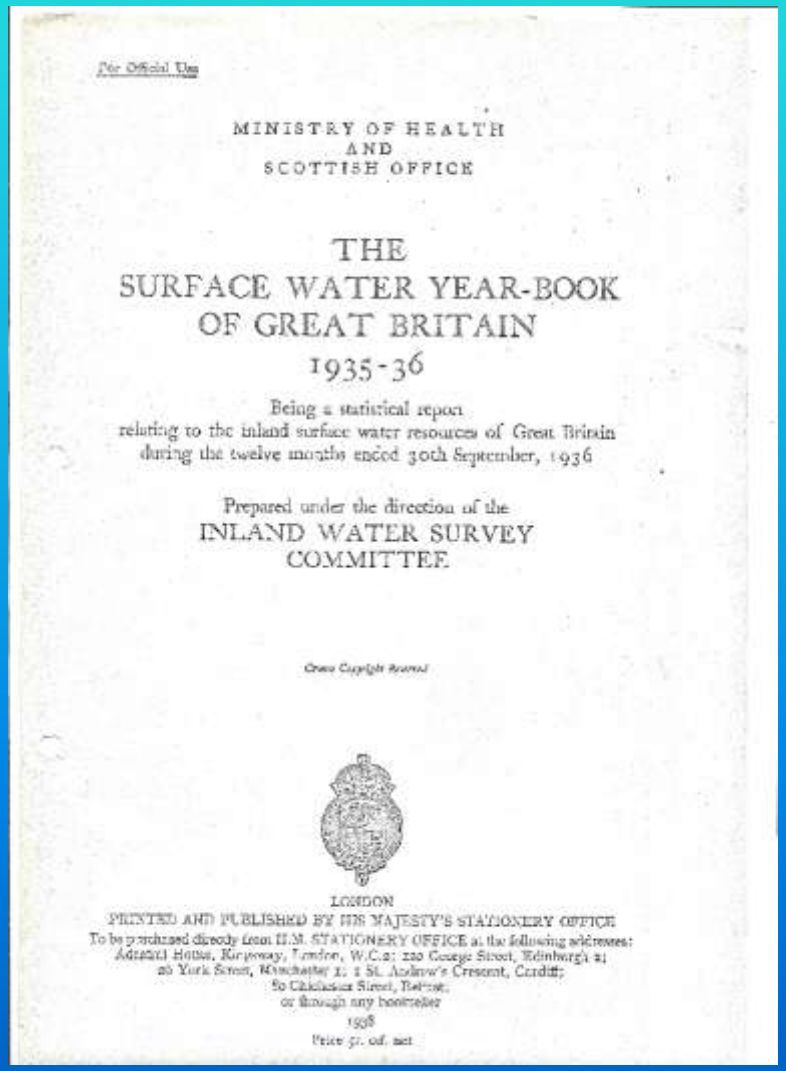
5. Gauging with current-meter from the bosun's chair: Invergarry, 1913



6. Gauging from the punt at the same place in 1929

Prime Minister Ramsay MacDonald

The First of the Surface Water Yearbooks



For Official Use

MINISTRY OF HEALTH
AND
SCOTTISH OFFICE

THE
SURFACE WATER YEAR-BOOK
OF GREAT BRITAIN
1935-36

Being a statistical report
relating to the inland surface water resources of Great Britain
during the twelve months ended 30th September, 1936

Prepared under the direction of the
INLAND WATER SURVEY
COMMITTEE

LONDON
PRINTED AND PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
To be purchased directly from H.M. STATIONERY OFFICE at the following addresses:
Adastral House, Kingsway, London, W.C.2; 120 George Street, Edinburgh 2;
26 York Street, Manchester 1; 1 St. Andrew's Crescent, Cardiff;
80 Chichester Street, Belfast,
or through any bookseller
1938
Price 5s. 0d. net

The Inland Water Survey and its Successors

- 1935 Inland Water Survey Founded
- 1952 Inland Water Survey Suspended
- 1954 Surface Water Survey Centre of Great Britain
- 1964 Survey transferred to the Water Resources Board
- 1974 Survey Transferred to the Water Data Unit
- 1982 Survey transferred to the Natural Environment Research Council

Gauging the Rhine