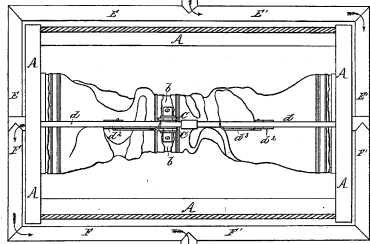
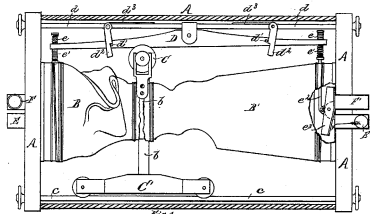


HISTORY OF WATER MEASUREMENT AND WATER METERS

Training Course on

Pattern Approval and Verification of Water Meters – OIML R49
15 – 18 October 2019 at NMIM, Sepang, Malaysia

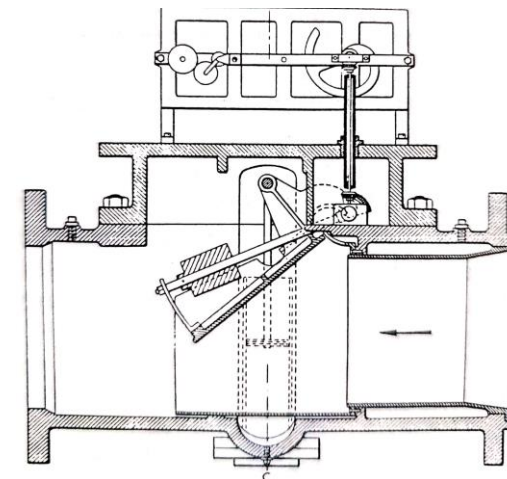
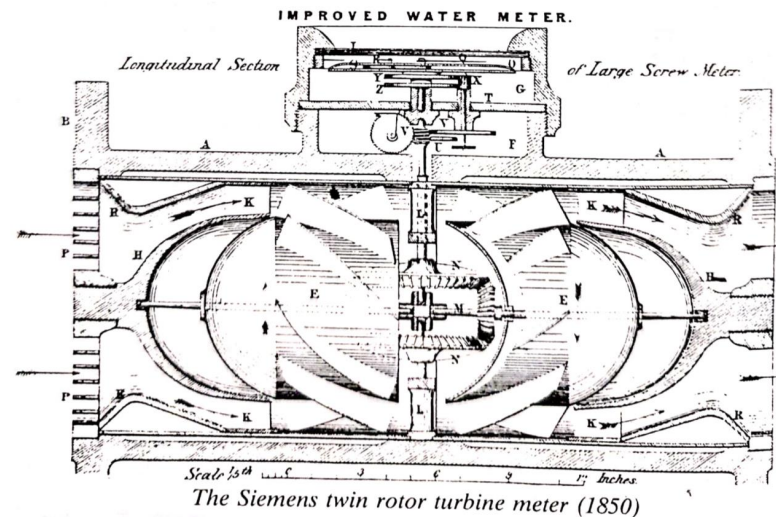
F. PHILIPPI.
WATER-METER.
No. 170,895. Patented Dec. 7, 1876.



Witnesses:
J. H. Kestel.
Charles M. Mason.

Inventor:
F. Philippi
per A. H. & C.

PATENT OFFICE, WASHINGTON, D. C.



Kent Gate Meter (1913)

HISTORY

Water is one of our most important natural resources.

The first records of flow measuring devices are not clear but can be traced back in ancient Egyptian times, where irrigation was a vital activity for survival.

The initial incentive to measure flow was the need to charge consumers and this led to the early development of positive displacement and inferential type flowmeters.

Commercial designs of water meters can be traced back to about 1820.

Later, towards the end of the 19th century, measurement of flowrate become important for industrial and utility purposes.

HISTORY

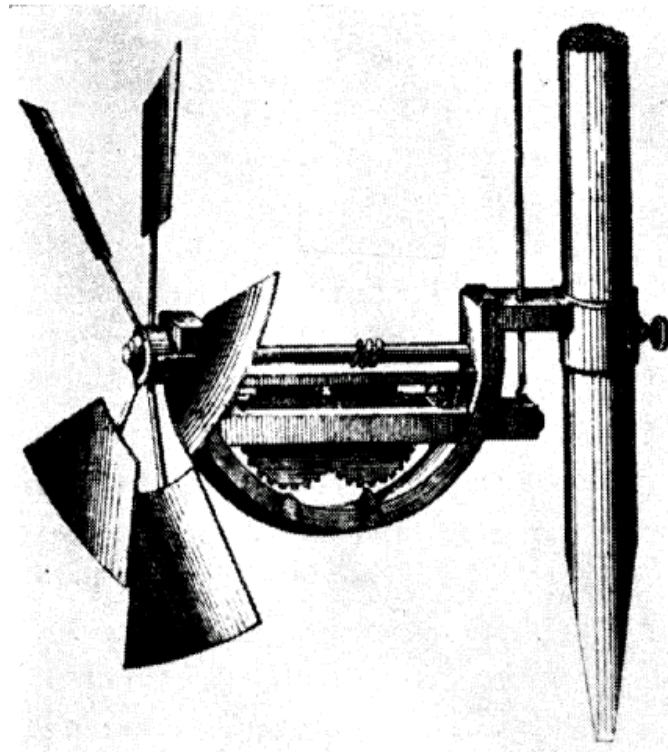


Water Delivery



Water Wheel

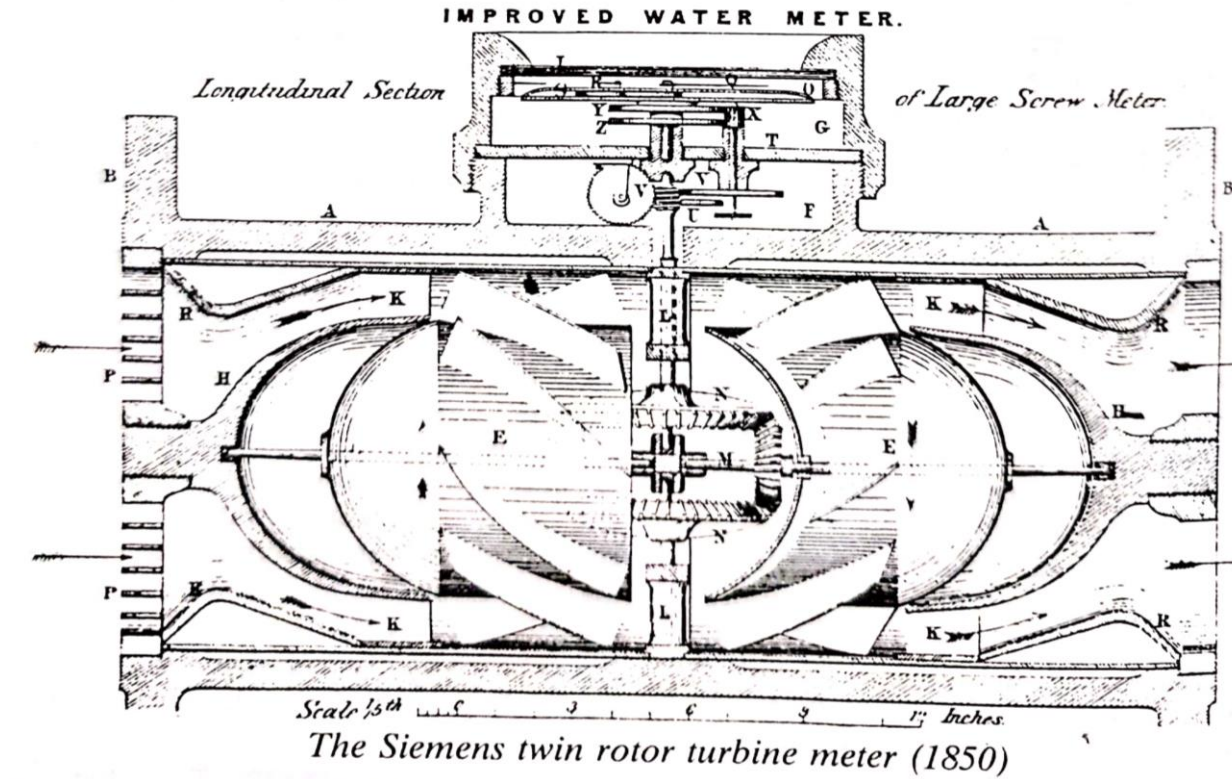
HISTORY



Woltman Meter

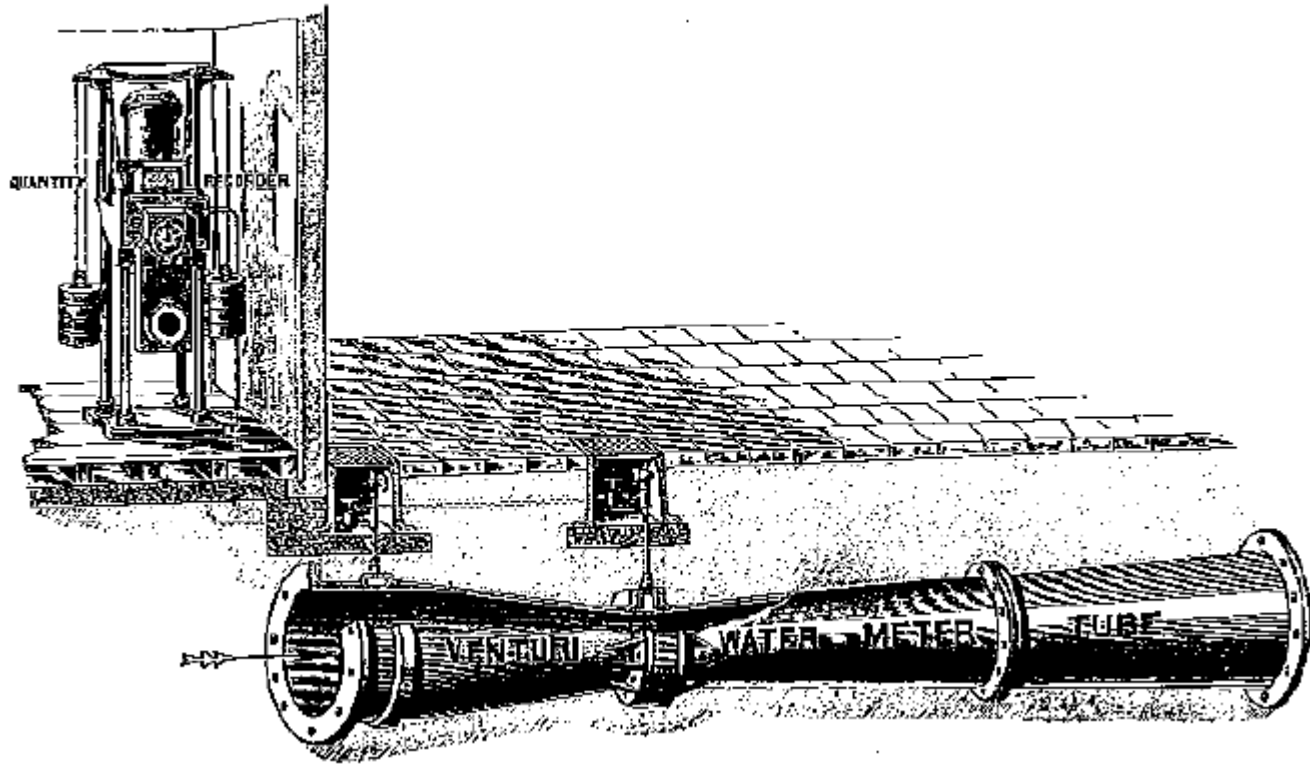
In 1790 Reinhard Woltman, Hamburg Germany, applied a multi-bladed fan to measure flowing air and water. This was the forerunner to a family of inferential meters and turbine meters, some of which still bear his name.

HISTORY



In 1850 Werner von Siemen designed Woltman meter to be applied in closed conduit. Water entered the centre of the rotor and was discharged from the turbine shaped channels in a diagonal direction which caused rotation by reaction. In 1960 Woltman meter with vertical rotor spindle was produced.

HISTORY

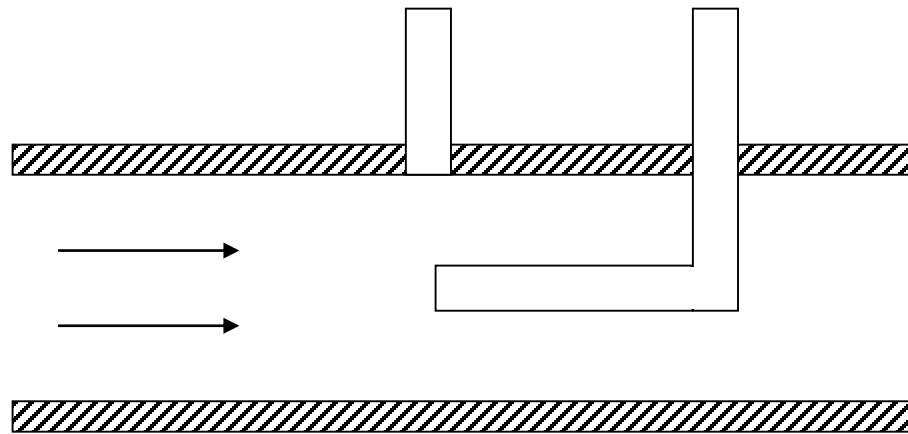


Venturi Tube

19 th century London Water Supply System.

In 1790 Giovanni Venturi published a paper on a metering device and the meter was invented by Clemens Herschel (1842 - 1930)

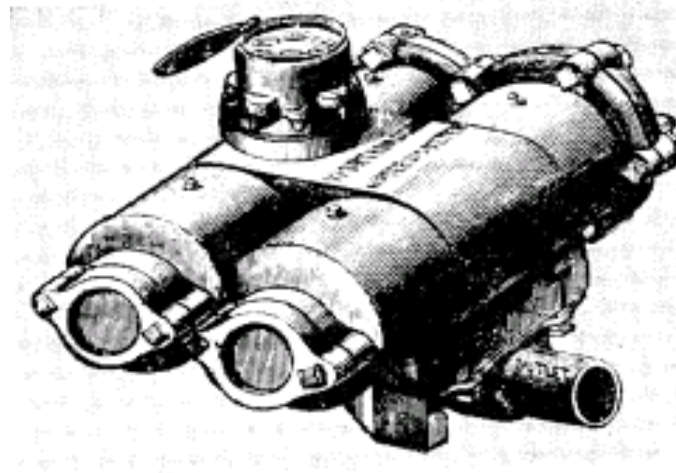
HISTORY



Pitot Tube

Was first described in 1732 by Henri de Pitot as a device for sensing water velocity and ship speed.

HISTORY



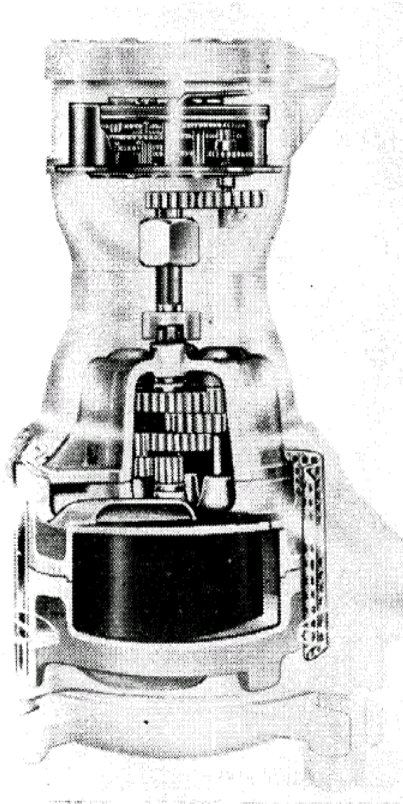
Worthington Piston Meter

The first claim to having produced a water meter in the USA was made by a Henry Worthington in 1857. These early designs were of the reciprocating piston type based upon steam engine design.

It consists of two cylinders and plungers with inlet and outlet port arranged in such a way that as water in one cylinder was discharged by the piston, the other piston was filling.

Problem with piston packing and valve thus slippage thus lead to inaccuracy.

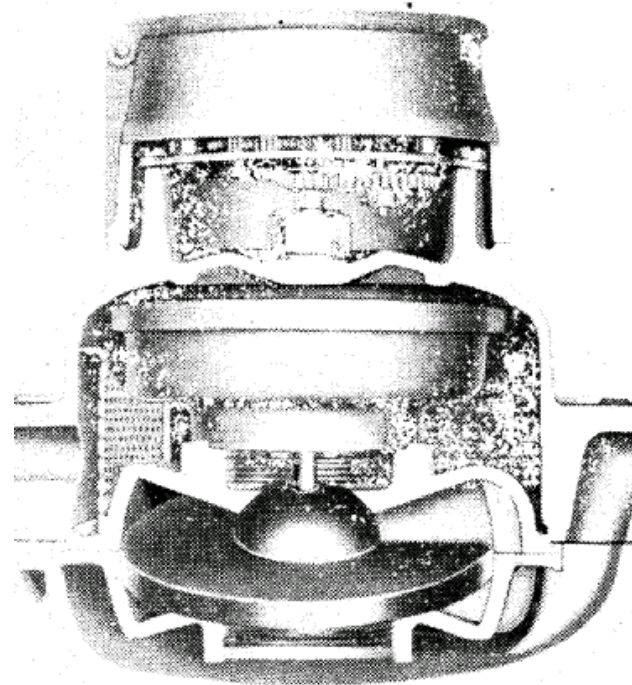
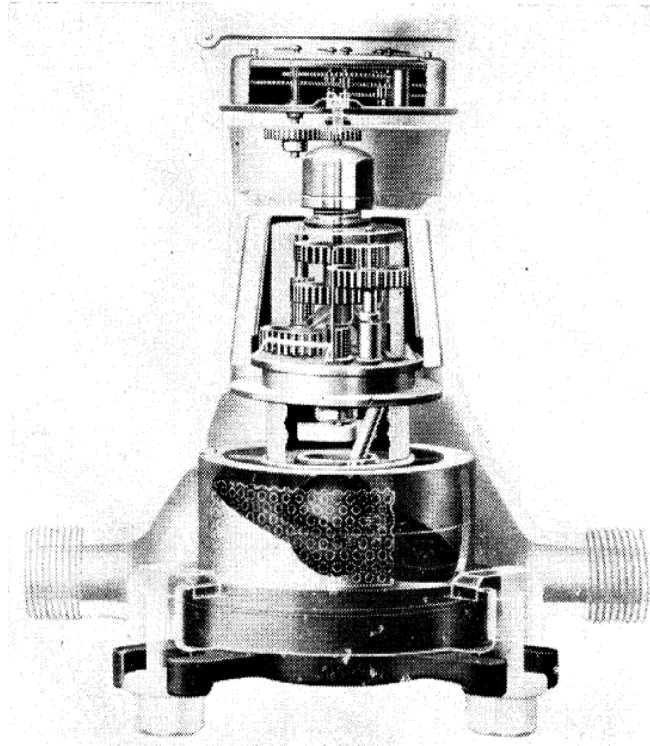
HISTORY



Oscillating Piston Meter

A patent was taken out in in USA in 1884 by L H Nash for an oscillating piston meter. This semipositive metering principle is currently used in a large number of modern designs.

HISTORY



Nutating Disc Meter

In 1888, the same man took out a patent for a nutating disc meter.

HISTORY

Modern Development

Flowmeter technology showed a little but steady progress during 1900 - 1950 period. From 1950 to the present, there has been a rapid progress in flow measurement innovations where most of important measurement techniques have appeared. These include electromagnetic, vortex, ultrasonic and Coriolis meters.

As mentioned earlier, the basic principles of operation of these meters had been established some years before the commercial meters actually appeared. For example, the operating principle of electromagnetic meter was established by Faraday in 1832, but the first commercial meter appeared in 1950. A second example is the ultrasonic meter, first reported by Rutten in 1928 but only appeared in 1970s as a commercial flowmeter.