other device to perform a predetermined function at the selected fluid surface level.

Turning to FIG. 8 the output of transmitter circuit 17 is received at the input to level setting amplifier 34. As mentioned above the flow volume equation for a V-notch weir is $Q = AH^{5/2}$. The setting for maximum H is made by adjusting the gain of amplifier 34 at resistor R30 and is made to coincide with maximum flow rate in desired units by setting maximum flow input 30. The output of amplifier 34 is converted in the analog to digital converter 36 and provided to the function read-only memory 29. Digital output related to flow rates from maximum to zero are provided by ROM 29. In the example of FIGS. 1 and 2 the function ROM 29 is specifically programmed for a V-notch weir.

In the case of flow through a channel such as the circular cross section channel of FIGS. 3 and 4, a table of solutions for open channel flow using the Manning formula is entered to arrive at the maximum flow rate. The maximum H for the channel is a gain set at the output of amplifier 34 to coincide with the maximum flow rate which is set at 30 on panel 28. The function ROM 29 for the specific channel shape provides digital output related to any portion of the maximum flow as a function of H.

The function ROM 29 contains a program which provides a flow volume related output derived from the set maximum value of the term H in amplifier 34 and the maximum flow rate for a specific channel set in maximum flow input 30 in computer 26. The inverter circuit 58 is present merely to provide the proper polarity digital signals to digital to analog converter 51 and the first buffer storage 37. Digital to analog circuit 51 is an optional feature and is only used when an external recorder (not shown) or internal recorder 33 are present.

As seen in FIG. 6 and in more detail in FIG. 8, first buffer storage 37 collects data from function read-only memory 29. Clock 38 dumps the data once each minute into the maximum flow input register 42. Maximum flow input register 42 is filled to a certain extent by manual manipulation of the thumb wheel switches 30 on the panel face 28 of computer 26 as described above. When maximum flow input register 42 is filled by the periodic data inputs from first buffer storage 37 it transfers its capacity to flow totalizer 41 through divide by 10 circuit 43. Any remainder received from first buffer storage 37 is retained in maximum flow input register 42 until the next time it fills and transfers, 20 Hz clock 39 is directed to flow totalizer 41 for driving the totalizer motor which provides an indication of cumulative flow volume at total flow indicator 31.

Decade switch 44 in FIGS. 6 and 8 is present to provide a scaling factor for the input to second buffer storage 48. When large flow volumes are required to pass between samples, decade switch 44 may keep the flow units within the range of second buffer storage 48. Sample rate register 49 is set at thumb wheel switch 32 in the same units of flow volume which are set at the maximum flow input switch 30. Thus when data equivalent to the setting in sample rate register 49 has accumulated in second buffer storage 48, an output signal which is a function of flow is directed to the sampler 59.

A total flow measuring system has been disclosed which provides cumulative flow volume indication by detecting the level of the flow surface in an open channel which has known cross section configuration. A system is described which uses a minimum number of moving parts, and which provides outputs related to predetermined surface levels for performing specified operations on the flowing medium. A continuous cumulative total and a time display of flow volume is provided and a setting providing for a periodic sampling operation as a function of flow may be made.

We claim:

1. A total flow measuring system for liquid flow through a channel having a predetermined cross section shape comprising means for detecting a fluid surface level in the channel, means for providing a signal related to fluid surface level relative to a predetermined reference level, computer means for receiving said signal related to surface level and converting said signal to a digital signal, and program means for receiving said digital signal and providing output indicative of total flow volume.

2. A total flow measuring system as in claim 1 together with means connected to said means for detecting a fluid surface level for visually indicating existing surface height.

3. A total flow measuring system comprising means for detecting a fluid surface level, means for providing a signal related to fluid surface level relative to a predetermined reference level, computer means for receiving said signal related to surface level and converting said signal to total flow volume, and circuit means responsive to predetermined values of said signal related to fluid surface level for providing a plurality of auxiliary signals, and means responsive to said auxiliary signals for providing a plurality of predetermined operations on the fluid.

4. A total flow measuring system as in claim 3 wherein said means responsive to said auxiliary signals comprise alarm means for indicating predetermined fluid surface levels.

5. A total flow measuring system as in claim 3 wherein said circuit means responsive to predetermined values of said signal comprises a plurality of voltage comparators, and wherein said means responsive to said plurality of auxiliary signals comprise a plurality of lights for indicating fluid surface levels beyond predetermined limits.

6. A total flow measuring system comprising means for detecting a fluid surface level, means for providing a signal related to fluid surface level relative to a predetermined reference level, computer means for receiving said signal related to surface level and converting said signal to total flow volume, wherein said means for detecting a fluid surface level comprises a probe for contacting the fluid surface, a drive motor for vertically positioning said probe upward and downward, and switching means for reversing rotation of said drive motor, together with means for delaying downward positioning of said probe following upward positioning.

7. A total flow measuring system comprising means for detecting a fluid surface level, means for providing a signal related to fluid surface level relative to a predetermined reference level, computer means for receiving said signal related to surface level and converting said signal to total flow volume, wherein said computer means comprises an amplifier for receiving and scaling said signal related to fluid surface level and providing an analog output related thereto, an analog to digital converter for receiving said analog output and providing a digital output related thereto, a function read only