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WATER STORAGE AND SUPPLY SYSTEM

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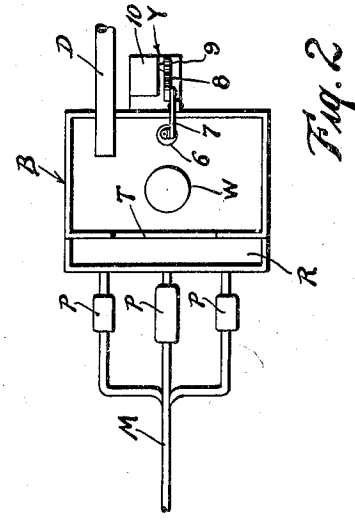


Fig. 2

Fig. 1

Fig. 3

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WATER STORAGE AND SUPPLY SYSTEM

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The present invention relates to an improved water storage and supply system for irrigation, domestic and public usages.

An object of this invention is to provide a system of reservoirs, pumps and service lines which will obtain the full benefits of reliability of flow resulting from availability of reservoir storage, with a minimum amount of power to maintain the necessary reservoir supply and with a minimum pressure on the supply and service lines.

Another object of the invention is to provide a system such as described which will materially reduce pumping operations and costs, eliminate high operating pressure, and minimize pipe line leakage.

A further object of the invention is to provide a system of the character described wherein the pumping of water to high elevations to maintain the necessary reservoir supply is materially reduced, the costs of installation and operation are lessened, and a better regulation of the water storage and of the operating lines and equipment are, therefore, made possible.

Yet another object of the invention is to provide a system of the character described wherein one reservoir is arranged below another reservoir, and has a service line leading therefrom, and is continuously supplied with water from a well, gravity flow source or the like, said lower reservoir being controlled by means which will automatically supply water thereto from the higher reservoir only when the water in the lower reservoir drops below a predetermined level and will pump water therefrom to the higher reservoir only when the water in the lower reservoir rises above said predetermined level.

Other objects may appear in the description of my device hereinafter following.

I have shown a preferred form of device embodying my improvements in the accompanying drawing, subject to modification, within the scope of the appended claims, without departing from the spirit thereof.

In said drawing:

Fig. 1 is a schematic view for the most part in side elevation and in part in section, and showing one embodiment of the system of this invention.

Fig. 2 is a top plan view of one of the sub-reservoir units, and

Fig. 3 is an enlarged fragmentary side elevation of the float operated control valve, being shown partly in section.

One embodiment of the system of this invention, as shown in the accompanying drawing, comprises a main reservoir A and sub-reservoirs B and C, arranged at different levels below the main reservoir, it being understood that the system of this invention may consist of two or more reservoirs as desired, and preferably arranged one higher than the other.

As here shown, the sub-reservoirs B and C are provided with water supply lines D and E leading from a gravity flow source, a well or the like, not shown, and adapted to continuously or intermittently supply water thereto.

Extending from these sub-reservoirs are service pipe lines F and G, whereas a main service line H leads from the main reservoir A. As here shown, the sub-reservoir service lines are connected into the main line H, and branch service lines J extend from said main line, there being suitable valves V controlling said main and branch lines.

As a means for supplying water from one reservoir to another, gravitationally, said sub-reservoirs have feed lines K and L leading thereto from said main line H.

To provide for pumping water from one sub-reservoir to the other, or from said sub-reservoirs to said main reservoir, that is, to elevate water from reservoir C to reservoir B and from reservoir B to main reservoir A, pump lines M and N are extended from pump sumps R and S to said main line H. A plurality of pumps P are connected with these pump lines and are controlled and operated, as will be hereinafter described.

Means is provided for automatically supplying water to the sub-reservoirs B and C, when the water therein drops below a predetermined level, this level as here shown being substantially that of the outlets or weirs T over which water will flow into the sumps R and S. This means comprises a float operated valve W in each sub-reservoir. Each of said valves is alike and the one associated with the unit B comprises a sleeve valve 2 slidable on the pipe K into and out of position to close the outlet ports 3 in said pipe. A float 4 is adapted to raise and lower said valve, being connected thereto by member 5.

It will be noted that means is provided for automatically operating pumps P when the water in the sub-reservoirs rises above said predetermined level and flows through weirs T into the sumps R and S. This operation takes place only when the supply from lines D and E exceeds the water user or service demand from said sub-reservoirs. As here provided, this means comprises float operated circuit closers Y which will operate one or more of the pumps P, dependent on the

rate of flow of the excessive supply into the sub-reservoirs, whereby to gauge the pumping operation therewith. Each float operated control device comprises a float 6 operating in the sub-reservoir, as does float 4. Through a lever 7, ratchet segment 8 and pinion 9, this float operates a circuit closer or pump control means, indicated at 10.

It is not deemed necessary to illustrate the particular circuit closer or pump control means 10 inasmuch as I may use any such device which, dependent on the extent of rotation of the pinion 9, will cause one or more of the pumps P to operate, and wherein said movement of said pinion is determined by the level of the water in the sub-reservoir.

In the operation of the system, it is seen that, for example, when the water in the sub-reservoir B, due to the service demand, drops below the predetermined level, which level is substantially on the plane of the outlet or weir T, the float 4 will descend and lower valve 2, whereby to uncover ports 3 and allow a gravity feed of water into said sub-reservoir from the main reservoir A through the pipe lines H and K. As soon as the water rises to said level, the float 4 will ascend and move the valve 2 so as to close ports 3 and thereby shut off the flow from the main reservoir A. Should the service demand from sub-reservoir B be such that the water therein will rise over said predetermined level and flow over weir T into sump R, the float 6 will rise and, through lever 7, ratchet segment 8 and pinion 9, cause the means 10 to start the pumping means P. If the rise above said predetermined level is slight, but a slight rotation is given pinion 9, and but one of the pumps P is operated, said one pump having sufficient capacity to elevate water from sump R through lines M and H to the main reservoir A. However, should the volume of water above the water user demand be such that float 6 will rise, and the overflow into the sump will be increased and require an additional pumping effort, then the means 10 will cause the other pumps P to operate to meet the pumping demand.

It is, therefore, apparent that the pumping of water to the main reservoir to provide the necessary storage supply will be intermittent and only required when the supply in the sub-reservoirs exceeds the service demands. Thus, only the water in excess of the service demand will be pumped to the main reservoir and a consequent saving in operating costs is provided for.

It will be noted that when a plurality of sub-reservoirs are employed, as here shown, should, for example, the reservoir C have a service demand which would lower the water below said predetermined level, then water will flow from reservoir B through service lines F and H, and feed line L into reservoir C. As the level in reservoir B is thus lowered, the valve W therein operates as hereinbefore noted to replenish the supply from the main reservoir A.

Should the water in reservoir C rise sufficiently to flow over the weir T thereof into sump S, then the control means Y causes the pumps P to elevate the water from said sump through the pump line N, main line, service line F and into reservoir B. Should the water user demand on reservoir B equal at this time the supply thereto from line D and the reservoir C, the main reservoir will not be called upon to supply water to the system.

It will now be seen that with the system of this invention a well balanced storage and distribution of the water is provided for with a nicety of regulation and a low operating cost.

The valve W is especially constructed for the equipment of this invention and it is important to note that it includes an adjustable sealing means which will insure a leak-proof closing action at all times. This means provides a double seat or seal in that an inwardly extending flange 12 on the lower end sleeve valve 2 is arranged to seat against a rubber or like seating ring 13 held in place by a shoulder 14, and the upper end of said valve is adapted to seat against a similar ring 15 vertically adjustably supported by a ring 16. The ring 16 is threadedly adjustable on the pipe K, whereby the two sealing rings or seats may be properly spaced to insure a leak-proof closing action.

While the system of this invention is primarily designed for use in connection with water systems, I wish it to be understood that it may also be used for storing and supplying other liquid and fluids, such as oil, gasoline, etc.

What I claim is:

1. In a water storage and supply system, a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir, a service pipe line leading from said sub-reservoir, means operating when water in the sub-reservoir drops below a predetermined level, to supply water thereto from said main reservoir, and means operating when water in the sub-reservoir rises above said predetermined level to pump water from said sub-reservoir to said main reservoir.

2. In a water storage and supply system, a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir from a source other than said main reservoir, a service pipe line for distributing water from said sub-reservoir, means operating when the water in the sub-reservoir drops below a predetermined level for supplying water to said sub-reservoir from said main reservoir and for shutting off said main reservoir supply when the water reaches said predetermined level, and pumping means operating when the water in the sub-reservoir rises above said predetermined level for forcing water therefrom to said main reservoir.

3. In a water storage and supply system, a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir from a source other than said main reservoir, a service pipe line for distributing water from said sub-reservoir, means operating when the water in the sub-reservoir drops below a predetermined level for supplying water to said sub-reservoir from said main reservoir and for shutting off said main reservoir supply when the water reaches said predetermined level, and pumping means operating when the water in the sub-reservoir rises above said predetermined level for forcing water therefrom to said main reservoir, and means which automatically varies the volumetric capacity of said pumping means in proportion to the rate of volume variation above said predetermined level.

4. In a water storage and supply system, a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir, a service pipe-line leading from said sub-reservoir, means operating when the water in the sub-reservoir drops below a predetermined level for supplying water thereto from said main reservoir and for cutting off said main reservoir supply when the water rises to said predetermined level, a sump into which water flows from said sub-reservoir when the supply in the sub-reservoir rises above said predetermined

level, means operating when water flows into said sump to pump water therefrom to the main reservoir at a volumetric rate proportionate to rate of flow into said sump.

5. In a water storage and supply system, a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir, a service pipe-line leading from said sub-reservoir, means operating when the water in the sub-reservoir drops below a predetermined level for supplying water thereto from said main reservoir and for cutting off said main reservoir supply when the water rises to said predetermined level, a sump into which water flows from said sub-reservoir when the supply in the sub-reservoir rises above said predetermined level, means operating when water flows into said sump to pump water therefrom to the main reservoir at a volumetric rate proportionate to rate of flow into said sump, and which automatically ceases operation when the supply in said reservoir lowers to said predetermined level.

6. In a water storage and supply system a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir from a source other than said main reservoir, a pipe-line for conveying water to and discharging water from said main reservoir, a service pipe for discharging water from said sub-reservoir, a feed line for conducting water from said main reservoir line to said sub-reservoir, valve means controlling said feed line and operating when the water in the sub-reservoir drops below a predetermined level for opening said feed line, and which closes said feed line when the water rises to said predetermined level, a sump into which water flows from said sub-reservoir when the water supply in the latter rises above said predetermined level, a pump line leading from said sump to said main reservoir line, and pumping means operating to pump water from said sump through said pump and main reservoir lines to said main reservoir when the water in the sub-reservoir rises above said predetermined level.

7. In a water storage and supply system a main reservoir, a sub-reservoir, means for supplying water to the sub-reservoir from a source other than said main reservoir, a pipe-line for conveying water to and discharging water from said main reservoir, a service pipe for discharging water from said sub-reservoir, a feed line for conducting water from said main reservoir line to said sub-reservoir, valve means controlling said feed line and operating when the water in the sub-reservoir drops below a predetermined level for opening said feed line and which closes said feed line when the water rises to said predetermined level, a sump into which water flows from said sub-reservoir when the water supply in the latter rises above said predetermined level, a pump line leading from said sump to said main reservoir line, and pumping means operating to pump water from said sump through said pump and main reservoir lines to said main reservoir when the water in the sub-reservoir rises above said predetermined level, said service line being connected with said main reservoir line, and a valve in the main reservoir line at a point therein between said feed and service lines.

8. In a water storage and supply system, reservoirs, means for supplying water thereto, service lines leading therefrom, means automatically supplying water from one to another of said reservoirs when the water in one of them drops below a predetermined level, means for pumping water from one to another of said reservoirs when the water in one thereof rises above said predetermined level, and means controlled by the level of water in said reservoirs for starting and stopping said pumping means.

9. In a water storage and supply system, a main reservoir, a sub-reservoir located at a lower level than the main reservoir, a main reservoir service line, a sub-reservoir service line, means for supplying water to the sub-reservoir from a source other than said main reservoir, a sump into which water flows from said sub-reservoir, when the water in the latter rises above a predetermined level, a pump line leading from said sump into said main line, a pump for forcing water from said sump through the pump and main lines into said main reservoir, and float operated pump control means operating responsive to the rise of water above said predetermined level to start the pump and to shut off the pump when the water falls below said predetermined level, a feed line for gravitationally supplying water from said main service line to said sub-reservoir and a float operated valve which opens and closes said feed line when the water falls below and rises above said predetermined level.

10. In a water storage and supply system, a main reservoir, a sub-reservoir located at a lower level than the main reservoir, a main reservoir service line, a sub-reservoir service line, means for supplying water to the sub-reservoir from a source other than said main reservoir, a sump into which water flows from said sub-reservoir when the water in the latter rises above a predetermined level, a pump line leading from said sump into said main line, a pump for forcing water from said sump through the pump and main lines into said main reservoir, and float operated pump control means operating responsive to the rise of water above said predetermined level to start the pump and to shut off the pump when the water falls below said predetermined level, a feed line for gravitationally supplying water from said main service line to said sub-reservoir and a float operated valve which opens and closes said feed line when the water falls below and rises above said predetermined level, and another sub-reservoir located below said first named reservoir, said service line for the first named sub-reservoir being connected with the main service line, means for supplying water to said second named sub-reservoir, a service line for said second named sub-reservoir, means operating when the level of the water in the second named sub-reservoir drops below a predetermined point, for supplying water thereto from said first named sub-reservoir, and means operating when the level of water in said second named sub-reservoir rises above said predetermined point for pumping water therefrom into said first named sub-reservoir.

11. In a water storage and supply system, two reservoirs, means for supplying water to one of said reservoirs, a service line leading from said one reservoir, means operating when the water in said one reservoir drops below a predetermined level, to introduce water thereto from the other reservoir, and means operating to pump water from said one to said other reservoir when the water in said one reservoir rises above said predetermined level.

12. In a water storage and supply system, two reservoirs, means for supplying water to one of said reservoirs, a service line leading from said one reservoir, means operating when the water in said one reservoir drops below a predetermined

level, to introduce water thereto from the other reservoir, and means operating to pump water from said one to said other reservoir when the water in said one reservoir rises above said predetermined level, said last named means including a variable capacity pumping unit and means operated by and responsive to the variations in the level of the water above said predetermined level for varying the pumping action of said unit.

13. In a water storage and supply system, a main reservoir, a sub-reservoir located at a lower level than the main reservoir, a main reservoir service line, a sub-reservoir service line, means for supplying water to the sub-reservoir from a source other than said main reservoir, a sump into which water flows from said sub-reservoir, when the water in the latter rises above a predetermined level, a pump line leading from said sump into said main line, a pump for forcing water from said sump through the pump and main lines into said main reservoir, and float operated pump control means operating responsive to the rise of water above said predetermined level to start the pump and to shut off the pump when the water falls below said predetermined level, a feed line for gravitationally supplying water from said main service line to said sub-reservoir and a float operated valve which opens and closes said feed line when the water falls below and rises above said predetermined level, said valve including a sleeve valve member slidable on said feed line, said feed line having an outlet opening adapted to be opened and closed by said valve, sealing rings arranged above and below said opening, for engagement with upper and lower extremities of said valve when the latter is in closing position, and means supporting one of said rings for adjustment towards and away from the other ring.

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