

PATENT SPECIFICATION

778,724

Inventor:—GEORGE SMETHURST.



Date of filing Complete Specification: May 2, 1955.

Application Date: May 12, 1954. No. 13855/54.

Complete Specification Published: July 10, 1957.

Index at Acceptance:—Class 46, B9, D2Q7,

International Classification:—B01d, C02b.

COMPLETE SPECIFICATION.

Improvements relating to Water Purification and Supply Systems.

We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

* This invention is concerned with water purification and supply systems.

It is an object of this invention to provide an improved water purification and supply system.

According to this invention a water purification and supply system comprises a gravity filter unit supplied from a constant level feed and an intermediate pure water tank located on substantially the same level and thus constituting a self-compensating system in that water will flow through the filter unit to the intermediate pure water tank when the water level in the latter is lowered below the water level in the former.

Since the filter unit and the intermediate pure water tank are located on substantially the same level, it will be appreciated that the filter unit will continue to filter water at a constant rate, irrespective of its degree of dirtiness, as a result of the varying degree of back pressure from the intermediate pure water tank.

Furthermore, the filter unit will start and finish each run slowly, which is highly desirable and which previously, has been provided by expensive mechanisms disposed on the outlet side of the filter unit.

In one form this invention provides an automatically-controlled water purification and supply system comprising one or more sedimentation tanks supplied from a constant level feed, a gravity filter unit, an intermediate pure water tank, one or more

pneumatically pressurised storage tanks adapted to supply purified water to a distribution point, a motor-driven pump for pumping water from the intermediate pure water tank to the storage tank, and a pressure-sensitive device adapted to operate the pump motor within predetermined limits of pressure in the storage tank, the filter unit and the intermediate pure water tank being located on substantially the same level and thus constituting a self-compensating system in that water flows from the sedimentation tanks to the filter unit and thence to the intermediate pure water tank when the water-level in the latter is lowered below the water-level in the filter unit by the automatically-controlled pumping of water from the intermediate tank to replenish the storage tank.

According to a feature of the invention, the various tanks and ancillary equipment are mounted on a supporting frame-work, together with one or more buoyancy tanks, the entire assembly constituting a buoyancy complete water purification system adapted to float with the several tanks at least partly submerged in the water to be purified.

Preferably, in the floating system, the sedimentation tank or tanks is or are located on the same level as the filter unit and at least one of them is provided with a permanently-open water inlet located at a shallow depth below the water-line.

Preferably, also, the motor for driving the pump for supplying the storage tank also drives mechanisms for supplying chemicals, e.g. a flocculating medium and a bactericidal agent to the water during its purification.

Furthermore, the sedimentation tank may be cleaned by a pneumatic lift, the air for the lift being obtained from the storage tank. In order to "top-up" the air pressure within

the storage tank an intermittently-operated compressor is employed. If desired, a pneumatic device drawing air from the storage tank may be employed to perform a preliminary cleaning operation on the filter unit before washing with water, also drawn from the storage tank.

By disposing the sedimentation tank and the permanently-open water inlet thereto below the surface of the water in which the system is floating, the sedimentation tanks will automatically fill as water is pumped from the pure water tank to the storage tank.

One embodiment of the invention will now be described by way of example of the invention, and this embodiment is shown in the drawing accompanying the Provisional Specification which is a schematic arrangement of a floating water purification and supply system.

The water purification and supply system comprises a skeleton framework (not shown) with buoyancy chambers (not shown).

The framework carries a first sedimentation tank 1 which is disposed on the framework so that it is completely immersed in the water when the assembly is floating in a lake or river. The outer surface of the sedimentation tank is on contact with the water. The sedimentation tank has a permanently-open water-inlet 2 arranged to be about twelve inches below the surface during operation of the system. The sedimentation tank is vented as shown at 3, and is provided with an air lift 5 for cleaning it.

The upper portion of the sedimentation tank 1 is connected to a second sedimentation tank 7 which is also completely immersed in the water. Sedimentation tank 7 is vented as at 9 and has an air lift 11 for cleaning purposes.

The upper portion of the second sedimentation tank is connected to an annular filter unit 13 which is vented at 15 and has an air lift 17 for cleaning purposes. Water from the bottom of the filter unit 13 flows by way of a valve 19 to an intermediate purified water tank 21.

The two sedimentation tanks, the filter unit and the intermediate purified water tank are disposed at the same level on the framework so that, by reason of hydrostatic pressure, water entering the first sedimentation tank is ultimately passed through the filter to the intermediate purified water tank as and when the level therein is reduced by pumping water therefrom to the storage tanks as described later.

The intermediate purified water tank 21 includes a foot valve and strainer 23 which is connected by way of valves 33, 35 to two water pumps 25, 27 operated by motors 29, 31. Each outlet pipe from the pumps is connected to pneumatically-pressurised storage tanks 37, 39 by way of stop valves

41, 43 and a non-return valve 45. The storage tanks 37, 39 are connected to an external distribution point (not shown) by way of a sluice valve 47.

The motors 29, 31 are connected to an electrical supply system 49 by way of a pressure-sensitive device in the form of a pressure switch 51 and a main switch 53. The main switch is also connected to a motor 55 arranged to drive an air compressor 56 which supplies air to the storage tanks for "topping-up" purposes via a non-return valve 59 and stop valve 61. One storage tank 37 includes a pressure sensitive device 63 adapted to operate the pressure switch 51.

The storage tanks 37, 39 are also connected through a restriction valve 65 to the filter unit 13 for the purpose of supplying wash water thereto.

Each of the motors 29, 31 also drives a chlorine doser 67 connected to the intermediate purifier water tank 21 and an alum doser 69 connected to the sedimentation tank 1.

In operation water flows into the sedimentation tank 1 through the inlet 2, then into the sedimentation tank 7, and by way of the filter unit 13 to the intermediate purified water-tank 21. The storage tanks are pressurised and the pressure-sensitive device is arranged to close the pressure switch when the air pressure falls below 27 pounds per square inch, and to open the pressure switch when the air pressure reaches about 35

per square inch. Consequently, the storage tanks will fill up until the air within them is compressed so that it exerts a pressure of 35 pounds per square inch. The motors will then stop supplying water to the storage tanks. As water is supplied to a distribution point the air pressure within the tank will fall and when it reaches 27 pounds per square inch the water pumps will be operated to replenish the water in the storage tanks from the intermediate purified water-tank.

As water is pumped from the intermediate purified water tank to the storage tanks hydrostatic pressure causes more purified water to enter the intermediate tank from the filter unit and thus more water will enter the sedimentation tank 1 through the permanently-open inlet. Since the pumping of water from the pure tank to the storage tanks is automatically controlled by the pressure-sensitive device in the storage tank and the flow of water through the filter to the pure water tank is dependent on a difference in their respective water levels, and moreover since the motor controlled by the pressure-sensitive device drives not only the water pump but also the chemical dosing mechanism, it will be seen that the functioning of the entire system is automatically



75

80

85

90

95

100

105

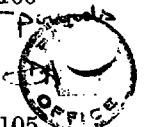
110

115

120

125

130



controlled by the pressure in the storage tanks.

What we claim is:—

1. A water purification and supply system comprising a gravity filter unit supplied from a constant level feed and an intermediate pure water tank located on substantially the same level and thus constituting a self-compensating system in that water will flow through the filter unit to the intermediate pure water tank when the water level in the latter is lowered below the water level in the former.

2. A water purification and supply system as claimed in Claim 1 in which the filter unit is an annular unit.

3. An automatically-controlled water purification and supply system comprising a sedimentation tank supplied from a constant level feed, a gravity filter unit, an intermediate pure water tank, a pneumatically-pressurised storage tank adapted to supply purified water to a distribution point, a motor-driven pump for pumping water from the intermediate pure water tank to the storage tank, and a pressure-sensitive device adapted to operate the pump motor within predetermined limits of pressure in the storage tank, the filter unit and the intermediate pure water tank being located on substantially the same level and thus constituting a self-compensating system in that water may flow from the sedimentation tank to the filter unit and thence to the intermediate pure water tank when the water-level in the latter is lowered below the water-level in the filter unit by the automatically-controlled pumping of water from the intermediate tank to replenish the storage tank.

4. A purification and supply system as claimed in Claim 3 mounted on a supporting framework fitted with a buoyancy chamber or chambers so that the assembly will float with the several tanks of the system at least partially submerged in the water to be purified.

5. A purification and supply system as

claimed in Claim 4 in which the sedimentation tank is located on the same level as the filter unit and is provided with a permanently-open water inlet located, when the system is in operation, at a shallow depth below the water-line.

6. A purification and supply system as claimed in Claim 4 having a series of two or more sedimentation tanks located on the same level as the filter unit, the last tank in the series being connected to the filter unit and the first in the series being provided with a permanently-open water inlet located, when the system is in operation, at a shallow depth below the water-line.

7. A purification and supply system as claimed in any one of the preceding Claims 3—6 in which each sedimentation tank is provided with a air lift for removing sediment from the tank.

8. A purification and supply system as claimed in any one of the preceding Claims 3—7 in which the filter unit is an annular unit.

9. A purification and supply system as claimed in Claim 8 arranged so that water may be fed from a sedimentation tank to the central part of the filter unit, an air lift being provided for removing sediment from this part.

10. A purification and supply system as claimed in either Claim 8 or 9 in which the filter unit may be cleaned by blowing with air and washing with water.

11. A purification and supply system as claimed in any one of the preceding Claims 3—10 in which the motor for driving the pump also drives mechanisms for supplying chemicals for treating the water e.g., flocculating agents and bactericides.

12. An automatically-controlled water purification and supply system substantially as described with reference to the drawing accompanying the Provisional Specification.

ALFRED O. BALL,
Agent for the Applicants.

PROVISIONAL SPECIFICATION.

Improvements relating to Water Purification and Supply Systems.

We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare this invention to be described in the following statement:—

This invention is concerned with water purification and supply systems.

It is an object of this invention to provide an improved water purification and supply system.

According to this invention, an automatically-controlled water purification and supply system comprises, one or more sedimentation tanks, a gravity filter unit, an intermediate pure water tank, one or more pneumatically-pressurised storage tanks adapted to supply purified water to a distribution point, a motor-driven pump for pumping water from the intermediate pure water tank to the storage tank,

controlled by the pressure in the storage tanks.

What we claim is:—

1. A water purification and supply system comprising a gravity filter unit supplied from a constant level feed and an intermediate pure water tank located on substantially the same level and thus constituting a self-compensating system in that water will flow through the filter unit to the intermediate pure water tank when the water level in the latter is lowered below the water level in the former.

2. A water purification and supply system as claimed in Claim 1 in which the filter unit is an annular unit.

3. An automatically-controlled water purification and supply system comprising a sedimentation tank supplied from a constant level feed, a gravity filter unit, an intermediate pure water tank, a pneumatically-pressurised storage tank adapted to supply purified water to a distribution point, a motor-driven pump for pumping water from the intermediate pure water tank to the storage tank, and a pressure-sensitive device adapted to operate the pump motor within predetermined limits of pressure in the storage tank, the filter unit and the intermediate pure water tank being located on substantially the same level and thus constituting a self-compensating system in that water may flow from the sedimentation tank to the filter unit and thence to the intermediate pure water tank when the water-level in the latter is lowered below the water-level in the filter unit by the automatically-controlled pumping of water from the intermediate tank to replenish the storage tank.

4. A purification and supply system as claimed in Claim 3 mounted on a supporting framework fitted with a buoyancy chamber or chambers so that the assembly will float with the several tanks of the system at least partially submerged in the water to be purified.

5. A purification and supply system as

claimed in Claim 4 in which the sedimentation tank is located on the same level as the filter unit and is provided with a permanently-open water inlet located, when the system is in operation, at a shallow depth below the water-line.

6. A purification and supply system as claimed in Claim 4 having a series of two or more sedimentation tanks located on the same level as the filter unit, the last tank in the series being connected to the filter unit and the first in the series being provided with a permanently-open water inlet located, when the system is in operation, at a shallow depth below the water-line.

7. A purification and supply system as claimed in any one of the preceding Claims 3—6 in which each sedimentation tank is provided with a air lift for removing sediment from the tank.

8. A purification and supply system as claimed in any one of the preceding Claims 3—7 in which the filter unit is an annular unit.

9. A purification and supply system as claimed in Claim 8 arranged so that water may be fed from a sedimentation tank to the central part of the filter unit, an air lift being provided for removing sediment from this part.

10. A purification and supply system as claimed in either Claim 8 or 9 in which the filter unit may be cleaned by blowing with air and washing with water.

11. A purification and supply system as claimed in any one of the preceding Claims 3—10 in which the motor for driving the pump also drives mechanisms for supplying chemicals for treating the water e.g., flocculating agents and bactericides.

12. An automatically-controlled water purification and supply system substantially as described with reference to the drawing accompanying the Provisional Specification.

ALFRED O. BALL,
Agent for the Applicants.



PROVISIONAL SPECIFICATION.

Improvements relating to Water Purification and Supply Systems.

We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, do hereby declare this invention to be described in the following statement:—

This invention is concerned with water purification and supply systems.

It is an object of this invention to provide an improved water purification and supply system.

According to this invention, an automatically-controlled water purification and supply system comprises, one or more sedimentation tanks, a gravity filter unit, an intermediate pure water tank, one or more pneumatically-pressurised storage tanks adapted to supply purified water to a distribution point, a motor-driven pump for pumping water from the intermediate pure water tank to the storage tank,



and a pressure-sensitive device adapted to operate the pump motor within predetermined limits of pressure in the storage tank, the filter unit and the intermediate pure water tank being located on substantially the same level and thus constituting a self-compensating system in that water flows from the sedimentation tanks to the filter unit and thence to the intermediate pure water tank when the water-level in the latter is lowered below the water-level in the filter unit by the automatically-controlled pumping of water from the intermediate tank to replenish the storage tank.

According to a feature of the invention, the various tanks and ancillary equipment are mounted on a supporting framework, together with one or more buoyancy tanks, the entire assembly constituting a buoyant complete water purification system adapted to float with the several tanks at least partly submerged in the water to be purified.

Preferably, in the floating system, the sedimentation tank or tanks is located on the same level as the filter unit and at least one of them is provided with a permanently-open water inlet located at a shallow depth below the water-line.

Preferably, also, the motor for driving the pump for supplying the storage tank also drives mechanisms for supplying chemicals, e.g. a flocculating medium and a bactericidal agent to the water during its purification.

Furthermore, the sedimentation tank may be cleaned by a pneumatic lift, the air for the lift being obtained from the storage tank. In order to "top-up" the air pressure within the storage tank an intermittently-operated compressor is employed. If desired, a further pneumatic device drawing air from the storage tank may be employed to perform a preliminary cleaning operation on the filter unit before washing with water, also drawn from the storage tank.

By disposing the sedimentation tank and the permanently-open water inlet thereto below the surface of the water in which the system is floating, the sedimentation tanks will automatically fill as water is pumped from the pure water tank to the storage tank.

One embodiment of the invention will now be described by way of example of the invention, and this embodiment is shown in the accompanying drawing which is a schematic arrangement of a floating water purification and supply system.

The water purification and supply system comprises a skeleton framework (not shown) with buoyancy chambers (not shown).

The framework carries a first sedimentation tank 1 which is disposed on the framework so that it is completely immersed in the water when the assembly is floating in a lake or river. The outer surface of the

sedimentation tank is in contact with the water. The sedimentation tank has a permanently-open water-inlet 2 arranged to be about twelve inches below the surface during operation of the system. The sedimentation tank is vented as shown at 3, and is provided with an air lift 5 for cleaning it.

The upper portion of the sedimentation tank 1 is connected to a second sedimentation tank 7 which is also completely immersed in the water. Sedimentation tank 7 is vented as at 9 and has an air lift 11 for cleaning purposes.

The upper portion of the sedimentation tank is connected to an annular filter unit 13 which is vented at 15 and has an air lift 17 for cleaning purposes. Water from the bottom of the filter unit 13 flows by way of a valve 19 to an intermediate purified water tank 21.

The two sedimentation tanks, the filter unit and the intermediate purified water tank are disposed at the same level on the framework so that, by reason of hydrostatic pressure, water entering the first sedimentation tank is ultimately passed through the filter to the intermediate purified water tank as and when the level therein is reduced by pumping water therefrom to the storage tanks as described later.

The intermediate purified water tank 21 includes a foot valve and strainer 23 which is connected by way of valves 33, 35 to two water pumps 25, 27 operated by motors 29, 31. Each outlet pipe from the pumps is connected by pneumatically-pressurised storage tanks 37, 39 by way of stop valves 41, 43 and a non-return valve 45. The storage tanks 37, 39 are connected to an external distribution point (not shown) by way of a sluice valve, 47.

The motors 29, 31 are connected to an electrical supply system 49 by way of a pressure-sensitive device in the form of a pressure switch 51 and a main switch 53. The main switch is also connected to a motor 55 arranged to drive an air compressor 56 which supplies air to the storage tanks for "topping-up" purposes via a non-return valve 59 and stop valve 61. One storage tank 37 includes a pressure-sensitive device 63 adapted to operate the pressure switch 51.

The storage tanks 37, 39 are also connected through a restriction valve 65 to the filter unit 13 for the purpose of supplying wash water thereto.

Each of the motors 29, 31 also drives a chlorine doser 67 connected to the intermediate purified water tank 21 and an alum doser 69 connected to the sedimentation tank 1.

In operation water flows into the sedimentation tank 1 through the inlet 2, then into the sedimentation tank 7, and by way of the filter unit 13 to the intermediate purified

5 fied water tank 21. The storage tanks are
pressurised and the pressure-sensitive device
is arranged to close the pressure switch when
the air pressure falls below 27 pounds per
square inch, and to open the pressure switch
when the air pressure reaches about 35
pounds per square inch. Consequently, the
storage tanks will fill up until the air within
them is compressed so that it exerts a pres-
sure of 35 pounds per square inch. The
motors will then stop supplying water to the
storage tanks. As water is supplied to a
distribution point the air pressure within the
tank will fall and when it reaches 27 pounds
per square inch the water pumps will be
operated to replenish the water in the storage
tanks from the intermediate purified water
tank.

10 As water is pumped from the intermediate
purified water tank to the storage tanks
hydrostatic pressure causes more purified
water to enter the intermediate tank from
the filter unit and thus more water will
enter the sedimentation tank 1 through the
permanently-open inlet. Since the pumping
of water from the pure water tank to the
storage tank is automatically controlled by

the pressure-sensitive device in the storage
tank and the flow of water through the filter
to the pure water tank is dependent on a
difference in their respective water levels,
and moreover since the motor controlled by
the pressure-sensitive device drives not only
the water pump but also the chemical dosing
mechanisms, it will be seen that the function-
ing of the entire system is automatically
controlled by the pressure in the storage
tanks.

Since the filter unit and the intermediate
pure water tank are located on substantially
the same level, it will be appreciated that the
filter unit will continue to filter water at a
constant rate, irrespective of its degree of
dirtiness, as a result of the varying degree
of back pressure from the intermediate pure
water tank.

Furthermore, the filter unit will start and
finish each run slowly, which is highly desir-
able and which, previously, has been pro-
vided by expensive mechanisms disposed on
the outlet side of the filter unit.

ALFRED O. BALL,
Agent for the Applicants.