the opposite sides of a pipe gallery. Arranging filters on two sides of a pipe gallery appears to be economy in piping. On the other hand, it means a complication of piping and it is very difficult to arrange same so that the pipe gallery is accessible.

Generally, the influent main or influent flume is arranged in the centre of the gallery and at the top. Under this and usually in the centre is arranged the air main. Under this again, the wash water main and on the floor of the pipe gallery, the sewer. It is necessary that branches from all of these mains be carried to the sides or across the gallery to enter the filters and it can be easily understood where the interruption to free access to the gallery occurs. Besides, the pipe gallery is usually dark, without windows or proper ventilation. It is quite certain that in any pipe gallery as above described, the valves operating the filters do not get proper attention and that at least four out of five valves will be leaking at the stuffing boxes. It is only another case where "out of sight is out of mind," and therefore proper attention is not given to the piping equipment. The writer prefers a design where all the filters are arranged at one side of the pipe gallery. This will often admit of the opposite side being an outside wall, where windows and proper ventilation can be arranged. It means that a clear space can be provided in front of the piping and that all valves and other equipment can be conveniently reached. It also provides a place that is decidedly not out of sight, and the tendency is to keep the stuffing boxes on the valves tight in order to keep the floor free from water. It is possible to arrange a plant up to twenty million gallons capacity in this way.

In the housing of the filters in this climate, the writer would not again deck over a part of the filters. It is better practice to arrange the house to cover the entire area of the beds. Where filters are decked over and are covered with 2½ feet of earth, in severe weather, colder than 15 degrees below zero, they will freeze at the back. Again, where the filters are arranged on one side of a pipe gallery, the design will probably work out so that the water from the coagulating basin will enter at the back of the filters. In this case it is necessary that the hydraulic influent valve be placed at the back of the filter and this valve must be protected against freezing.

The raw water supplied to the plant may in some cases reach it by gravity. It is, however, more often the case that pumps are required to lift the water into the plant. In filtration work, these pumps are called low-lift pumps. Usually the low-lift pumping machinery is a part of the design of the filter plant and space must be provided for this equipment. There is very little to be said about the arrangement of low-lift pumping machinery, other than it should be arranged in duplicate and that the capacities of the pumps should be arranged for economical power consumption. Electrically driven centrifugal pumps are in every way satisfactory. Where interruption in electric service is liable to occur for any length of time, stand-by of some other convenient power should be arranged, or storage of clear water provided to carry over such interruption.

The control of the water from the low-lift pump or from a gravity supply is necessary. The water level in the coagulating basin should be maintained at a constant level and this is usually accomplished by placing at the end of the raw water main, in the inlet chamber to the coagulating basin, a butterfly valve. This valve has an extension rod at the top of which, or at the high-water mark, is arranged a float for operating the valve. This arrangement is not altogether satisfactory. It is difficult to keep the water in the inlet chamber from freezing around the float and putting the controlling apparatus out of commission.

A better way to control the flow to the basin is by arranging a float chamber inside of the plant. This chamber can be arranged at any point where the water from the coagulating basin can conveniently be conveyed to it. The chamber only need be large enough to accommodate the required number of floats and deep enough for them. In the raw water discharge main from the low-lift pumps and beyond any pump connection a hydraulic valve should be placed in the line. At the float chamber a pilot valve for operating the hydraulic valve can be arranged. The float operates through the pilot valve, the hydraulic valve cramping or opening the discharge from the pumps as required to maintain a constant level in the basin. This arrangement is satisfactory in every way.

Almost every filter plant in operation to-day is treating the filtered effluent with a sterilizing agent; hypochlorite of lime or liquid chlorine most often being used. Hypochlorite of lime, however, is being replaced by the use of liquid chlorine. The writer's experience has been altogether with the Wallace & Tiernan chlorinators. Their solution feed machines are entirely satisfactory, and for small plants the machine operating with a pulsating meter is particularly satisfactory.

The feeding of chlorine gas to the effluent passing from the filter plant, proportional to the amount of water flowing, is a problem requiring a good deal of study. There is no question but that the ideal way to chlorinate would be to chlorinate the effluent from each filter, or to collect the effluent of all the filters into a comparatively small area and chlorinate the water as it passes to the storage in the clear water basin. Any such arrangement as this, however, runs into so many complications that it does not seem feasible. Where a venturi meter can be arranged on the discharge line from the high service pumps, the velocity head through the meter can be used for operating the chlorinator and the chlorine solution fed to the suction of the pumps. Where such a meter cannot be arranged, a special venturi tube can be installed at the outlet of the clear water basin and the velocity head at the throat utilized, feeding the solution through a distributing pipe, directly in front of the outlet. It is, however, important and much to be preferred that an automatic proportional feed machine be used on plants of large capacity. On smaller plants satisfactory results can be obtained with manual control machines.

In any filter plant, space should be provided for an office, or store-room, a room where small tools and supplies can be kept and where a sink and bench can be arranged, to facilitate the making of alkalinity, turbidity and color determinations. These small plants can arrange to have the bacterial work done at the laboratories of the board of health. In large plants, office space, tool and storage-room, lavatories and rooms for a complete chemical and bacterial laboratory are real necessities and the arrangement of this part of the plant should be carefully laid out.

It requires very little labor to operate a filter plant. One man to a shift will handle a plant up to four million gallons without any difficulty. Two men to a shift will handle a plant from four million gallons to ten million gallons, and three men to a shift seems all that is necessary for a plant up to thirty million gallons. On a plant, however, of this size it is well to have an extra man on the day shift, a good mechanic or handy man. This man