REFERENCES to the "future" in this article pertain to a time approximately 50 years from now—the end of the life of existing supply facilities. Predictions of future developments can be made on the basis of past experience, but, because it is difficult to free the mind of considerations of today's and tomorrow's problems, most thinking is of the immediate present, or, at most, of a year or two in advance.

If the minds of those in the water supply field can be freed from the fetters of present-day problems, great, though seemingly far-fetched, developments can be imagined; the towing of icebergs from the Arctic to places where more water is needed; and the use of balloons to condense water in the clouds, the water running down through anchor cords, made of hose, to ground storage. Hundreds of thousands of dollars have been, and are being, spent for seeding clouds and otherwise attempting to control rainfall. Many experts are engaged in this work, and the future holds great promise. Of course, present means of transporting water and the improvements in, and better utilization of, existing underground basins will be continued, and, where justified, sea water will be converted to fresh water.

Need for Water

Human beings need water for every phase of their being. Furthermore, they need, relatively, a lot of water, for every physical process requires water and every chemical change in the body is based on water solubility. As to how much is needed and how much is used depends, to a great extent, on how Americans will live and on the price of water. At today's costs, piped utility water is extremely cheap compared to other commodities. About 98 parts of water are used to wash 1 part of waste through sewers from bathrooms, kitchens, and laundries. More money is paid for the disposal of used water than for the distribution of fresh water. In some places, sewage collection lines cost twice as much as water supply lines.

Economy

Even though water for California is transported hundreds of miles from the Colorado River and will be transported, in a few years, from the Feather River, it is still so relatively cheap that considerations of cost continue to be ignored. But, in the future, water will begin to cost more, and it will eventually cost enough to call for economies in production and use.

The best watersheds in the United States recover about 10 per cent of all the water that falls as rain. The rest is lost in evaporation and transpiration from trees and brush. The US Forest Service of the Department of Agriculture has been conducting experiments...
and studies for years in the relative value of trees, brush, and grasses on the watershed productivity of various areas. For several years past, at the annual meeting of the San Dimas (Calif.) Charter Oak Domestic Water Co., the results of the work on the San Dimas watershed have been reported. Each year, the reports indicate that water-using trees and brush must be removed and grass substituted, but no action has been taken by the Forest Service.

Another step in economizing on production will, of course, be the salvaging of waste water. The feasibility of treatment plants and spreading grounds has been proved for many years. Heretofore, very misconceived ideas of the value of used water have been stated.

Undoubtedly, in the future, the consumption of water will tend to be more controlled. Some of the ways economies may be effected are:

1. Reduction of items that need to be laundered, by the increased use of paper towels, handkerchiefs, tablecloths, napkins, and diapers. Underwear and socks also may be made of paper.

2. Elimination of the need to wash poultry, meats, and other foods by preparing them for cooking at the point of packaging, where the water can be used for crop irrigation. This is done today with salad vegetables, baking potatoes, fancy packed fruits, and all frozen foods.

3. Reduction in the need for dishwashing and dishwashers. More and more foods are being so packaged that they can be prepared in their own cooking and serving foil containers. Some day, most food may be sold this way, and in decorated and fancy containers.

4. More economical use of water for washing and bathing. Navy personnel aboard ship soon learn that baths may be sufficiently cleansing by the “wet, soap, and rinse method.” When the water for a wasteful bath costs 15–40 cents, economy will be practiced in a hurry.

5. Less wasteful landscaping of homes. Today, the constant growing and discarding of grass consumes much water, fertilizer, and labor. Homes can be made attractive with less, but better, planting. The big park expanses of lawn and golf courses may be watered with reclaimed waste water, as are many courses at present. It may be possible for waste water from each home to be used on the home property.

Quality and Costs

It used to be said that water is water, regardless of quality. Today there are pollution standards, and it is no longer permissible to discharge waste waters with excessive dissolved solids or excessive amounts of certain elements into watershed areas or stream beds. By the same token, waters of low mineral content and desirable chemical makeup are valuable for spreading—whether they have been used once or many times—and for industrial and agricultural uses.

Most water costs the consumers in towns and cities about $100–$125 per acre-foot. Still, many people everywhere buy water in 5-gal bottles for 50 cents to $1. At 50 cents, they pay $32,500 per acre-foot. To compare various waters, new and used, and to evaluate them properly, a price formula based on water quality is needed for piped water. An engineer considered to be an authority on water should establish such a formula, with tables and curves to make it simple to use.

A standard of good-quality water delivered to, say, a 500-ft elevation,
could be used as a base. The cost of other waters would depend on how they were treated and from what level they were pumped. Waters of better quality could be used to blend out poorer waters; this would permit greater reuse of water. Only by a real appreciation of the quality of water can the true value of water be recognized.

Supply and Demand

As the price of water increases, and less of it is used, it is inevitable that the size of services to the home will become smaller. Meters will then be smaller, and the present trend in piping will probably be reversed, with pipe sizes becoming smaller. It can be remembered when a normal house service used 0.5-in. pipe. Then the size of pipe increased to 0.75 in., and then to 1 in. Now there are quite a few places that require 1.5-in. pipe. So long as the homeowner wants to water his entire yard at one time, and the service charge for the meter encourages the utility man to give him the largest meter he will take, the services will stay large. But some day homeowners will stop their wasteful use of water and the size of the service will be reduced. The trend of larger pipe will be reversed. The factor that will cause this reversal will be the size of the water bill, for American consumers are cost conscious. Their awareness of the water bill and, consequently, of the water utility may be among the reasons why municipalities will take over water utilities. By that time, the utilities will be so thoroughly tied up in government, regulatory, and employee-bargaining controls that they will be glad to sell out.

If the trend goes toward smaller services, and it is believed that it will, the needed size of distribution mains will also be reduced. From the present minimum of 4 in., the size will probably decrease to 2 in., and an 8-in. main will really be a whopper.

Homes may be equipped with a 20–50-gal elastic tank that will take the surge demand off the supply line when there is a sudden demand for 5 gal or 10 gal of water. The tank will deliver the water and refill, with practically no drop in pressure.

Fire Protection

It may be thought that the size of mains cannot be reduced because of the requirements for fire protection. This is another area where some radical changes will be made. The entire concept of fire protection should be based on the elimination of hazards and the prevention of fire, rather than on fighting fire. The burden of providing fire-fighting water is, today, a very serious problem for the small water system. As the domestic consumption of water decreases, this burden is going to become unbearable.

If water is to be used to fight fires, it should be supplied from trucks instead of by a pumper hooked to a fire hydrant. One community boasts that it has not unrolled a fire hose to a hydrant in 15 years. The time will come when a householder will be assessed the cost of fighting the fire and will be subject to damage suits by his neighbors. If factories and large buildings need water for protection, they should supply their own storage tanks, as many do today.

Equipment, Materials, Labor, and Power

Undoubtedly, many improvements in materials and methods and the better use of power and men will come about in the future. The use of tele-
phone and radio for telemetering and supervisory controls is a familiar one today. The use of this equipment, with the subsequent trend toward fully automatic facilities in the field, has taught that the best system is one that controls and operates itself on a local level, with constant review by a central headquarters station. Such systems emphasize the need for equipment that needs no maintenance. Some motors are lubricated to withstand 10 years of normal usage. Mechanical seals on pumps, the use of strainers ahead of pumps, and ample safeguards and factors of safety in the use of materials and equipment will allow plants to be maintenance-free. In this regard, all manufacturers of equipment must cooperate. An important automatic valve operating in a system must have large control tubing and oversize strainers on the control tubing, and be, in every way, designed to operate continuously without attention—not for a year, but for the life of the unit. In the future, it may be expected that watershed supplies and the spreading of waters in basins will control the level of underground water in such a manner that pumps will be installed underground, the land surface being utilized for other purposes.

With the increased numbers of people that have to be served, undoubtedly more power is needed to operate water systems, especially because more and more work will be done by machine. The burning of fuel and the internal-combustion engine are on the way out. Sources of power that will be used in the future are actually here today, but they remain unrecognized. Electricity was discovered long before it was used for power. Radioactive materials were studied long before they were used in the atomic bomb. New forms of power different from any known today are sure to be found.

As to materials used in the water industry, meter and fitting manufacturers are trying hard to find plastic and other material to replace brass. Plastic sheets are being used as linings for reservoirs and for inflatable roofs of tanks. Other materials planned for development are foam forms of steel, aluminum, and other metals. These forms will result in structural members of great strength and light weight. Mixed with, or combined with, plastic foams and various cements, these and other materials will provide economical tank roofs and tank panels. Tanks will then be installed underground, the land surface being utilized for other purposes.

If one examines a chart showing all chemical elements and their combined weights, he finds that electricity is based on the magnetic series of elements. Likewise, atomic energy is based on the radioactive series. It is probable that there is a power system behind each of the other series of elements and that these systems will soon be used. If each new power system is as great an improvement over the one before as atomic energy is over electricity, a wondrous world is in the offing.