ENGINEERING

Leo Ranney, Bringer of Water

He is noted for a new water supply system made up of wells sunk in a gravel bed and yielding clean, unpolluted water of some half a billion gallons a day.

By HARLAN MANCHESTER

See Front Cover

➤ ALFRED RANSOM, young superintendent of waterworks of Canton, Ohio, pulled open a steel trapdoor in a small building on the outskirts of the city and led the way down an iron ladder set in the concrete wall. Above us hummed giant electric motors, and far below in the beam of his flashlight the ladder disappeared in the black surface of swirling water.

"This leads to a natural underground reservoir," he explained. "We discovered a thick layer of glacial gravel, stretching under the entire valley, which will hold perhaps three billion gallons of water. This is what is known as a Ranney well, and we have two others like it. During the winter they collect the surplus water from the creek and store it a hundred feet down to be used during the dry summer. The gravel filters it. We've added ten to 14 millions of gallons a day to Canton's water supply, and we've saved the city millions of dollars."

Water Shortage Crucial

Industrial expansion and population growth have made water shortage a crucial problem in many parts of the country. This completely new type of well, the invention of Leo Ranney, a genial, white-haired engineer now 64 years old, has solved the problem for some 40 towns, cities, and industrial plants here and abroad. To name a few places: Manitowoc, Wis.; Anderson, Ind.; Louisville, Ky.; Wallingford, Conn.; London, England; and Lisbon, Portugal.

Leo Ranney spent his boyhood on "the poorest farm in Iowa." He soon began inventing farm machines because he hated drudgery. A merry-go-round came to town, and inspired him to build a rotating horsepower device to thresh beans. He worked his way through normal school and took a job in a country school. He went West, worked as a harvest hand, taught school in Seattle, then shipped himself to Alaska and became superintendent of schools in Ketchikan. Listening to the tales of old goldseekers, he decided to become a geologist and set out for Chicago, where he enrolled at Northwestern University with a ten-dollar bill in his pocket. After three years of fiscal juggling he emerged with a B. S. in geology and a Phi Beta Kappa key, and he went on to Columbia for night courses in engineering.

During World War I, Ranney, as special assistant to the Chief of Ordnance, was assigned to study the problem of reclaiming the large amount of oil left in the ground after pumping. Ranney invented and later patented a method of "mining oil"—the father of his water supply systems. The method was to sink a deep shaft near an old oil well, dig lateral tunnels from the bottom of the shaft, and then drill upward from the tunnels into the oil-bearing sands. After the war, Ranney tried to interest oil companies in his device, with no luck. It sounded all right, but how did they know it would work? So Ranney hocked everything he had, went to Texas, leased a pumped-out well for nothing, bought some second-hand tools, and set to work with one helper to dig a 120-foot shaft and tunnels radiating from the bottom. The job took five years and the work almost killed him. One night his "powder monkey" got drunk and tried to dynamite Ranney in his sleep. Ranney had a gun under his pillow, and woke up in time to scare the drunk away. At long last he finished the job. It worked according to plan, and as "black gold" rushed through the pipes he called in the newspaper men. Engineers came from all over the country. Standard Oil of New Jersey promptly bought Ranney's patents and gave him a job as consulting engineer.

Then, just as Ranney was riding on top of the wave, lush new fields were discovered in California, Oklahoma and East Texas, and the price of oil hit the cellar. Expensive digging to reclaim oil no longer paid.

As a consulting engineer Ranney went to Ontario to try to buy some small oil fields for a client. He was warned that the doctor's widow who with her sister owned the fields was a shrewd bargainer. The negotiations lasted so long, and inspired so much mutual regard that when the deal was over Mr. Ranney and the widow decided to get married.

"My wife is a wonderful woman," says Mr. Ranney, "she understands everything. When I told her how my oil-mining had bogged down, she thought a minute, and said, 'Why not use this method to get water? Everybody needs water.' So that's what I did."

As a result of that decision, as much as half a billion gallons of water now gush every day from Ranney wells, and plans are under way for digging many more. The shafts of Ranney wells are of reinforced concrete, 13 feet inside diameter, usually 60 to 160 feet deep. They must terminate in a sizable deposit of water-carrying gravel. From the bottom of the shaft, perforated metal pipes are driven outward as much as 300 feet. During the drilling, fine sand is flushed around the pipes by compressed air and water, leaving coarse gravel which will not clog the intakes.

On this week's cover of the Science News Letter water is shown pouring into the shaft of a well through one of the completed portholes.

Marketing the Idea

Ranney tried to market this idea during the trough of the depression. Anyway he's a poor salesman, he says. No city or plant in America wanted to buy something that didn't exist. Then one day Ranney picked up a British magazine and read that the city of London was trying to cope with a water shortage. He bought a ticket on the next ship. Sir John Davidson, chief of the Metropolitan Water Board, gave him a hearing, and after 15 minutes he asked, "Can you build this water-collector in six weeks?"

Securing tools and help, Ranney at once began work at Sunbury Cross, a suburb, and spent 16 hours a day underground until the job was done. He met the deadline, and since then the well has been yielding two million gallons of water every day. This water is purified as it trickles downward through many feet of sand and

TAPS WATER STRATA—This is a typical collector showing elaborate pump house above elevation of highest recorded flood.

SOLVING WATER SHORTAGE —Here is shown the test pumping of one of the Ranney collectors. The test gave a yield of 9,800,000 gallons per day.

gravel to the collector pipes, and needs no further treatment. During the bombing of London, it was one water source which was safe from destruction or pollution. He installed a similar well in Lisbon, Portugal, and was negotiating to install a whole series of wells for the city of Paris when the job was called off because of the threat of war. When the tremendous Indiana Ordnance Works at Charlestown was built by the Du Pont Company in 1941, seven Ranney wells were sunk in a gravel bed near the bank of the Ohio River, and during production peaks they supplied as much as 64 millions of gallons of water a day—clean, pure water, despite the notorious pollution of the river. Experts say that it would have taken at least 70 conventional vertical wells to supply the amount of water. In the production of power alone, one third of all the water needed by the United States during the war was supplied by the Ranney wells, and dozens of chemical and distilling plants followed suit.

The goal of these big war plants was to get a lot of water fast for thirsty manufacturing jobs, but the Ranney well also has turned out to be an important tool for staggering the use of ground water throughout the year. For these wells are reversible —the perforated pipes which collect ground water so efficiently will also file away millions of gallons for future use. Then Seagram's Distillery put in Ranney wells near Louisville and during the winter months used the city's surplus of cold river water to recharge the deep reservoir. During the dry summer season it uses this reserve, which is all the more valuable for cooling jobs because of its low temperature.

The proved success of his well has not induced Ranney to rest on his laurels. The possibilities have only been scratched, he says. At an age when most men are retiring, Ranney is piling up airplane mileage to and from his home at Morro Bay, California, and sketching new ways to dig holes in the ground. His plan for "oil mining" is by no means dead, he maintains. Working for the Australian government during the recent war, Ranney supervised the sinking of a 1200-foot shaft in an oil field near Melbourne, and work is proceeding on drilling lateral holes from the bottom. As oil grows scarcer, his method will reclaim billions of "lost" petroleum from American oil fields, he predicts, and he is also eager to try it out in getting oil from the great Alberta tar sand deposits. He believes that his drilling methods can be used to burn coal underground in the production of commercial gas, and in laying cables and conduits under the surface without tearing up streets. And when people call him visionary, which they sometimes do, he just laughs and says, "This is where I came in."

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MINERALOGY

Low-Grade Ore Deposits

➤ THE threatened exhaustion of rich metallic ores is creating a world-wide interest in low-grade deposits and in better methods of recovering the metals from them, the UNSCCUR, will be told at its session to be held at Lake Success, N. Y., this summer. UNSCCUR is short for the international organization, the United Nations Scientific Conference on the Conservation and Utilization of Resources.

Among important presentations will be a paper by R. W. Diamond, C. O. Swanson and B. P. Sutherland of the research board in Trail, B. C., of the Consolidated Mining and Smelting Company of Canada, Ltd. These mining experts will discuss new processes for the utilization of low-grade ores.

There are two types of ore deposits classed as low-grade, they will remind the international group. The first are simple ores of low metal content, and the second are complex ores containing a number of minerals. The recovery process depends upon the type.

In the first type, crushing and grinding form an important part of the total cost. The general trend has been towards larger sized units, together with the adoption of automatic controls and greater mechanism in the handling of materials. In the separation processes, gravity methods are especially suitable because they are inexpensive. Favorable results have been obtained from sink-and-float devices over a broad field. In addition, notable advances have been made in jigs, spirals, tables, flotation and magnetic separation.

The treatment of complex low grade ores covers a wider field because they can stand larger costs, the scientists stated. The use of induced superficial oxidation, a fluidized bed for roasting and calcination, controlled crystallization of mattes, improved reagents in flotation, and electrostatic separation are some of the advances recently made. Automatic sorting of ore by visual differences, reflectivity, fluorescence, and transparency to various radiations has interesting possibilities.

During the past few decades the mineral industry has made great progress, they said, and a good part of the progress has been achieved by industrial research and developing using, in co-operation, the advances made in individual lines of science and engineering to further the industry as a whole. In North America, at least, there has been a remarkable recognition of the mutual advantage gained by the free interchange of technical information between individuals and companies.

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Science Service Radio

➤ LISTEN in to a discussion on "Chemistry Tomorrow" on "Adventures in Science" over the Columbia Broadcasting System at 3:15 p. m. EDST, Saturday, June 11. Prof. G. Rochow, Harvard University chemist, will be guest of Watson Davis, director of Science Service. Prof. Rochow, who just received the biennial Leo Hendrik Baekeland Award of the North Jersey Section of the American Chemical Society for his work in silicones, will predict how the U. S. could support a billion people living in earthenware houses and eating fats from coal, sugar from trees and proteins from yeast.

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