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Engineering Review

Power Giants

Boulder Dam's hydroelectric generators will be the world's largest both electrically and physically.

The generators are rated 82,500 kilovolt-amperes, unity power factor, three phase, and are designed for 50-cycle generation at 150 rpm. and 13,800 volts or 60-cycle generation at 180 rpm. and 16,500 volts.

Four 82,500-kv-a generators will be installed for the opening of the station, and ultimate plans call for a total of 15 such generators. In addition, one 40,000 kv-a. generator will be installed now and another one later.

The Boulder Dam generators will be smaller in diameter but both higher and heavier than the U. S. S. R. generators. The first two will have an overall diameter of 40 feet and height of 32 feet above floor level. Each will weigh more than 2,000,000 pounds.

The rotor, including its 115,000 pound, 38-inch diameter shaft, will weigh 1,250,000 pounds. At least 40 freight cars will be required for the transportation of each unit. The water wheels driving the generators will operate 90 percent of the time with a head of from 450 to 560 feet.

Because of special problems encountered in the transmission of the power over the distance of 265 miles to Los Angeles, special features of design will be incorporated in the units, making them equivalent in size to generators of approximately 125,000 kv-a. capacity in units of normal characteristics.

The Boulder power house will be immediately downstream from the dam. It will be U-shaped structure, with the base of the U across the river on the downstream toe of the dam, and one wing on each side of the river. The main generating units and the station service units will be in the wings of the power plant. The main step-up transformers and the low-voltage switching equipment will be on a platform along the river side at the wings of the power house. The high-voltage switching station will be on top of the canyon, a short distance back from the rim on the Nevada side of the river.

Two of the 82,500 kv-a. generators will normally be operated in parallel and will be connected to one bank of step-up transformers. A 13,800/16,500 volt transfer bus will be provided so that a square 82,500 kv-a. generator may be substituted for any other 82,500 kv-a. generator without dropping load. The power generated by these units will be transmitted to the City of Los Angeles by means of two transmission circuits operating at 275,000 volts at the receiving end and from 280,000 to 303,000

volts at the sending end. The transmission distance is approximately 265 miles and the lines will be sectionalized into three approximately equal sections by intermediate switching stations.

Minerals From the Ocean

After being successful in meeting the current demand for bromine by recovering it from seawater, which contains seventy parts of bromine in every million parts of seawater, the Dow Chemical Company, Midland, Michigan, is pursuing research of the nature which might lead to a commercial way of also extracting gold, silver, and other natural minerals from the ocean.

The process of extracting the bromine is carried on in the Ethyl-Dow plant at Kure Beach, near Wilmington, N. C. The Dow Chemical Company and the Ethyl Gasoline Corporation of New York built the plant and use the 15,000 pounds of bromine which is put out daily.

A film, made by Leroy C. Stewart and Thomas Midgley, Jr., of Worthington, Ohio, discoverer of Ethyl fluid, is now touring colleges, universities, and sections of the American Chemical Society.

This plant at Kure Beach is the boldest American commercial venture in ten years. It is the first big attempt to extract the minerals from the sea. Science and industry are cooperating to supply shortage of natural minerals.

The gold content of the ocean is estimated at \$10,000,000 to \$25,000,000 per cubic mile. Mr. Midgley predicts that the methods used to extract the bromine will lead to discovery of a means of extracting the gold.

Even though the gold is present to the extent of only a few parts per billion, the water which flows through the Dow plant daily contains \$1,000 worth of gold.

Mercury Detection

A device, which might well be called an "electric nose," was recently developed for the detection of mercury vapor in flue gases. Even the faint whiffs given off when the cork of a mercury bottle is held against one of its nostrils, a test valve, makes the detector react violently, causing a red lamp to flash and a large gong to ring.

This "electric nose" can smell out only mercury, but in this one field, it is sensitive to the point of monomania. It will give warning if there is only one part of mercury vapor in a hundred million parts of atmosphere. The most sensitive previous types of mercury detector would

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Selling by telephone gets results. In many lines of business, salesmen are finding they can cover more customers more often—and close more sales at lower cost—by telephone.

Bell System men have worked out a number of plans for systematic market coverage by Long Distance telephone. They have also devised telephone plans for more efficient handling of production, purchasing, administration, distribution, collections.

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give warning of one part of mercury in thirty million parts of atmosphere. Furthermore, the new detector is faster; it responds in a few seconds, whereas the old type detector takes several minutes.

The hypersensitive detector was developed in the Research Laboratory of the General Electric Company especially for use in connection with the new mercury-vapor turbine. The flue gases from the stack of a mercury boiler are drawn into an intake duct. They are, of course, given a preliminary treatment to remove stack impurities which would nullify the work of the detecting mechanism. The gases then pass through an ultra-violet light beam, coming from a mercury light source, and of a wave length known as the resonance radiation of the mercury atom. This radiation is directed on a quartz-sodium phototube, which, unlike the usual type of "electric eye," is supersensitive to a beam of this character. Mercury vapor is opaque in this light and casts a shadow, just as smoke is opaque in ordinary light and casts a shadow.

One part of mercury vapor in one hundred million parts of flue gases will dim the radiation sufficiently to actuate the phototube. The small change in the current inside the tube is amplified by other tubes and operates the circuits, giving warning of mercury leaks through the flashing lamp and the gong.

Combined in the same apparatus is the older chemical mercury detector. A light ray is directed on a sheet of paper coated with selenium sulphide and reflected on a phototube. Mercury vapor darkens the yellow coating on the paper, cuts down the amount of reflected light in the phototube, and causes a relay to operate the warning signals. The two methods of detection are used to check on each other, although the resonance radiation method will be the process normally depended upon because of its greater sensitivity and quicker operation.

Nurse: Are you the young lady who was with him when the car went into the ditch?

Visitor: Yes, I thought it would only be fair to come and give him the kiss he was trying for.

—The Sibley Journal.