

## A Study in Depreciation

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This year is the twentieth anniversary of long-distance energy transmission in the United States. Near the beginning of the year 1893 the San Antonio Canyon plant, started late the previous year, got settled down to regular business on the San Bernardino line, this being the first 10,000-volt transmission system used for commercial purposes. It was a single-phase line operated without a motor load. Early in September, the first of the American three-phase plants was started at Redlands, where there were two 250-kw generators, directly connected to Pelton wheels in what is now the No. 1 Mill Creek power house. The voltage at the machines was carried between 2600 and 2700, the rated terminal value being 2500 volts. The arc lighting of Redlands was carried by Brush arc machines installed in the same station and directly coupled to Pelton wheels. The distance of transmission in this case was only about 8 miles, but the plant enjoyed the unique distinction not only of beginning American three-phase transmission work but of being part of the splendid system which now covers southern California with its gigantic network.

There had been in the year or two previous some other praiseworthy attempts at energy transmission on the Pacific Coast. At the Falls of the Willamette a couple of years previously some single-phase machines had been installed for lighting Portland, Ore. These generators operated at 3000 volts, each over a separate line, if the writer remembers correctly. Fig. 1 shows the interior of this plant as it was twenty years ago. There was also at Bodie, Cal., an early single-phase transmission system in which two machines of the type and voltage of those in the Portland plant were utilized as generator and synchronous motor respectively.

Fig. 2 is a reproduction of a photograph of the north end of the original Redlands power house, taken about three years ago, quite unchanged from its appearance when the writer first lined up the machine in September, 1893. The remarkable thing about the case is that this particular machine, the old "T Y 10-250-600," is still in service after twenty years at the old stand, playing its regular part in the supply of energy to the system of which it was the be-



FIG. 1—WILLAMETTE PLANT OF TWENTY YEARS AGO

ginning and on which it impressed its original frequency of 50 cycles per second. It is a very substantial generator, designed with a large factor of safety, able to carry considerably over its rated load and with a full-load efficiency of 95 per cent. The writer is inclined to think also that this plant was the first polyphase installation in which the machines were regularly run in parallel.

The story of these early Western plants might serve as a curious text for a sermon on the vicissitudes of electrical equipment and particularly concerning the relation of that sinister and somewhat mysterious thing known as "depreciation" to change in the art. The Portland plant, as shown, went out of existence within two or three years from the date of its installation and was replaced by another plant

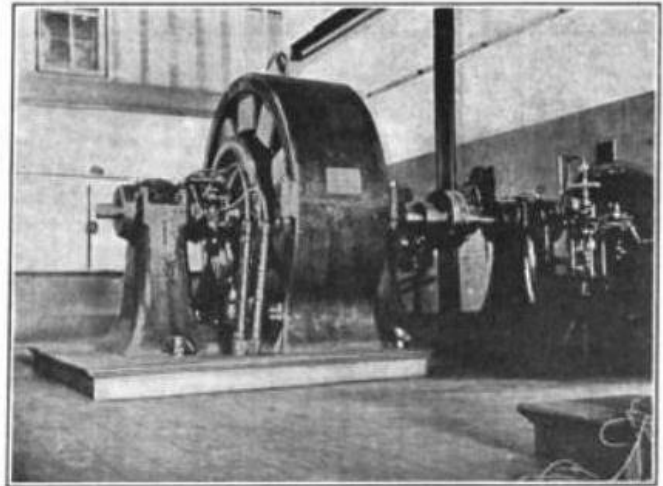


FIG. 2—NORTH END OF REDLANDS POWER HOUSE

which itself has in turn been replaced. The single-phase plant was actually installed within three or four years of the practical disappearance of single-phase working for the transmission of energy on any considerable scale. The machines were put out of service when still new with every prospect of a considerable length of life before them. In the next plant use was made of 6000-volt vertical-shaft three-phase generators.

The San Antonio Canyon plant, also single-phase, was changed over later, and what has become of the Bodie transmission equipment the writer does not know. Later calls for very much larger output again caused a shifting of the equipment at Portland, so that twenty years have seen practically three equipments at the Falls of the Willamette. The Redlands plant, on the other hand, was a year or two ahead of its time instead of a year or two behind its time, and has gone straight on for twenty years with a probability of a considerable useful life still ahead of it.

There have been some changes in the hydraulic situation, but this is not extended to the three-phase equipment. Probably the thing which has approved it for service so long is in part that the original installation has become one of the contributory generating stations of a large network, being originally developed to fairly near its maximum permissible hydraulic output. There was then no incentive to change by reason of enlarging the original equipment and increasing greatly the size of the units, while in point of efficiency and reliability the original generator has continued to give a good account of itself in spite of increased knowledge of design and a general transition from the revolving-armature to the revolving-field type of machine. The generators of even twenty years ago were built to give long useful life so far as actual physical service was concerned. Their actual depreciation due to change in the art or change in the conditions of suitability has generally been very great. The uncertainty of this phase of the matter is by nothing better shown than the persistence of the original three-phase commercial generator at Redlands as contrasted with the repeated and wholesale changes frequently observed elsewhere. Any engineer may make a shrewd guess at the probable useful life of a physical structure, but it takes a prophet to tell what is going to happen in the way of change enforced by other conditions.