

# CALTECH MEN ON THE AQUEDUCT

By Gene Riggs, '27

The construction of the largest water supply system in the history of the world is rapidly nearing completion within a few miles of Caltech. The Metropolitan Water District of Southern California is building an aqueduct that will bring 1500 cubic feet of water per second from the Colorado River a distance of 300 miles over mountains and across deserts to serve the ever-growing population of Southern California. The aqueduct intake is located at Parker reservoir on the Colorado River about 150 miles below Boulder Dam. From here the water will be pumped into a tunnel which is large enough to accommodate a railroad train, and thence through a series of canals, conduits, siphons, tunnels, reservoirs and four more pumping plants until it finally reaches the water faucets in thousands of Southern California homes.

This great project, involving as it does nearly all types of engineering construction, has required the services of a large number of technically trained men. It was only natural, therefore, that Caltech, being situated so close at hand, should play an important part in this work. Many Tech alumni have been employed on the aqueduct in various capacities, several members of the faculty have been called upon to act in advisory, consulting, and administrative capacities; and the Institute's facilities have been extensively used for research purposes and for testing equipment and materials.

The governing body of the District is a board of directors composed of representatives of the thirteen member cities. These directors, who serve without pay, have had the responsibility of financing and administering this 220 mil-

lion dollar project. Professor Franklin Thomas represents the City of Pasadena on the board and has served as its vice-chairman since the District was organized in 1928. The District has greatly benefited from Professor Thomas' wide engineering experience and knowledge of Southern California's water needs.

Other faculty members who have been employed as consultants for the district include Professors Sorensen, Buwalda, Martel, Converse, Daugherty, von Kármán, Knapp, and the late Professor Ransome. Professor Sorensen assisted in the design of the 240 miles of 230,000 volt transmission line that will supply power for the aqueduct pumping plants from Boulder Dam, and in the design of the transformer, switching, and electric motor installations at each plant. Professors Buwalda and Ransome prepared the geological reports that were used in determining the route of the aqueduct and the location of over 90 miles of tunnels. Professors Daugherty, von Kármán and Knapp were consulted in the design and testing of the main pumps, which will have to lift water through a vertical height of more than 1600 feet.

The Institute's high voltage laboratory was used to test the porcelain insulators that are a part of the District's 230 kv transmission line, and the hydraulic laboratory was used to solve some important problems of pump design and operation. This hydraulic laboratory was financed jointly by the District and the Institute and has already paid for itself many times over by increasing the efficiencies of the aqueduct pumps. Since each of the five aqueduct pumping plants will ultimately have nine main pumps, each with a



Bob Allen, '16

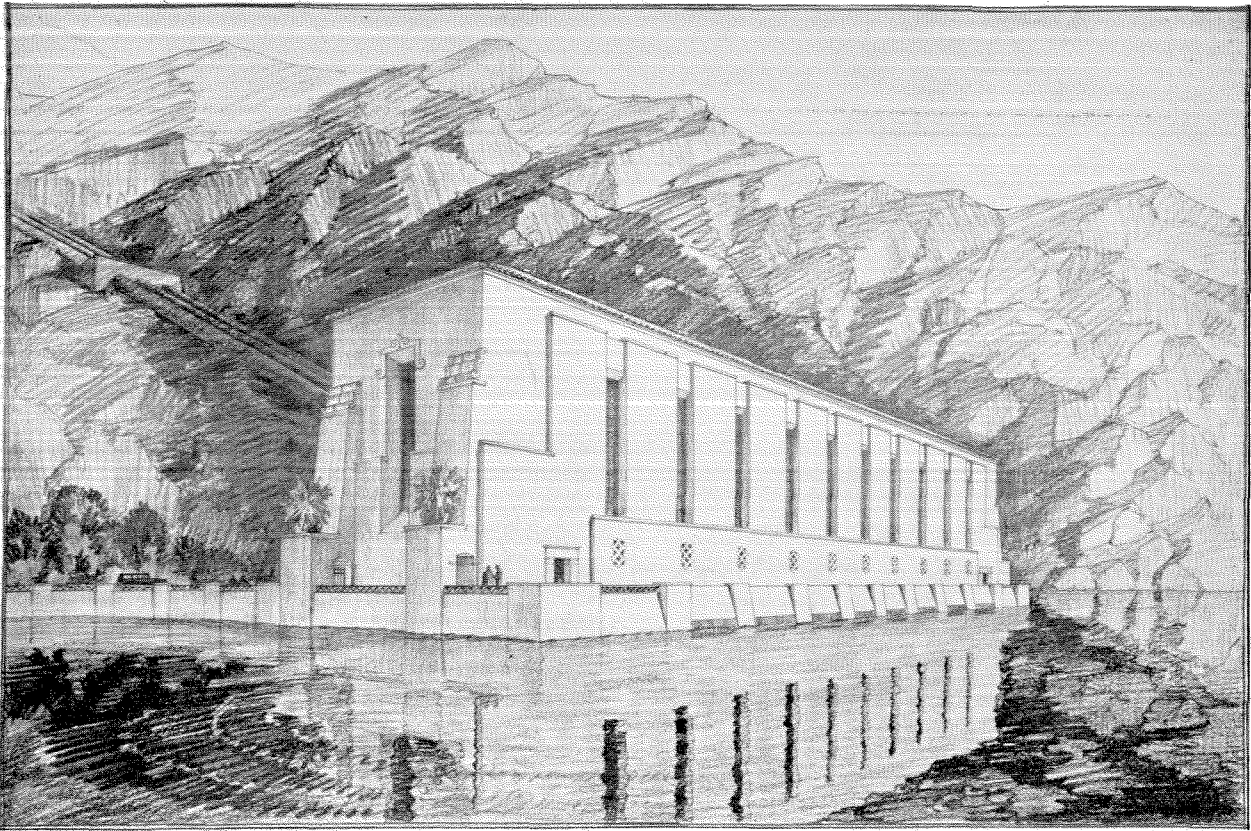
J. M. Gaylord, '02

V. D. Elliott, '15

E. H. Riggs, '27

W. W. Aultman, '27

Neal D. Smith, '25



Architects Sketch of Intake Pumping Plant

capacity of 200 cubic feet per second against heads varying from 146 feet at Iron Mountain plant to 444 feet at Hayfield plant, it is easy to see that a small increase in pump efficiency will result in large savings in operating costs.

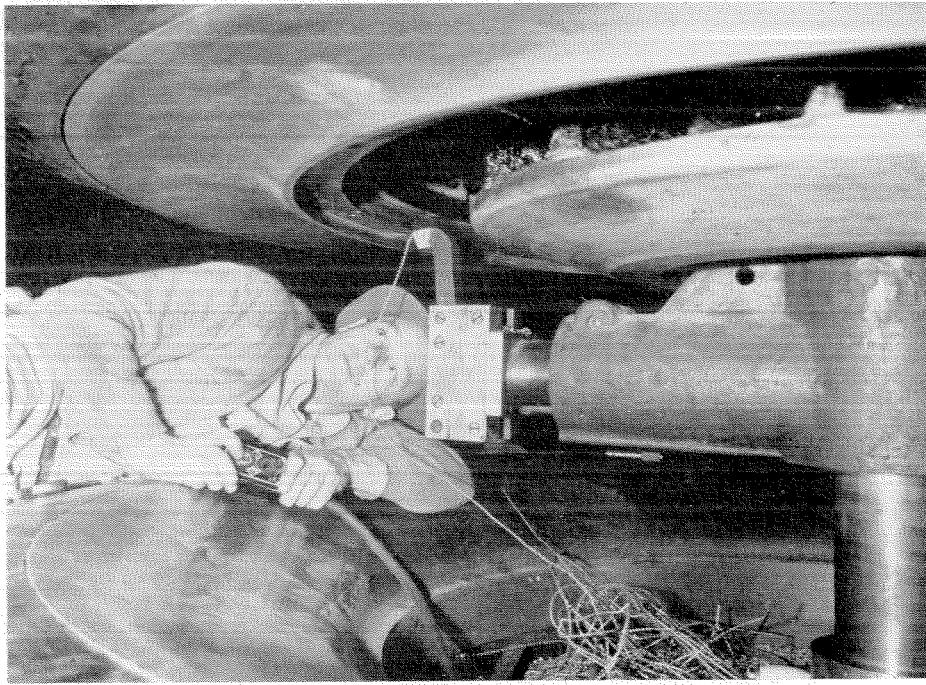
During the construction of the aqueduct there have been more than one hundred Tech graduates and ex-students employed by the District, and at present there are about twenty-five of these still in the District's employ. There have also been many Tech men employed by contractors on the construction of various parts of the aqueduct, and by manufacturers supplying materials and equipment for use on the aqueduct. Since it is not possible in the space here available to tell what each of these men has been doing in connection with the aqueduct construction, it will be necessary to limit the account to some of the jobs that are representative of the various types of work that the Tech men have been doing.

Jim Gaylord, Throop '02, is the District's Chief Electrical Engineer and is in charge of the design and construction of the pumping plants, transmission lines, telephone system and other electrical and mechanical features of the aqueduct. Verne Elliott, '15, is in charge of the office engineering work in connection with the construction of the pumping plants and transmission lines, and Al Atwood, '32,

is one of Verne's able assistants. Bob Allen, '16, has been the division engineer in charge of the construction of the 230 kv and 69 kv transmission lines, and Jordan Lummis, '21, helped Bob sag in the conductors for these lines.

Walt Gilbert, '23, was assistant personnel officer for the District and had the job of interviewing and classifying thousands of applicants for employment. Carl Heilbron, '25, and Bill Saylor, '32, have been doing structural designing. Carl also had charge of the hydrostatic tests on one of the concrete siphons. In making these tests he had the unusual experience of doing some deep-sea diving in the middle of the desert, for it was necessary to don a diving suit and go into the water-filled siphon to read the strain gauges.

Neal Smith, '25, is one of the old timers on the aqueduct, having worked on the project since April, 1928. Neal is now office engineer at Eagle Mountain and Hayfield pumping plants. Another office engineer is Dick Rofelty, '29, who serves in this position at Division 1. Bill Aultman, '27, is running the District's experimental water treatment plant at Boulder Dam, gathering information about the treatment of Colorado River water. Gene Riggs, '27, has had the job of writing the specifications for the construction of the pumping plants and appurtenant works, and for the equipment and materials that go into them. Al Capon, '27, has



Boring a seat for the seal ring inside one of the huge aqueduct pumps.

been doing electrical design work. Al also represented the District at the General Electric, Westinghouse and Allis Chalmers factories during the testing of the main pump motors. Wendel Morgan, '33, started with the District as a substation operator and is now in the electrical design division at Los Angeles.

Ralph Watson, '27, had charge of the District's pump testing at the hydraulic laboratory until about a year ago, when he went to Harrison, New Jersey, to work for the Worthington Pump and Machinery Corporation. Another man who landed a good job with an equipment manufacturer is Sterling Beckwith, Ph.D., '33, who went from the District's electrical design division to the Allis Chalmers Manufacturing Company at Milwaukee.

Emmet Irwin, '24, had charge of the electrical construction work at the hydraulic laboratory, and is now in charge of the electrical work on the Institute's 200-inch telescope at Palomar Mountain. Ralph Baker, Ph.D., '36, also worked at the hydraulic laboratory and later in the electrical design division in Los Angeles. Ralph left the District last fall to accept an assistant professorship at the University of Utah.

Some of the other Tech men who have, at one time or another worked in the District's Los Angeles office are Harlan Asquith, '29; Don Barnes, '30; Ray Binder, '33; Bert Coupland, '30; Linne Larson, '22; John Monning, '33; Frank Wattendorf, '33; Paul Joseph, '35; John Sinnette, '31, and Gleb Spassky, '27.

A number of Tech men have worked at the District's concrete testing laboratory at Banning, helping to test all

the cement and concrete that has gone into the aqueduct. This concrete lab is known along the aqueduct as "Banning Tech," due to the stiff training course that is given there to all concrete inspectors. Dick Stenzel, '21, and Byron Hill, '25, are ex-members of the "Banning Tech" faculty.

Besides those Tech men who have worked in the District's Los Angeles and Banning offices and in the hydraulic and concrete laboratories there have been quite a number employed in various field jobs where they have had a hand in the actual construction of the aqueduct. De Wolfe Murdoch, '31, for example, is a construction foreman on the San Jacinto tunnel. This tunnel is next longest of all the aqueduct tunnels, being 13 miles in length, and is the most difficult of all to drive, because of the large flows of water that have been encountered.

Among those who have watched the growth of the aqueduct through the telescope of a transit are John Bascom, '32; Lewis Behlow, '32; Francis Noel, '28; Elliott Bennett, John Mendenhall, '33, and Charles Spicer, '33. Some of those who have been rodmen or chainmen are Gordon Bowler, '32; Bob Carr, '30; Ed Core, '34; Phil Craig, '33; John Daly, '29; Francis Frazier, '36; Bob Grossman, '33; Ray Jensen, '36; Glenn Myers, '32; Harold Roach, '32; Mervin Schubert, '32; Dick Searle, '32; Jim Thomson, '26, and Prentice Willis, '34.

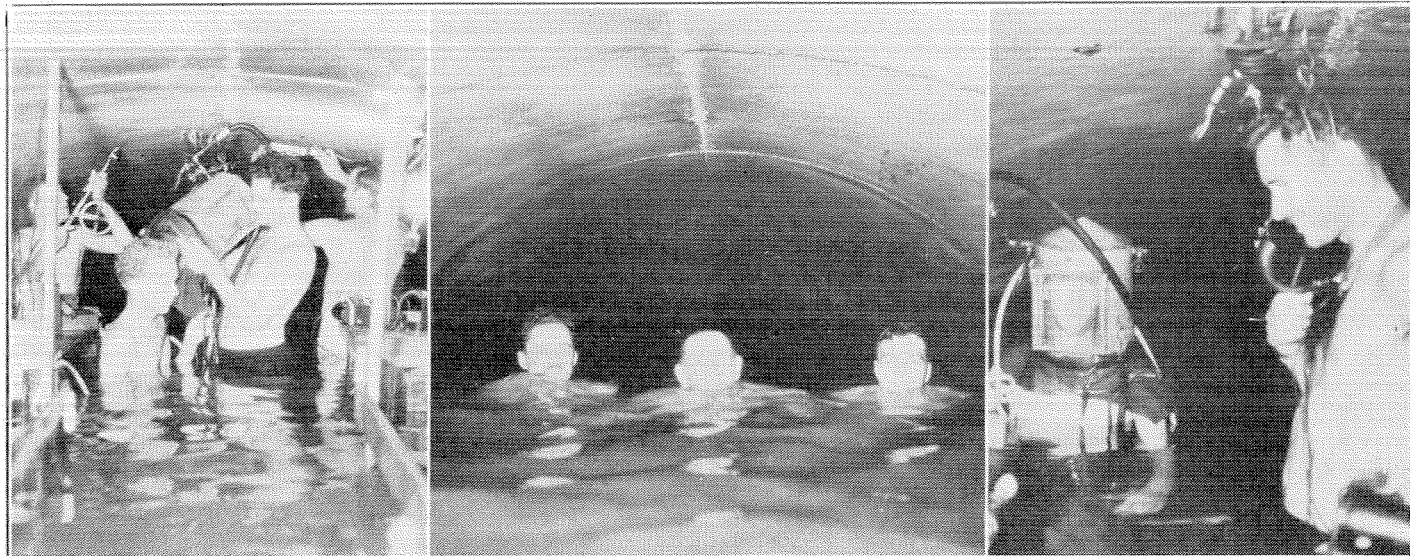
Another popular field job has been that of inspector. Since most of the construction work has been done by contract, the District has had to employ a regular army of inspectors to check up on the contractors and see that the

work is done in accordance with the plans and specifications. Some of the inspectors who hail from Caltech are John Hesse, '30; Frank Schack, '34; Perry Boothe, '31; Al Buxton, '26; Carroll Craig, '34; Art Duncan, '23; Charles Morse, '36, and Wally Swanson, '36.

One of the more important field jobs is that of junior engineer. Junior engineers are those slide rule and calculating machine artists who spend their lives computing quantities of excavation, cubic yards of concrete, and tons of steel. Tech men who have been junior engineers in the field include John Anderson, '30; Don Graff, '32; Harold Hol-

ton, '34; Maynard Anderson, '31; Dean Batchelder, M.S., '32; Ed Kanouse, M.S., '34, and Kenny Swart, '32.

The big job is now almost finished and before long the melted snow water from the upper tributaries of the Colorado River will be flowing through the aqueduct, to supply water for the homes and factories of Southern California. What was, only ten years ago, the dream of a few far-seeing engineers and business men is rapidly becoming an actuality of concrete and steel. Those of us who have helped a little to make this dream come true, feel, as we drift away to other jobs, that we have had a part in a great achievement.



Saylor, '32, Ayers, '30, and others, go deep sea diving in aqueduct.

## FASTEST IN THE WORLD

A recent advertisement appearing in the California Tech was worded in the form of a series of questions and answers. The question, "How fast do the electric elevators travel in Radio City, New York?" The amazing answer, "Some of the elevators in Radio City, believed to be the fastest in the world, travel at the speed of 1400 feet per second."

Sorry but I have an old fashioned stomach so prefer to walk up the stairs. (Yes that is right you slide rule artists, it figures out to be 954 miles per hour.)

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## ALUMNI ASSOCIATION FINANCES

The Board of Directors of the Alumni Association announce that copies of the annual financial statement will be available in mimeographed form immediately following the official audit, early in August. Any member wishing to review this statement is asked to write the Alumni office at that time, requesting that a copy be mailed to him.

## TECH COOPERATES IN SEARCH FOR TITANIUM

Even before the new geology building has been finished, a room in its basement is already in use as an ore testing laboratory. Work is being done on a titanium ore which is found in the San Gabriel mountains. Titanium is chiefly used in the form of titanium oxide—a white pigment which is now a constituent of most paints. It has the advantage that it does not discolor with age as do other white pigments. At present there is no large commercial deposit of titanium being worked in this country and hence, with the increasing demand for the material, an extensive search is being made for deposits. The Du Pont Company, one of the largest users of titanium, has had a party working in this district for some time, and now they have enlisted the support of the Institute to investigate the value of the ores found. Dr. George Anderson, Ph.D., '33, is in charge of the project and he is hopeful that the San Gabriel ores may prove to be a valuable source of the metal.