so that the water will be smooth and even again when it completes its circuit and re-enters the working chamber. The resorber system is built into an 85-foot shaft, dug straight down into the ground under the Laboratory. Thus, behind the tiny model in its small working chamber are literally tons of equipment filling up a good part of the large building.

When the pumps are turned on, the water starts to circulate. When it gets to the working chamber it is made to rush past the model, and pressure changes occur. Cavitation bubbles are formed wherever the pressure is lowered to the water's boiling point, and each bubble or cavity formed is then pushed by the moving water along the model until it runs into an area of higher pressure. There the bubble collapses as water in areas of higher pressure pushes into the cavity from all sides. In addition to the cameras, there is a battery of recording instruments for keeping track of the forces that act on the model during this boiling process.

It is when the water smacks against itself, rushing into the cavities, that the forces are set free which are responsible for cavitation damage. But at the same time something else happens that is a mixed blessing for the hydrodynamics engineer. The water slapping against itself makes a great deal of noise—just as air does when it rushes in to fill the cavity caused by a lightning discharge. The smacking air is thunder, and the thunder of cavitation, while it warns engineers when something is beginning to cavitate, also makes pumps objectionably noisy, and causes vibration that annoys the passengers on an ocean liner. Worst of all, however, is the fact that cavitation slows down flow, or increases resistance to flow. And this, in turn, means that pumps and propellers cannot operate at maximum efficiency, and that objects running with heavy cavitation are difficult to control.

These are some of the problems hydraulics engineers face, and the problems the California Institute of Technology researchers have set out to solve. The tools of their investigation—the water tunnel, the special high-speed movies, the models—have been developed to the point where the engineers know how to control pressure and velocity in order to make any good shape cavitate or any bad shape stop cavitating. And recently, through studying their photographs, they have reached some tentative conclusions about different types of cavitations. Formerly engineers thought all cavitation bubbles acted the same way. Now Institute researchers have identified several kinds of bubbles which behave in several ways.

Engineering advances

The fruits of this research, made possible through the support of the Bureau of Ordnance, with the help of the Office of Naval Research, are being made available to industry and to other researchers. Already about a dozen firms and several universities have obtained copies of the Institute's moving picture. And the Institute research team has moved ahead into newer fields, toward more fundamental problems.

Located in a building next to the Guggenheim Aeronautical Laboratory of the California Institute of Technology, the Hydrodynamics Laboratory is an ideal spot to study the widest ramifications of its field. For the flow of water and the flow of air are related, and the research being done by these two laboratories gives promise of ever-widening discoveries and developments, which in turn give promise of more efficient pumps and turbines, better underwater shapes, even better fluid transmission for automobiles—and engineering advances that may affect every one of the millions of parts that operate in fluids in American industries.

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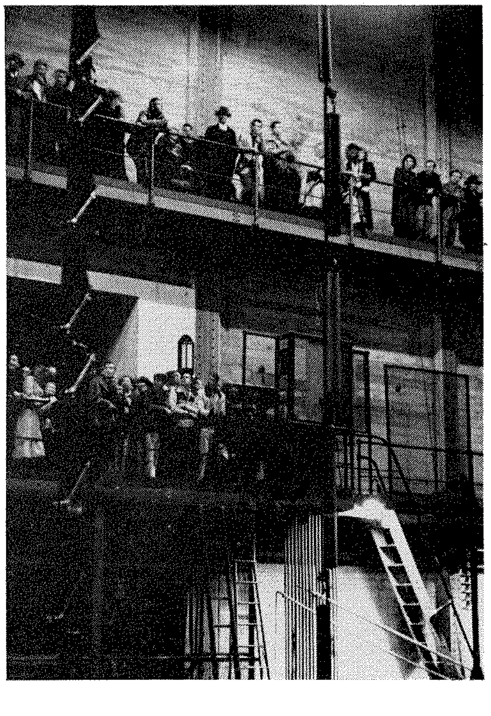
This review of cavitation studies in Caltech's Hydrodynamics Laboratory is the first of a series of reports on research in progress at the Institute.



Standing room only

Most popular of Caltech's Friday Evening Demonstration Lectures, held for the general public throughout the school year, is the one on high voltage, delivered by Prof. R. W. Sorensen. The demonstration in the High Voltage Laboratory which follows Prof. Sorensen's talk is still, after 25 years, one of the best shows on the campus. It proved to have its usual strong draw this year when, on a rainy Friday evening, almost 1,000 people stormed East Bridge. Prof. Sorensen obligingly gave his lecture twice, and the lab ran off three demonstrations, while a special police detail coped with the crush.

Specially designed for conducting researches requiring high-voltage electrical energy, the High Voltage Laboratory was built in 1924, with funds supplied by the Southern California Edison Co. The first laboratory in the country to have a reliable 1,000,000 volt power frequency, provided by a chain system of transformers designed by Prof. Sorensen, its facilities are available for research or for industrial tests. These facilities have been used to aid Southern California Edison in the development of high-voltage transmission lines, to furnish lightning protection of oil storage tanks for the oil industry, to test insulators for numerous utility companies.