More TECHNICAL BRIEFS

induction motor; unipolar motor; and turbomagnetic drive. The latter may be considered to be a canned eddy-current clutch driven by a turbine or motor. All three have been built in sizes from ½ to several hundred horsepower, each for a specific application.

The canned induction-motor drive is suited to high system pressures and has been designed to handle fluids at 1000 F in the rotor space with the pump impeller operating at about 1500 F. Turbomagnetic drive pumps are suited for temperatures up to 1500 F, but at low system pressures. Unipolar motor drives can be applied to pumping liquid metals and has the advantage of being a low-voltage unit that requires little electrical insulation. It can be built to operate efficiently with heavier walled cans than the turbomagnetic or canned induction motor.

Bearings, valves, liquid-level indicators' liquid-level controllers, flowmeters and pressure measurements are also considered. *A fluid-piston type bearing* in which the journal is kept centered in the bearing shell by liquid under pressure is described in detail. *ASME paper, no number, available only from the author.*

Electromagnetic Pumps for High-Temperature Liquid Metals *By J F Cage, Jr, Knolls Atomic Power Laboratory, General Electric Co.*

Liquid metals are used to cool atomic *energy reactors. To circulate these coolants* special types of pumps, described in this paper are used. For this service electromagnetic pumps are well suited, all of which use the electric-motor principle—a conductor carrying a current in a magnetic field has a force exerted on it.

The author shows the elements of one of these pumps, known as the Faraday type. Liquid metal contained in a thin-walled rectangular duct has a magnetic field passed through it. An electric current passes through the liquid at right angles to the magnetic field. Usually the low-voltage power-source conductors are brazed directly to the duct. Reaction of the magnetic field of the current on the field from the pole pieces produces a force on the liquid causing it to flow. Pumps of this type have been built for 400 gpm at heads up to 100 ft. A unit that delivers 135 gpm against a 21 ft head weighs 950 lb and requires 6000 amp at 1.25 volts.

Other designs of electromagnetic pumps use the induction-motor principle and operate on 60-cycle ac. One of these units delivers 1200 gpm of 850 F sodium at 110-ft head when using 288 amp at 300 v. This unit weighs 6430 lb and requires 2000 cfm of cooling air. *ASME paper No. 52-A-66.*

Measurement of Pulsating Flow with Propeller and Turbine Type Meters. *By R B Dowdell and A H Liddle, Jr, Builders Providence, Inc.*

It has been conclusively proven, both by theory and experiment, that it is impossible to accurately measure pulsating flow with a differential type flow meter when pulsations are excessive. The suppression of pulsations in a pipe line, either by filters or surge tanks, is often unsatisfactory and may prove to be a large expense; thus, a meter which will accurately measure pulsating flow has long been desired. The data presented in this paper show that with the magnitude and frequency of pulsations tested, a propeller type flow meter will accurately totalize the flow of an incompressible fluid. The Shuntflow Meter, *a device which combines some* of the features of a differential type meter and some of those of a propeller type meter, though performing accurately under some conditions, may produce readings with considerable error when measuring a compressible pulsating flow.

Two different testing set-ups, one utilizing water as the working medium and the other using steam, were used. All hydraulic tests were made at the *Hydraulics Laboratory of Builders*-Providence, Inc, Providence, R. I. The flow from a fixed head tank passed through a control gate valve before entering the straight run of pipe preceding the meter. This valve was wide open at all times during testing; thus, all results are for a meter operating under a constant total head. The six-inch test meters were preceded by a straight run of 52 inches of six-inch pipe which, in turn, was preceded by a straight run of 53 inches of 8-inch pipe. These two sections of pipe were joined by an 11-inch long, 8-inch by 6-inch reducer. The 8-inch meter was preceded by a straight run of 94 inches of 8-inch pipe. Two sets of straightening vanes were installed in the upstream end of the 8-inch pipe to eliminate the possibility of swirl following the elbow. The 6-inch meters were followed by a 35-inch length of straight 6-inch pipe, then 12 inches of 8-inch straight pipe and 12 inches of 6-inch pipe followed the 6-inch meter. In both cases, this entire directly into the pulsation producing loop. This loop consisted of (1) a straight-through section of 6-inch pipe which contained a continuously rotating 6-inch butterfly valve followed by a control gate valve, and (2) a by-pass containing a six-inch gate valve. Pulsations were produced at a constant frequency by driving this rotating valve at a constant speed. *ASME Paper 52-A-32.*

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American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York, N. Y. Nov 30-Dec 5, 1952. Identified by initials ASME and obtainable through ASME, 29 W 39th St, New York 18, N. Y.

Gas Turbines

Installation Factors Related to Gas Turbines in Closed Compartments. *By [illegible] Shallenberg, J O White, K E Schuster, USN Engineering Experiment*

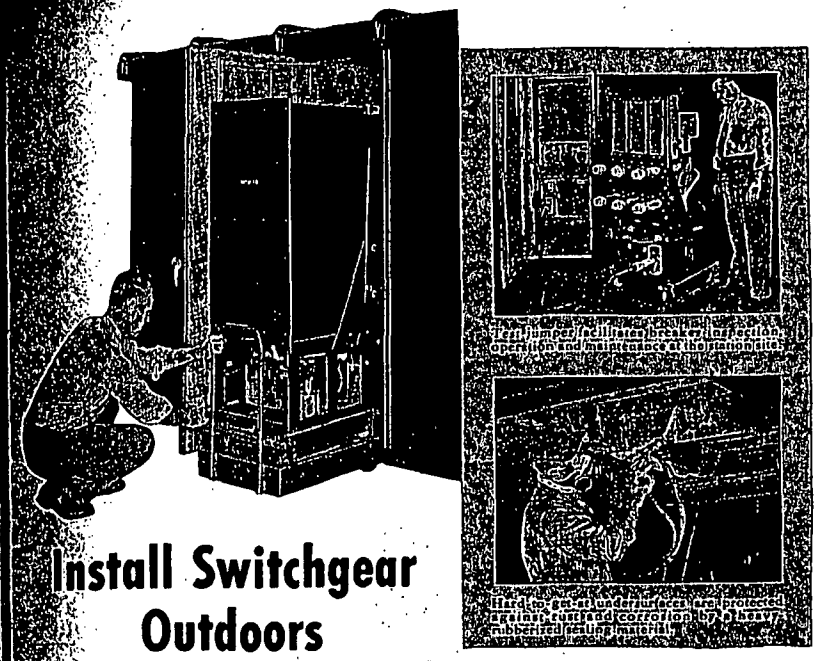
The U.S. Navy is presently constructing a group of wood-hulled vessels to meet size and weight limitations, gas turbine engines are being installed for generator drive.

Problems of design which arose in connection with the installation of *gas turbine engines in a closed compartment* are discussed and the solutions as developed at the U.S. Naval Engineering Experiment Station are given.

The problems discussed are: (a) The maintaining of satisfactory temperature limits in the compartment. (b) The maintaining of satisfactory temperature limits on the exhaust ducting and stack. (c) A combustion air inlet system that will prevent sea-water droplets entering the compressor, partially silence the compressor noise, and give a low intake pressure loss. (d) An exhaust muffler that will partially silence the turbine exhaust noise and give a low exhaust system pressure loss.

The fact that a compartment containing gas turbine engines can be satisfactorily ventilated without the use of ventilation blowers is of significance to those who are interested in the application of this relatively new prime mover. By use of the eductor stack system, a portion of the energy contained in the exhaust gases and which would otherwise be wasted, is put to use in ventilating the compartment and [illegible]

(Continued on page 212)



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