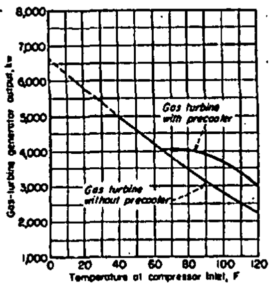
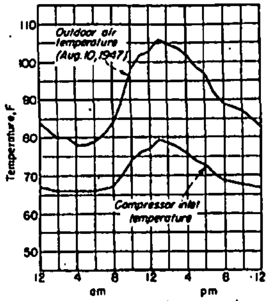
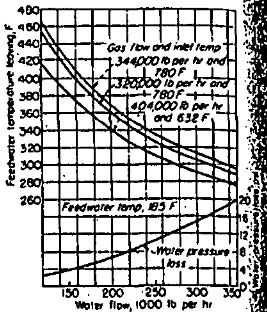


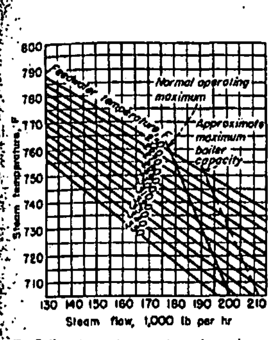
4 Precooler at compressor inlet raises unit output at high air temperatures



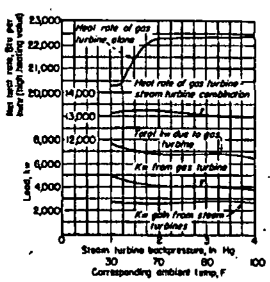
5 How precooler will lower compressor inlet temperature during summer day



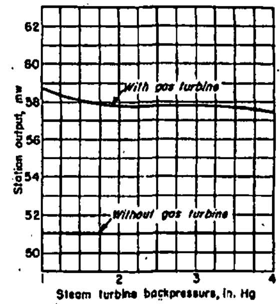
6 Predicted performance of heat exchanger with given inlet temperature



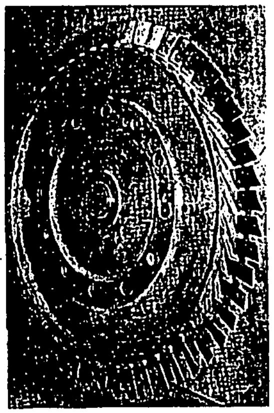
7 Boiler steam temperature depends on feedwater temperature and steam flow



8 For constant steam flow, combined performance varies with backpressure



9 With constant steam flow, combined capacity remains almost constant



10 The 15th-stage compressor wheel shows method of mounting blades

temperature makes it attractive for reclamation of heat for feedwater.

Exhaust-Heat Recovery. In applying an exhaust-gas heat exchanger to the unit, determination of amount of transfer surface was one of economics and indicated a unit of 18,950 sq ft. Performance of this heat exchanger with variable water and exhaust-gas flow is shown in Fig. 6.

In normal routing of feedwater the heat exchanger will function in parallel with the closed heaters. Automatic control will divide the flow to hold either constant feedwater temperature or final steam temperature. This control is desirable since the final steam temperature on the boilers is a function of feed temperature, see Fig. 7. For periods of reduced-load operation it may be necessary to operate steam units nonbleeding. For such operation the heat exchanger will be in series with the closed heaters. This will allow the gas turbine to operate at full load. If it is desired to reduce the gas-turbine load during load-reduction periods, however, then the routing can be left as described for normal.

Performance. Fig. 8 shows the gain in kw output of the station by using the gas turbine, also the heat rate of the additional capability and the heat rate of the gas turbine with no exhaust-gas recovery.

Fig. 3 shows the station heat balance with the gas turbine operating and is directly comparable with Fig. 2 showing the original heat balance. Results of comparative performance studies at variable backpressures and loads are shown in Figs. 9, 16 and 17.

Installation. The entire project will be engineered and designed by the Pioneer Service & Engineering Co, Chicago, and will be installed by the Construction Dept of the OG&E Co. The gas turbine will be housed in an inexpensive building added to one side of the existing plant, Fig. 18. With operating floor at same level as existing turbine-room basement, the auxiliary engineer will be responsible for the gas-turbine operation.

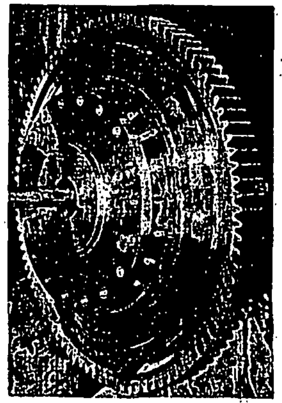
Natural gas will be supplied to the unit at a minimum pressure of 100 psi. The compressor air inlet equipped with a filter and precooler is expected to reduce intake air noise to a reasonable level.

Turbine exhaust will flow through the building wall in an insulated duct and then downward through the heat exchanger. The inlet piece will have a damper which can be positioned to allow free atmospheric exhaust if it becomes necessary to operate the gas turbine with no water flow through the heat exchanger. Exit gas will be conveyed from the heat exchanger to an unlined steel stack placed against the existing building wall, extending up to just above the coping.

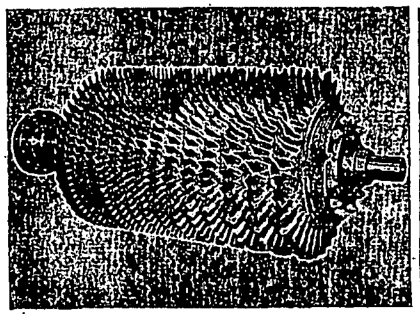
The gas-turbine building will have a standard crane with power hoist operated from the floor. Ample laydown space is provided for overhaul of the unit. A large door will allow trucking or dollying any part of the equipment into the main plant machine shop. The control board will be adjacent to the starting motor to make it more accessible for the auxiliary engineer.

The gas-turbine generator output will go to the plant bus at 13.8 kv and will be used for system capacity, just as does the steam-turbine output.

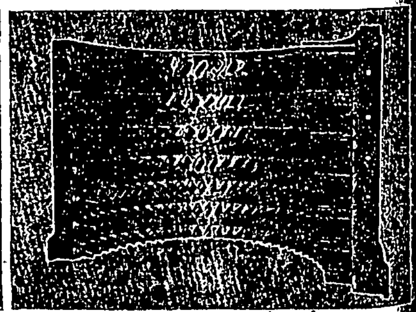
Gas Turbine Unit. Though the General Electric unit is designed for initial temperature of 1400 F, tests on an exact duplicate unit indicate that full load can be developed at a somewhat lower



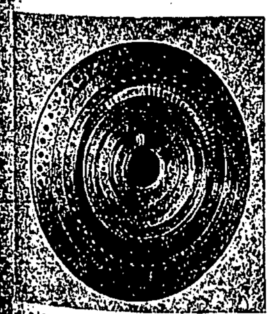
11 Each turbine wheel is built up of stainless rim and low-alloy center



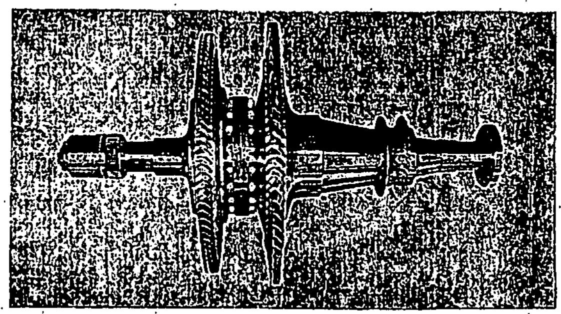
12 The 15-stage compressor rotor is made up of individual wheels bolted together, first six are of aluminum alloy



13 First half of compressor casing is also made of an aluminum alloy, remainder of rotor and casing is of steel



14 Discharge side of turbine first-stage nozzles, gas enters at 1400 F



15 Turbine rotor consists of two wheels, each with its own shaft, bolted together. First of two impulse stages operates at 1160 F. A fan cools the exhaust casing.