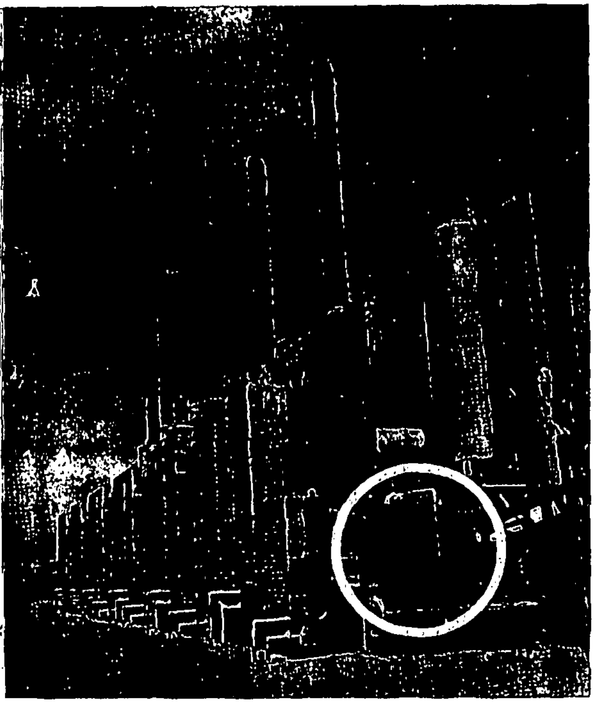
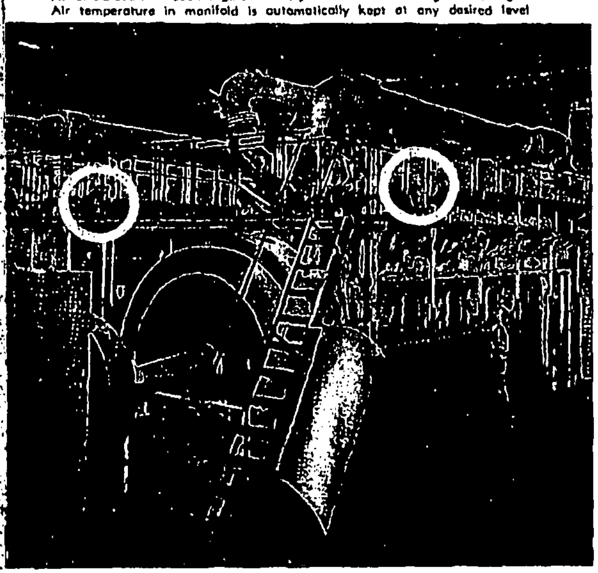
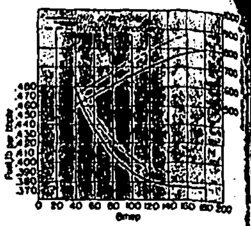


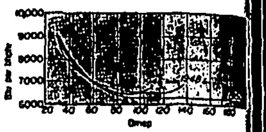
INTAKE-AIR precooler is evaporative wood-fill type. Air leaving cooler passes to the turbocharger mounted at one end of the engine shown below

AFTERCOOLER on each engine in this plant cools air leaving turbocharger. Air temperature in manifold is automatically kept at any desired level

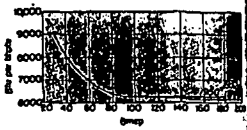




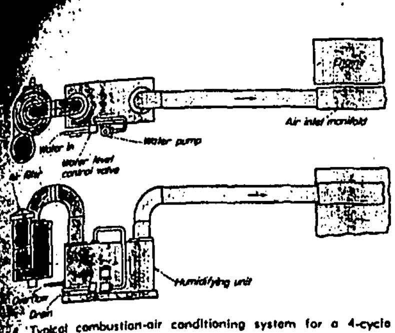
1 Here's how an aftercooler improv 4-cycle supercharged diesel outpu



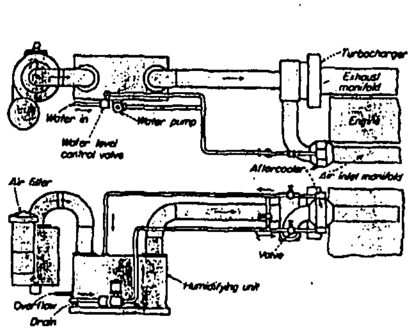
2 Steady progress in design reduc supercharged gas-diesel heat ra



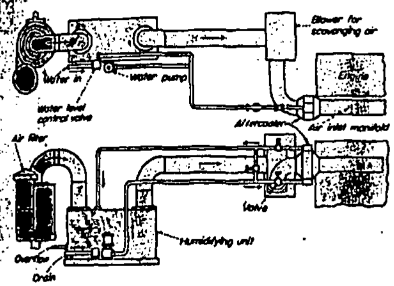
3 Between 1950 and 1952 conditionin systems extended flat heat-rate curv



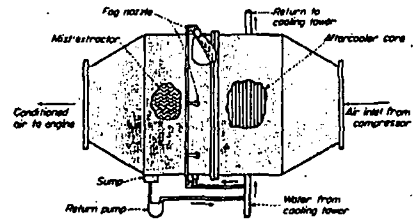
4 Typical combustion-air conditioning system for a 4-cycle atmospheric engine has humidifier between engine, filter



6 Turbocharged 4-cycle engines can be fitted with a conditioning system like this to improve output at all loads



5 Typical combustion-air conditioning system for a 2-cycle pressure-charged engine uses a humidifier and aftercooler



7 Combined aftercooler evaporative cooler has good humidifying efficiency, is located on compressor's pressure side

Conditioned Combustion Air Jacks Diesel Output

New ways are opened up to more power from a given size cylinder, with no thermal-load increase, by conditioning combustion air for high-compression engines. In climates with high ambient temperatures and low relative humidities the results are especially satisfactory

By W R CROOKS, *Chief Engineer's Ass't*
and
E L MILLER, *Project Engineer*
The Cooper-Bessemer Corp

► THE GREATEST CHALLENGE to the diesel-engine industry has always been development of more efficient and economical prime movers. Notable achievements since 1936 include (1) diesel-engine supercharging to increase power output by 50% (2) production of highly flexible and efficient gas-diesel atmospheric and supercharged engines and (3) development of spark-ignited high-compression supercharged engines using natural-gas fuel. Thermal efficiency of latter runs to almost 40%.

Higher ratings and reduced specific fuel consumption are made possible by continuing design and research studies. As a result we see increased compression ratios on atmospheric gas engines, improved turbochargers, scavenging systems, ignition and gas-injection systems and materials.

Intake Air. Today much attention is directed toward conditioning combustion air as an added step in developing more power from an engine of given size. Before 1946, need for cooling combustion air did not exist on most engines because specific output was relatively low. All gas engines were low-compression types. Load-carrying ability was limited by inability to efficiently burn the rich fuel charge present in their cylinders.

Overload capacity of 10% in these engines was more than enough to take care of changes in oxygen content of air with temperature. For instance, at 120-F intake temperature, content is only 5% less than at 90 F. Engines had sufficient reserve load-carrying capacity at elevated temperatures.

Supercharged Engines. During this same period 4-cycle supercharged diesels were rated at 115-psi brake mean effective pressure (bmep) with turbocharger pressure ratios up to 1.3. Air reaching engine was at 140 F on a 90-F ambient day. Combustion-air temperature was not an important factor.

When atmospheric gas-engine compression pressures were upped from 100 to 450 psi, conditioning of combustion air became economically justifiable. Developments in supercharged gas-diesels and spark-ignited high-compression gas engines raised bmep to 180 psi before detonation limited output and pointed the way toward study of conditioning systems for combustion air.

Equipment. Radiator-type heat exchanger between turbocharger and air-inlet manifold was first conditioner tried. Cooling medium was water. On low-rated supercharger diesels we could see no advantages.

But later developments on 4-cycle high-compression supercharged gas and diesel engines, having turbochargers with pressure ratios of 2 to 2.5, showed