jacket, goes to the jacket on the lower head and then to the reheater coils. There being no separate steam supply to the reheater coils, nor any separate drain from the high pressure jackets, it is not possible to use either jackets or reheater alone.

The receiver is a large cylindrical drum at the back of the engine and close to the cylinders.

The reheater consists of one or more coils of pipe in the receiver. The low-pressure cylinder is unjacketed.

I have gone into the principal details of this plant that you may appreciate the fact that the highest economy was sought in its design and that the desired results were accomplished is evidenced by the fact that when tested by Lionel S. Marks, Assistant Professor of Mechanical Engineering at Harvard University, engine No. 1, operating at 139.5 pounds pressure at the throttle, superheated 75° F., exhausting into a vacuum of 26.27 inches, carrying a load of 485 kilowatts, produced a water rate at the switchboard of 19.52 pounds of steam per kilowatt.

Engine No. 2, operating at 133 pounds pressure at the throttle superheated 55.5° F., exhausting into a 26-inch vacuum, carrying a load of 577 kilowatts, produced a water rate of 19.51 pounds of steam per kilowatt.

The condensers previously mentioned were capable of maintaining a 28-inch vacuum under full load conditions, but the gain made by the engines from this vacuum not being commensurate with the expense of maintaining it a vacuum between 26 and 27 inches was ordinarily maintained.

The location of the condensers with relation to the engines was such as to offer ample floor space for the installation of low pressure turbines between the exhaust from the low pressure cylinders and the condenser by simply taking out a section of the exhaust and introducing the turbine.

The load conditions in this plant being such that the daily output is from 750 to 900 kilowatts continuously and required the running of both units partially loaded day in and day out, and under these conditions they operated at an average water rate of 27 pounds per kilowatt.

A careful investigation of these units developed the fact that each was capable of developing from 15 to 20 per cent. over full load when exhausting to atmosphere at a water rate of 25 pounds per kilowatt at full load and 27.5 pounds at 10 per cent. over full load.

Therefore operating one engine non-condensing at 575 kilowatts at a water rate of 27.5 pounds would deliver 15,812 pounds of steam per hour.

The quality of this exhaust steam for 75 degrees Fahrenheit contained in the steam delivered to the engine 100 per cent.

The water rate of a 500 kilowatt 1,800 revolution turbine supplied with this steam at atmospheric pressure and exhausting into a 28-inch vacuum, which their condenser is capable of maintaining, would be 33 pounds per kilowatt.

It will be readily seen that the engine will deliver enough steam when operating 575 kilowatts to enable us to obtain from it 480 kilowatts from the turbine or a total of 1,055 kilowatts from the combined unit, at a water rate of 15 pounds per kilowatt.

That while they are now operating 900 kilowatts at 27 pounds of steam per kilowatt hour, using 24,300 pounds of steam per hour, an investment of less than $20,000 will reduce the steam consumption to 17 pounds per kilowatt hour, which would require only 15,300 pounds of steam per hour.

Figuring an evaporation of 10 pounds of water per pound of coal this would represent a saving for 300 days of 10 hours each of 1,350 short tons, or at $3.00 per ton a yearly saving of $4,050, which would pay for the turbine complete in five and one-half years plus an 11 per cent. interest on the investment.

By piping the exhaust of both engines to the turbine and connecting it through suitable valves with both condensers, the turbine can be used with either engine, thus making either engine a spare for the other.

Immense benefit can be derived from the use of low pressure turbines in mechanically operated manufacturing plants. Take for instance a mill or other manufacturing establishment mechanically operated by means of belts or ropes where an increase is desirable and either due to the shape or position of land available this addition cannot be economically or satisfactorily reached by belting and shafting, the low pressure turbine offers an ideal solution of the problem, permitting the electrical operation of the sections which are awkward to reach mechanically.

In closing caution should be made not to entertain a wrong impression of the idea intended to be conveyed, that is, I feel that the turbine will more economically utilize the steam energy, both above and below the atmospheric line, than the reciprocating engine and therefore is entitled to first consideration in a new installation, but where an increase is necessary to an existing reciprocating plant, the low pressure turbine can oftentimes be used to better advantage than any other piece of apparatus, without entailing increase in boiler plant or buildings proportionate to the increase in capacity, and in many cases without any increase of the items mentioned.