During the year the question of acceptance of Velox supercharged steam-boilers for electric-power generation at Wellington was put before the Department, and after careful consideration it was decided to accept the boilers under certain conditions. The Velox boiler, or steam-generator, which is perhaps a more appropriate term, is one of the most recent developments in the steam-generation field. The main characteristic is the application of the principle of supercharging resulting in combustion taking place under pressure far exceeding normal practice and the partial transformation of this pressure into velocity in order to obtain high flue gas speed. Essentially, the boiler comprises a combustion chamber lined with evaporator tubes, a superheater, a separator by means of which water is separated from the steam, an exhaust gas turbine, and a feed water preheater.

The Velox boiler is very light in weight, contains little water, and occupies a comparatively small space. There is a complete absence of brickwork, and it operates flexibly under load variations at a very high efficiency. A feature of the design is the rapidity in which steam at full working-pressure can be supplied from cold. The boilers, made for New Zealand under test at the makers' works, Baden, started from cold to full load in 3 min. 38 sec. and attained the high efficiency of nearly 95 per cent.

The pressure parts are practically of all-welded construction, and in this respect the Velox boiler is the first power boiler of this construction approved for service in New Zealand. The conditions of acceptance of the welded pressure parts called for rigid tests. These comprised tensile of all weld metal, bend, impact at the junction of the welds, impact at the welds, tensile at joints, and density tests. Photo-macrographs and micrographs were required of the plates in the vicinity of the welds, of the junctions between welds and parent metals, and of the welds. X-ray photographs were required of the entire length of each welded seam, both longitudinal and circumferential. In addition to the tests it was required that each welded vessel should be efficiently heat-treated. The heat treatment consisted of heating each vessel in twelve hours to 650° C. holding it at that temperature for three hours and allowing it to cool slowly to 200° C. at the rate of 15° to 20° C. per hour.

All the tests were carried out to the Department's satisfaction. The boilers will operate at a steam-pressure of 225 lb. per square inch, and are rated to generate 90,000 lb. of steam per hour. At the moment of writing the first unit is erected and is about to undergo exhaustive steam tests. Reference to the results of tests and the general operation of the Velox boiler will be made in the next annual report.

A return showing the number of boilers inspected during each of the past five years is as follows:—

| — | 1932–33. | 1933–34. | 1934–35. | 1935–36. | 1936–37. |
|---|---|---|---|---|---|
| Fired boilers | 4,501 | 4,582 | 4,655 | 4,997 | 4,834 |
| Unfired steam-pressure vessels | 2,522 | 2,649 | 2,670 | 3,251 | 3,370 |
| Air-receivers | 635 | 691 | 675 | 761 | 775 |
| Totals | 7,658 | 7,922 | 8,000 | 9,009 | 8,979 |

## Machinery.

The following statement shows the number of inspections of machines, machinery plants, lifts, cranes, and hoists made during the year, the corresponding figures for the previous year being shown in parentheses:—

| | | |
|---|---|---|
| Machines not driven by steam power, plants, 9,499 (9,473) | 64,214 | (60,253) |
| Machines driven by steam power, plants, 2,514 (2,638) | 13,316 | (12,329) |
| Electric-power-supply stations | 154 | (167) |
| Lifts | 3,328 | (3,116) |
| Cranes | 336 | (395) |
| Hoists | 1,329 | (1,308) |
| Total inspections | 82,677 | (77,568) |

Included in these numbers are sixty-three lifts and twenty-seven cranes inspected for the first time. The plans of these machines were examined in Head Office and the working-loads computed before they were certificated.

Of the new cranes installed in New Zealand during the past year the crane with the largest lifting capacity is one of the Guy Derrick type, imported by Messrs. Kanieri Gold-dredging, Ltd., for dredge-erection purposes. The mast and derrick of this crane are each 100 ft. long, and the safe load which can be lifted with the derrick at the maximum radius of 92 ft. is 10 tons.

The increased dimensions of the newer passenger and cargo vessels that now call regularly at New Zealand ports are reflected in the larger and improved cargo cranes which have been installed on the wharves at Auckland, Wellington, and Lyttelton during the past year. At Auckland four new electric wharf cranes, each with a lifting-capacity of 5 tons at a maximum radius of 60 ft., have been purchased, and the jibs of some existing cranes on Auckland wharves have been lengthened to enable them to satisfactorily load and unload cargo from the largest vessels now trading to the port. At Wellington two 3 ton derrick cranes have been erected on the Queen's Wharf. They should prove useful in the rapid handling of the cargo, baggage, and mail carried by the large trans-Tasman express steamers which habitually berth at this wharf, and whose stay in port is of