the boiler as possible. The piping between this separator and the boiler, also the separator itself, shall be thoroughly covered with insulating material.

Boiler surfaces which are designed to be covered shall be insulated with 1½ in. of asbestos plastic cement or its equivalent.

Gas analysis shall be determined by means of an Orsat apparatus. If recording carbon dioxide (CO_2) instruments are provided, they shall be checked every hour with the Orsat.

Smoke observations shall be determined by means of a Ringlemann chart.

Weather bureau reports from immediate vicinity may be used to determine atmospheric conditions. When such reports are not available, a sling psychrometer shall be used for determining relative humidity and a calibrated aneroid barometer or mercury column shall be used for determining barometric pressure.

Steam pressure shall be determined by a calibrated steam gage or by a mercury column.

A log of the test shall be kept on record sheets similar to those provided by this Code.

RULES FOR CONDUCTING EVAPORATIVE TEST

The primary object of the test is to determine the number of pounds of water evaporated per pound of dry fuel consumed. All measurements and readings should be taken with this object in view.

Boiler shall be carefully set and connected with a short, straight smokepipe to a chimney flue of suitable size and height to give proper draft. Chimney shall be tested for air leakage. Boiler shall be made smoke and gas tight and the gas passages properly cemented.

The water spaces of the boiler shall be thoroughly boiled out with a solution of sal soda, potassium hydrate or sodium hydrate and then thoroughly rinsed with clean water.

The heating surface, firebox, and ashpit shall be clean and free from soot, ashes and dust at beginning of test.

The piping shall be connected in such a way that the steam may be carried to a point away from the boiler and piping shall be arranged so that its condensation may not flow back to the boiler.

A pipe connected to the bottom of the steam separator shall be provided with a positive seal. The water shall be drained from the separator hourly and weighed immediately.

The water shall be fed to the boiler continuously through suitable piping with all necessary valves, thermometer cups and connections so that the amount and temperature of water fed to the boiler can be determined at any time.

There shall be three draft gages so arranged as to determine pressure loss in the ashpit, pressure loss through the fuel bed, and pressure loss between firebox and smokehood.

ATMOSPHERIC TEST

The steam delivery pipe shall be open to the atmosphere.

PRESSURE TEST

The boiler pressure shall not exceed 8 lb. and the steam shall discharge through a suitable reducing valve into a chamber where a uniform pressure of two (2) pounds shall be maintained. The steam is to be finally discharged to the atmosphere through an orifice or graduated needle valve, which shall be used to control boiler capacity.

DURATION OF TEST

The duration of test should not be less than two firing periods and at least 12 hours in length. Longer tests are desirable but the length of test should always be some multiple of the firing period.

METHOD OF STARTING AND STOPPING TEST

The new fire method of starting and stopping test may be used on boilers having a fuel capacity of 15 cu. ft. or less from grate to center of fire door, when anthracite coal is used as fuel.

Boilers having a fuel capacity greater than 15 cu. ft. when using anthracite coal shall be tested by the Continuous Firing Method. All tests using bituminous coal shall be conducted by the Continuous Firing Method.

NEW FIRE METHOD

Starting and Stopping.—A preliminary fire shall be made and the boiler operated under test conditions for at least one hour before starting the test. The preliminary fire shall then be dumped, the ashpit thoroughly cleaned and dried wood placed on the grate and kindled. The test shall be considered started at the time of firing the charge of wood. On this charge of wood fuel shall be placed. The wood shall be considered as having a heating value equal to 40 per cent of that of an equal weight of coal. The height of water line in gage glass shall be noted and recorded at the time preliminary fire is dumped. The water level shall be kept at this level as nearly as possible throughout the test and must stand at this same height when the test closes. At the end of test the fire shall be dumped. The residual fire when dumped shall be placed in tightly covered cans, weighed and left to cool. After cooling the unburned fuel and ash shall be separated, and the weight of unburned fuel subtracted from total fuel charged. The remaining refuse shall be weighed and recorded as ash.

CONTINUOUS FIRING METHOD

Starting and Stopping.—A preliminary fire shall be made and the boiler operated under test conditions for at least one hour before starting the test.

The fire shall then be burned low, thoroughly cleaned and the remaining live fuel spread evenly over the grate as the foundation for the first test fuel charge. The thickness of the fuel shall be quickly estimated or measured. The height of water line in gage glass shall be noted and recorded. The time of these observations shall be considered the start of the test. A weighed charge of fuel shall then be fired. The ashpit shall be thoroughly cleaned and the test allowed to proceed.

A constant water level shall be maintained throughout the test.

At the end of test the fire should be burned low and cleaned so as to leave the same amount of live fuel on grate as at the start. When this condition is reached and the water level is at the same height as at start, record the time and this time shall be the time of stopping. The contents of the ashpit shall be removed, placed in air tight cans, weighed and left to cool. The boiler shall be charged with all fuel fired during test.

GENERAL

The actual evaporation shall be considered the total water fed to the boiler less water removed from steam by separator.

During the progress of the test, regular samples shall be taken from the fuel charge and after quartering, sufficient sample shall be retained to fill two one-pint glass jars or other tight vessels.

These samples shall be preserved for subsequent determinations of moisture, calorific value, and chemical composition.

The residue taken from the ashpit shall be reduced by quartering to a quantity sufficient to fill two one-pint jars or other air tight vessels for subsequent chemical analysis.

RECORDS

Records of data shall be obtained as pointed out in the appended log sheet. Half hourly readings are usually sufficient. If there are sudden or wide fluctuations, the readings in such cases shall be taken every fifteen minutes or oftener.