



Left: Testing the meter for accuracy with the automatic proving machine. Center: Pitting the indices of eighteen service meters against three master instruments. Right: Public Service Commission tester filling his proving machine to get the necessary gas to test a group of meters.

Where New York's gas meters are proved to be accurate before they go into use

Checking Up the Gas Meter

How New York's Consumers Are Assured That They Get What They Pay For and No More

By William R. Andrews

IN New York City about four thousand new and used gas meters are tested each week for accuracy, first by the gas company, then by inspectors in the employ of the Public Service Commission. The result of one test made not long ago showed a general average in favor of the consumer by 1.79 per cent. A similar low percentage became evident in the tests of 59,475 meters made by the Massachusetts Gas and Electric Light Commissioners. The figures of the Board revealed the fact that only 206 of these meters were inaccurate. A few were fast, and those that registered slow were found to average 3.78 per cent over the average of the fast meters. Here again the results favored the consumer.

The gain by the public through such percentages as these is due to legislative enactment in the various States where commissioners have been appointed to supervise the relations between public utilities and the consumer of gas, water and electricity. For instance, in New York State gas meters are not allowed to run over one-half of one per cent fast, a trifling gain for the companies. The net result is so small that the tolerance may be compared to the one-eighth of an inch variation in a mile allowed a civil engineer in running a line for railroad trackage. It is pretty evident that the "gain" is almost infinitesimal in both instances. But there is still another factor to be reckoned with—the commission permits a meter to run two per cent slow. Thus the consumer whose meter fails to register correctly in this particular is the gainer, and by legal cognizance. If on test this discrepancy in the action of the meter is found the gas company cannot collect arrears. On the other hand a rebate is allowed if tests show a meter has been running fast.

Notwithstanding the advantage to the consumer in the few instances of meter variation in his favor, the law governing such cases was not passed with any idea of favoritism. The purpose was to meet the exigencies of certain mechanical contingencies which might affect the equitable distribution and sale of the company's product and its payment.

Curiously enough these statutes safeguard the consumer in a way he little realizes. The ancient law of *caveat emptor*, which governs the purchase of prac-

tically everything except electricity from a public utility corporation, seems to have become inoperative in his case. For, as gas is standardized in quality and fixed in price by law, he does not, when dealing with a gas company, buy at his own risk. As to electricity, the parallel applies only to the price-fixing by public service commissions. Everyone knows, of course, that there is no such thing as a possible variation in "quality."

All meter tests in New York City are conducted in the meter and appliance repair shops of the gas company at 111th Street and First Avenue. The building is 100 by 200 feet and is ten stories high. The meter department however occupies only three floors. The rest of the premises is used for general repair work, the storage of material and the testing of gas appliances—stoves, heaters, ranges, etc. •

The overhauling of 4,000 meters a week is no slight undertaking and the cost of the meter tests is borne solely by the company. A considerable force of workmen is maintained and the burden of expense is not lessened in these days of plutocratic labor when an experienced meter tester draws a wage of \$60 a week.

Meters to be tested or in need of repair are first sent to the central collection stations of the districts in which the company has divided the city. Thence the

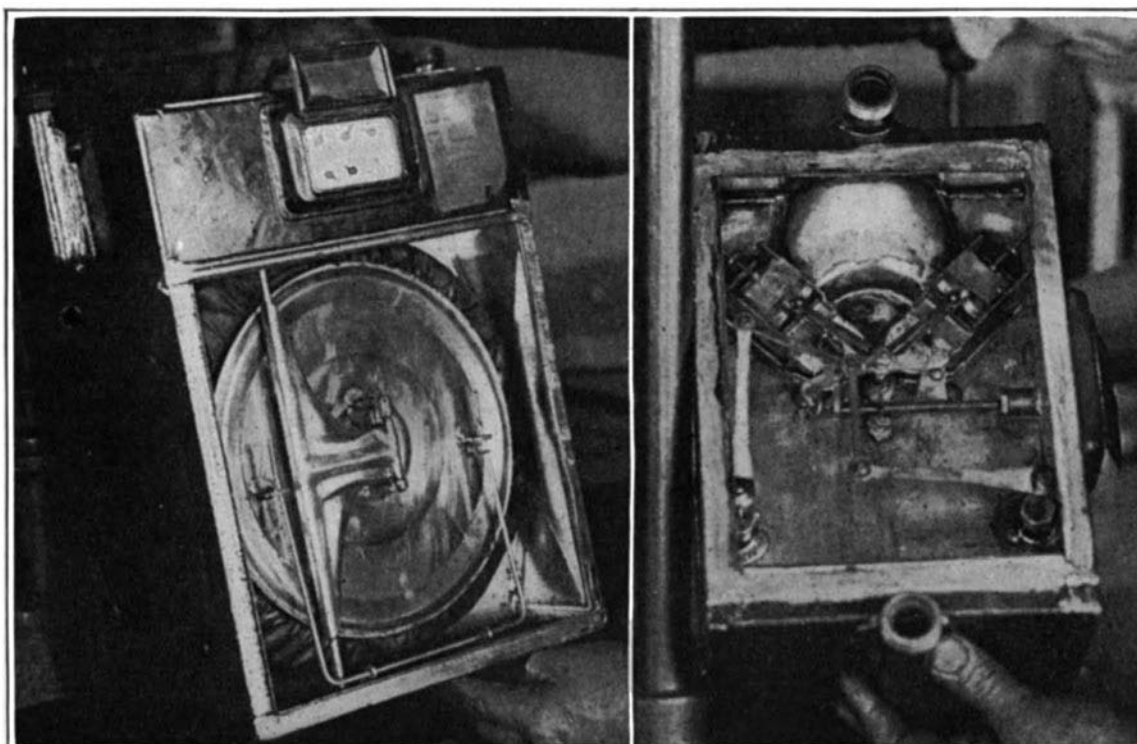
meters go to the 111th Street building and are sent upstairs to the testing department on trundle trucks in lots of 200 or less. There are eighteen sizes, ranging from the three-light meter to those which measure the gas consumed by 300 burners. Only a small portion of the meters received are sent to be tested at the instance of the consumer. The majority have been taken from apartments, private dwellings, stores, office buildings, shops and places of amusement in accordance with a prescribed routine. Experience shows that the wear and tear on the mechanism makes it necessary to remove a meter for repairs after six years' service. The overhauling and testing operations number thirty-two and cover a period of three weeks.

For the initial test an instrument called a meter prover is used. This consists of a large metal tank, filled with water, three and a half feet in diameter and about as high as a man's armpits. A cylinder of galvanized iron is suspended with a counterweight from a wheel at the top of a metal frame secured to the rim of the tank. The upper part of the apparatus towers considerably over one's head. Thermometers, a syphon pressure gage and a hose are the principal parts of the equipment. The gage is used to detect leaks, and a vertical metal scale on the cylinder shows any deviation in the meter's registering device when the gas used in the test moves the cylinder up and down in the water.

Besides these machines there are in use on the same floor several automatic provers invented by Marshal Cornine, the superintendent of the meter and appliance shop, and installed about 12 years ago. His invention saves considerable time. For instance: The tangent connected with the top dial over the indices on the front of a meter is set to make one complete turn to register two cubic feet in the tests. On the old style machines the tangent must be run twelve times. But the same result is obtained on a Cornine prover with one revolution of the tangent. The automatic provers are used for the smaller meters and the other type for the large sizes. All the provers are inspected by Public Service experts, who place the seal of the commission on each prover as it is shown to be correct in its operations.

A complete record is kept of every meter brought to

(Continued on page 264)



Left: The bottom of the gas meter, as it appears when opened to see whether the diaphragms are properly flexible. Right: At the top of the meter, where valves must be clean and in place, gears properly meshed, and stuffing boxes tight.

Investigating the internal workings of the gas meter



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Water Pipes of Wood

(Continued from page 262)

pipe, the whole of whose erection is carried out in the field, one may substitute short lengths of machine-made wood stave pipe. That is, machine-banded or wire-wound pipe may be employed. Such piping may be obtained in diameters ranging up to 24 inches, inside diameter. The lengths run from 8 to 24 feet, and are provided with the collars and couplings necessary to their secure junction in the field. Such pipe is understood to be made for heads running up to 400 feet. The band, or wire, is secured to the pipe by means of pressed-steel clips or staples or both. The sections, once banded, are dipped in melted asphalt and then rolled in sawdust. The asphalt affords protection, the sawdust makes it possible to handle the pipe.

Some of the more important installations of continuous wood stave pipe are the following: At Atlantic City, N. J., a 48-inch line, 5 miles long has been laid across the salt marshes where metal pipe lines have failed. A big piece of wood piping is the line laid for the Erie Construction Co. (a subsidiary of the Ontario Power Co. of Niagara Falls). The whole line is about 1 1/2 miles long. The shorter half consists of 144-inch pipe and the longer half of 132-inch. Pretty big tubing. The maximum head in contemplation was 150 feet. But there is a mile of continuous wood stave pipe which forms part of a big hydroelectric development on the White Salmon River and which has the magnificent diameter of 162 inches. Some pipe! It is carried on wooden cradles 4 1/2 feet apart, center to center. The weight of the contained water is nearly 900 pounds per linear foot of pipe.

Checking Up the Gas Meter

(Continued from page 262)

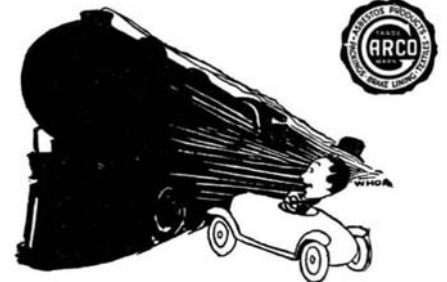
the building. On large yellow oblong sheets of paper the meter's "pedigree" is entered—the size, the manufacturer, the premises it came from with the date, the number of years it was in service, the number of previous tests, and the date of each test. Beside the spaces for these entries there is a column in which is printed a series of indices similar to the clock faces of a meter, and hands are drawn on the diagrams to correspond to these on the meter under observation.

In the initial testing operation the meter, attached to the prover, is under conditions exactly the same as when in the home. In this first operation the "U" shaped water gage shows whether any gas is escaping from the meter box. Care must be exercised in attaching the hose. Sometimes three minutes are necessary to adjust it to the satisfaction of the tester.

After this preliminary test the meters are opened to see how much repairing is needed. Their condition determines whether they fall into the classification of light, medium, or full repairs. On the tenth floor a force of men puts in the parts which the previous inspection showed were needed. Upon the completion of repairs and a test of the meter for soundness, a high pressure test is made.

Sometimes a leak is not detected by the "U" gage. When this happens the meter case is filled with water. No matter how small the hole, it is soon discovered. After soldering, another test is made for soundness. Ordinary meters have 50,000 cubic feet of air passed through them to detect any defects, like a loose cog or a buckle at any point. In the operation several meters are linked up together, with a connection to a master meter. After this test there is a final one made with the provers before the meters are sent to what is called in the building the State Department—a space on the ninth floor, on the east side of the premises, where inspectors of the Public Service Commission are at work.

(Continued on page 266)



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Checking Up the Gas Meter

(Continued from page 264)

Here there are twelve proving machines identical in design with the ones used by the company. The inspectors, after verifying the company's tests, apply the seal of the commission at the top of each meter, near the upper edge of the index. So strict are the regulations as to the use of the seal that inspectors are under instructions to carry their sealing irons home with them at the end of the day's work.

On this floor the meters are painted and placed in bays, according to the ownership of the various gas companies throughout the city. On this same floor the prepayment or slot meters are tested.

An important part of the testing operations is the examination of the diaphragms. These are made of Australian sheep leather—found by experience to be the best material for this purpose—and are attached to the metal disks in the measuring chambers. Generally speaking, the disks and diaphragms constitute a kind of double bellows. The quantity of gas used is measured by the number of times they fill and empty—consequently they must not leak in the slightest degree.

Quality of leather and the exercise of all possible care in the manufacture of the diaphragms cannot prevent mishaps to them now and then. In severe weather a meter will sometimes freeze, which destroys the leather. It turns white and gets hard. All diaphragms are examined by an expert with a view to learning the extent of the repairs that might be necessary. In the majority of cases the leather only needs softening. This is accomplished by giving it a bath in Pennsylvania mineral oil heated to a temperature of 110 degrees Fahrenheit.

All new meters are tested for accuracy on the ninth floor. Great care is exercised in the adjustment of the tangent in the valve chamber. The tangent bears the same relation to the testing mechanism as a pendulum to a clock. Hence it must be adjusted to a nicety, if the meter is to meet the requirements set by the Public Service Commission, which, it may be added, guarantees the reliability of all meters upon which is has placed its seal after a test for accuracy.

America's Bid for the Gordon Bennett Cup

(Continued from page 258)

thus lessening wind resistance, they have added 25 miles an hour to 125 miles an hour speed of the monoplane, and from 30 to 35 miles an hour while it is racing at 175 miles an hour or more with flattened wings.

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