

prosperous exchanges will in the near future fall under the control of a large trust, stocks will be watered, rates increased and the probabilities are that unless this movement is checked, a deal may be made with the "Bell" monopoly, whereby they will again control the telephone business of the United States. To illustrate our meaning we would refer to the Federal Telephone Company, of Cleveland, with a capital of \$10,000,000, which was incorporated for the purpose of purchasing the securities and controlling the operating policy of a number of the largest independent telephone companies in Ohio and Michigan. It controls seventeen companies, and the following table will show that they are very much overcapitalized:

Overcapitalized Independent Telephone Companies, Whose Operations are Controlled by the Federal Telephone Company of Cleveland.

Name of Company.	Miles of Toll Lines.	No. of Subs.	Capital.	Bonded Indebtedness.	Average per Subscriber.
Cuyahoga Telephone Co.	90	9,710	\$3,000,000	\$2,233,000	\$539
Columbian Telephone Co.	301	2,355	300,000	200,000	212
Findlay Home Telephone Co. ....	....	972	150,000	80,000	235
Citizens' Telephone and Mess. Co. ....	....	736	50,000	44,000	127
Lancaster Telephone Co.	95	732	100,000	50,000	249
Lima Telephone and Telegraph Co. ....	....	870	150,000	70,000	253
Mansfield Telephone Co.	88	1,575	300,000	200,000	317
Massillon Telephone Co.	48	902	75,000	75,000	166
United States Telephone Co.	8,647	200	2,000,000	1,865,000	447*
Youngstown Telephone Co. ....	....	1,747	200,000	200,000	229
Janesville Telephone Co.	55	1,251	250,000	150,000	320
Columbus Telephone Co. ....	....	6,277	705,000	650,000	216
Akron Telephone Co.	32	3,011	300,000	300,000	199

*This a long distance company and the figures in the last column give the average per mile of toll line.

In contrast with the Cuyahoga Telephone Co. (which is the largest of the Federal companies), with ninety miles of toll lines, and 9,710 subscribers, having a capitalization and bonded indebtedness averaging \$539 per subscriber, the Citizens' Telephone Company, of Grand Rapids, Mich., with 2,000 miles of toll lines and 10,448 subscribers, has no bonded indebtedness and a capitalization averaging \$96 per subscriber. The experience of competition in the United States points to the necessity of adopting such legislation in Canada as will prevent the amalgamation of groups of local companies with the inevitable watering of stock, and raising of rates which always follows in the train of such consolidations.

We might also point out that the People's Telephone Company, in Detroit, Mich., was an undoubted success until it was persuaded, on the plea of strengthening independent telephony, to amalgamate with the Erie Telephone Co., a corporation professing independent principles, but which afterwards sold out to the "American Bell" from which time Detroit has always been held up as an example of the impracticability of telephone competition. Had the "People's" retained control of their system, Detroit, to-day, would have a service surpassing any independent system in the United States. This is a striking illustration of the undesirability of permitting franchises to get into the hands of companies, whose whole primary object is to run the business for all that it may be worth, the interests of the people being a secondary consideration.

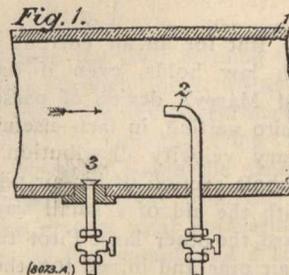
The advent of improved methods involving cheaper construction and maintenance, renders it possible to supply the people with telephones at almost one-half the existing rates, and at the same time to earn good dividends on the capital outlay, but the one means of obtaining and maintaining these low rates is by granting franchises only to local companies, independent of outside control, who shall satisfy the people that their capital is free from "water" in any form, and that the people will get what they have a right to expect, viz., service at rates which include a fair profit on the actual cost of building and operating the system. Failing this, the only available remedy for the existing high rates is municipal ownership.

TESTING ELECTRIC GENERATORS BY AIR CALORIMETRY.

An ingenious and entirely novel way of testing alternating-current dynamos was recently brought before the Institution of Electrical Engineers, London, England, by Richard Threlfall, M.A., F.R.S., of Birmingham. There is considerable uncertainty about large alternating-generator tests, and frequently, as in the case which confronted Mr. Threlfall two years ago, neither brake-power tests can be applied, because the fields of alternators are built upon the flywheels, nor, owing to structural difficulties, can one machine be run as generator and the other as motor. It oc-

curred to him, hence, to enclose the alternators in a non-conducting casing, and to pump air through the system at a measured rate. If M kilogrammes of air of specific heat o be passed through the system per second, and the temperatures of the air on entering and leaving be t and zero degrees Centigrade, and if no heat be lost or gained by the alternator, then M o (zero-t) = H will represent the rate at which power is being wasted in kilogramme-calories. If, further, P represent the rate of external working of the engine, P¹ the power delivered by the generator in kilowatts, then the efficiency of the generator is E = P¹/P = P¹/(P¹ + H). Assuming that the dynamo does not radiate like a wireless telegraph transmitter, E and H can be determined, provided we can measure the bulk of air; and this method should share with the Hopkinson method the advantage we determine in H the actual loss in the generator from all sources, and that—supposing a loss of 10 per cent., or an efficiency of 90 per cent.—any error made in the determination of H would enter by one-ninth of its amount only into the efficiency E.

The measurement of the current of air is the hard problem which Mr. Threlfall had to solve, and he finds that H can be determined in practical trials within 2 or 3 per cent. It is done with the aid of Pitot tubes, simple tubes bent over at the end, which have long been used to explore the velocity of flowing liquids. When air streams against the open end of the Pitot tube (2 in Fig. 1), which is closed



otherwise, a certain pressure, known as velocity pressure, is set up in the Pitot tube, because some of the momentum of the impinging air is destroyed by the quiescent air in the tube. It has been shown by Lord Rayleigh and confirmed