

unwritten law it was understood that the offices of president and vice-president should be filled by men representing either central station interests or telephone and telegraph interests, and that where the rule had been departed from, in the case of the older associations in the United States, it had lowered the status and influence of the organization. Messrs. Bonner and Carroll thought, however, that the lighting men were as much dependent on the supply men as the supply men were upon them. Messrs. Dion and Anderson regretted that the discussion had taken this turn, and deprecated any jealousy between the two interests. On being put to vote Mr. Cary was declared elected by 29 to 25. Several members, representing central stations, were absent from this session.

The following resolution was moved by O. Higman, seconded by James Anderson: Recognizing the difficulty, if not impossibility, of measuring with any degree of accuracy the illuminating power of the arc lamp, and the great obligation of the producer of electricity for illuminating purposes to the consumer thereof, be it resolved, "That in the opinion of this association, what is ordinarily known as a 2,000 candle-power arc lamp is one requiring on the average 450 watts for its maintenance, the measurements being made at the lamp terminals, where no sensible resistance is included with the arc. In case such resistance is used it must be excluded in the measurement."

The mover said there was a good deal of misunderstanding in the matter, and he was frequently called in to decide disputes in regard to lighting contracts, which might not occur if there was a clearer definition of the power of arc lamps.

Mr. Gossler suggested that in view of the practice of reducing the candle-power of lamps and increasing the number of lamps, it might be well to put the definition so that it would be of more general application.

Mr. Thomson (Montreal), also pointed out that 450 watts of straight current would give more candle-power than the same number in alternating current, and there was also a difference between open and enclosed arc lamps.

The president understood the resolution to mean, not that the association should make an arbitrary standard, but that the term candle-power should be abolished, and that contracts should be on the basis of the energy supplied.

Mr. Gossler pointed out another difficulty. An energy of 450 watts might be supplied to a lamp, but in some lamps 300 watts of this energy might be consumed in the mechanism of the lamp, and only 150 appear in light.

Mr. Higman said that the average lamp known as 2,000 c.p. really gave only about 750 c.p., so that when the term was used, the contracting company undertake to give what they really cannot give, and the words candle-power should therefore be dropped.

After further discussion Messrs. Higman, Gossler, Thomson (Montreal), Yule and Wyse were appointed a committee for the purpose of taking up the question raised by the resolution, and rating the power of arc lamps on the basis of energy.

On motion of Mr. Yule, votes of thanks were passed to the City Council, and the various companies, who had contributed to make the convention a success.

Mr. Turbayne's paper on "Enclosed Arc Lamps," was then read. It will be dealt with in another issue. Mr. Cary's paper, which is also crowded out, was taken as read.

After short addresses by the retiring president, and incoming president, the convention closed with a vote of thanks to president Browne for his unselfish devotion to the interests of the association during the past year.

#### CONVENTION NOTES.

The trip out to Grimsby over the Hamilton, Grimsby, and Beamsville Electric Railway was one of the pleasantest features of the convention, and manager Nelles' care of and attention to his guests was highly spoken of.

The most instructive of the social features was the trip to the great power-house of the Cataract Power Co., at Decew's Falls, about four miles from St. Catharines. The members were given complimentary tickets by G.T.R. to St. Catharines, where several vans awaited them, and the trip

afforded some glimpses of the rural surroundings of the Garden City. The view from the top of the bluff at the intake was greatly admired. The Cataract Power Co. started last November with the transmission of 500 horse-power, which has been increased till now they are sending about 1,400 horse-power into Hamilton. This will be increased shortly by several large contracts, bringing the total up to 2,400 or 2,800 h.p.. The power-house, as it stands, has equipment for 7,500 h.p., but if the capacity of the company's canal were fully taken up, it could transmit 15,000 h.p.

Hamilton presented quite a gay appearance during the convention. The Gore in King street, so rich in its floral display, was illuminated at night with festoons of colored incandescent lights, while the City Hall had across its front in large electric light letters the words "Welcome to Hamilton," and the headquarters of the convention were illuminated with the monogram of the association inside a maple leaf.

#### TRANSFORMER ECONOMY.\*

F. H. LEONARD, JR., MONTREAL.

The practical use of A. C. transformers covers a period of little more than a decade, and yet in so short a period has been developed into the most perfect piece of apparatus known to the art of electrical engineering. Transformers having a full load efficiency of 98 per cent. in the large sizes are not unusual, and in the very large sizes even this high figure is exceeded, and with the best designs the no load losses are less than one-half the full load loss, permitting an exceedingly high efficiency to be maintained over the entire working range. While the commercial application of transformers is so recent, the principle was demonstrated more than 67 years ago by Faraday, whose investigations gave to the electrical engineer the principles on which are based the science of dynamo electricity. Faraday, in 1832, made a crude transformer, which is identical in general principle and construction with the commercial article of to-day. There are many types and modifications of details, but the commercial transformer of to-day may be simmered down to two general types, known as the shell type and the core type; the once much-talked-of hedgehog transformer, so stoutly championed by Swinburne, having dropped out of the race entirely. There are still strong adherents to both of the first-mentioned types. The adherents to the core type of transformer will tell you that the coils are more easily wound and the core itself more easily insulated, that the copper coils being on the outside radiate the heat due to internal losses more quickly. Notwithstanding these seeming advantages to the casual observer, the Johnson & Phillips Co., Ltd., of London, England, who first manufactured this type of transformer from the designs of Gilbert Kapp, after extensive experience with them, abandoned their manufacture and became adherents to the shell type.

For an equal investment in material and labor it has been demonstrated that with proper design a better transformer can be built of the shell type than of the core type. The double magnetic circuit of the shell type gives a shorter average path for the lines of force, which combined with a smaller number of breaks or interruptions in the magnetic circuit call for a less number of ampere turns or magnetizing force, and result in giving the shell type the advantage of a better power factor at light load. With proper machinery the coil for the shell type transformer can be wound and carefully insulated with but little more trouble than the core type, and the waste in copper in turning the ends of the coil will be no greater than is necessary in the cylindrical coil used with the core type, which touches only at the four corners of the core, which for commercial reasons is made of a rectangular cross section, leaving considerable space inside the coil not filled with iron. There are many points of view from which comparisons can be made, too numerous for the limits of such a superficial treatise as this, which, generally speaking, favor the use of the shell type, which we believe will be the standard as improvements are made, and the results of careful tests are more thoroughly understood.

The sub-division of coils in a transformer is one of the most important features, both as regards the safety of its

\*Paper read before the Canadian Electrical Association.