COMPARATIVE COST OF ELECTRICITY AND GAS.

MR. FRANK GERALDY has published some interesting statistics comparing the cost of the electric light with gas, both as to its actual cost and its cost per candle power:—

Installation.	Electric light system.	No. of lamps.	Candle pow of lamps.	Motor.	Tot. cost p. hour gas.	Tot. cost p. hour electric light.	Cost per candle power gas.	Cost per candle power electric light.
Salle des Télégraphistes at Brussels (Nord)	Jaspar	3	235		1·86	3·42	0·0265	0·0054
Halle aux marchandises, Lyons Station (Paris)	Lontin	18	64	Steam	6·825	6·625	0·0273	0·0054
Spinnery at Riverside (United States)	Brush	71	75	"	36·80	11·18	0·0353	0·0022
Ducommun Establishment at Mulhouse	Serrin	4	110	"	—	6·64	0·044	0·015
Passage in the Friedrich-strasse (Berlin)	Siemens	10	50	Gas	9·14	6·45	0·040	0·013
Thames Embankment	Jablochkoff	20	28	Steam	—	0·457	0·0150	0·018
Spinnery of E. Manchon (Rouen)	Sautter-Lemonnier	6	150	"	9·550	7·0557	0·0597	0·0082

This is only an extract from a longer list, but conclusively shows that in large instalments electric lighting is cheaper than gas on the total cost, whilst considered per candle power it is far away cheaper. An exception to the rule seems to occur in the first on the list, this is due to the smallness of the installation. In the case of the Thames Embankment the *light is reduced by the use of ground glass globes*. If we bear in mind the fact that the economy consists in having large installations, we shall be brought face to face with the fact that whereas gas is now made in as large quantities as is practicable, electricity has still to be brought to that state of economy. Thus we may still expect a greater economical advantage than is shown by the above figures.

DR. HOPKINSON'S ELECTRICITY METER.

(*For illustrations see page 349.*)

It is not a little curious that so important a subject as that of electricity meters should have received—comparatively speaking—but scant attention, whilst many of the other details of electric lighting have been overdone. Perhaps the demand for such apparatus is at present so limited that inventors have preferred to turn their thoughts in more profitable directions; but the few who have in the meantime brought their inventive skill to bear upon the instruments will, doubtless, secure the leading positions, when the time has arrived, which shall make electricity meters a necessity. At various times, the meters of Edison, C. Vernon-Boys, Cauderay, etc., have been illustrated, and we now present to the notice of our readers the instrument invented by Dr. Hopkinson. This gentleman's eminent position in the scientific world is a sufficient guarantee that the subject has received due and careful consideration at his hands, and that the apparatus has not been constructed without a thorough knowledge of requirements. Fig. 1 is a general view of the meter, and figs. 2 and 4, for which we are indebted to Messrs. Chamberlain & Hookham, the licensees and manufacturers, show the details of its *construction*.

The method of working is as follows:—One of the main leads, say, the positive, enters at one of the binding screws, is wound around the core of the electro-magnet, forming the solenoid, *f*, and leaves at the other binding screw. One binding screw is in contact with the frame of the machine; the other is insulated from it. The shunt circuit, the current which drives the small dynamo, is taken from the negative lead, enters the machine by a small insulated binding screw (not shown), is carried in series round the magnets and armature of the small dynamo, and is attached to the insulated bar, *h*. So long as *h* remains insulated it is clear that no current passes through the dynamo; but if *h* is put in connection with the frame of the machine a current passes, since the positive lead is also connected to the frame. Now, as soon a current passes round the solenoid, *d* is drawn down by the magnetic action, *g* falls with it, and touching *h*, puts it into connection *with the frame. A current now passes through the* dynamo; the governor balls rotate with increasing speed till their centrifugal force is sufficient to overcome the magnetic attraction of the solenoid, *g* then rises again, the current ceases through the dynamo, the speed of the governor falls till *d* is again drawn down by the magnetic attraction, and the operation described is repeated. Now, it is clear that when a small current is passing along the main leads, *e g*, when but few lamps are in in use, the attractive power of the solenoid and its iron will also be small; consequently, a comparatively low speed of the governor balls will suffice to overcome it. If, however, many lamps are in circuit, the current will be greater, the attraction stronger, and a higher speed of the governor necessary to break contact. Thus it is plain that there is a relation between the current strength passing along the main circuit and the speed of the governor. It may be seen, further, that they are directly proportional, the one to the other, for *the attraction of an electro-magnet varies as the square of the* current round it, and centrifugal force as the square of the velocity of rotation. Hence, in the present case the current in the main leads is proportional to the average speed of the governor balls. This speed is indicated, in the usual way, with dials, and, in practice, the machine is standardised so as to register ampère hours.

The range of this meter is only limited by the speed of rotation which it is possible or advisable to impart to the revolving shaft. The inventor has designed a modification of the present instrument of which the range would be practically unlimited, but it is very doubtful whether this will be called for as its price would be higher, and it is unlucky that in practice any accuracy greater than that of gas-meters will be found worth paying for. In the meantime, owing to improvements in mechanical detail, each succeeding set of instrument shows an increased range. At first this was from 1 to 20. At present *they are producing meters which have a range of at least* 1 to 30.

In practice, and from the consumers point of view, the instrument has the following special advantages.—

(1.) It is read as a gas meter is read. No electrical or other scientific knowledge is necessary in order to understand its registrations.

(2.) It is not merely easily understood, but a consumer can tell at any moment of the night or day whether his house wires are in order, either by noticing whether there is any movement of the hand when no lamps are in circuit, or by observing whether, with a given number of lamps, a proper current is being registered. Even with an illuminant, to which the public is well accustomed, as gas, the consumer is often suspicious when the quarterly bill is presented. This would be still more the case with the early use of electricity, and anything which will enable the consumer to judge from time to *time what is the amount of his supply will greatly tend to the* smooth working of the undertaking.

(3.) The meter is, practically, independent of friction, no clockwork is used in it, and it requires no attention beyond