

# Lighting Department Practice and Equipment

By

J. M. WARD and J. M. MANN

*(Corporation of Glasgow, Lighting Department)*

*Paper to be presented at the Eleventh Annual Meeting and Conference of the Association of Public Lighting Engineers, to be held in Aberdeen during September 17 to 20, 1934.*

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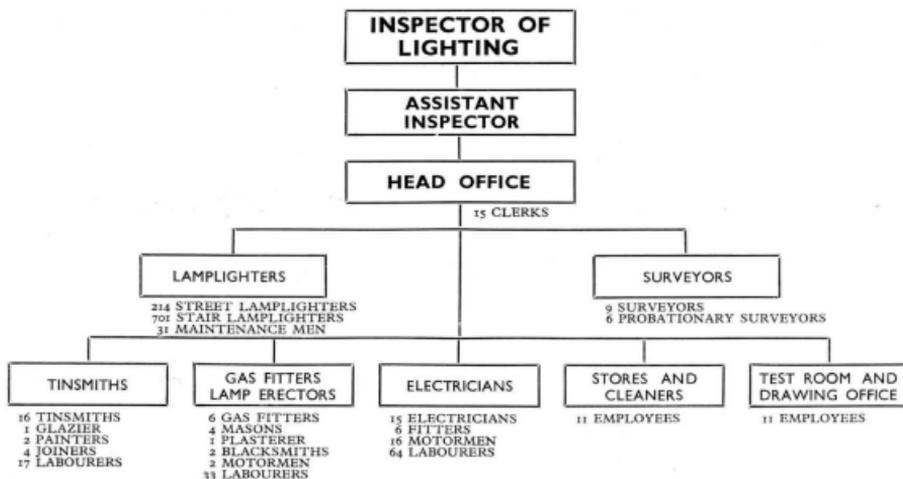
In selecting this title, "Lighting Department Practice and Equipment," we have been influenced by the desire to present a paper which will be of real practical interest to those engaged, or interested, in Public Lighting. We hope to succeed in this, since the paper will consist for the most part of the experiences, experiments, and progress made by the Glasgow Corporation Lighting Department—a very old-established department, having been in existence for over a hundred years. There has been a Lighting Department in Glasgow since 1800, and an old Order Book covering the years 1819-1839 contains some delightful items of a period when life pursued a more leisurely course than it does to-day. In 1819, we find it laid down that "The lamplighters are to start the valves of the gas pipe with their hands, and not with their ladders, under penalty of a shilling for each offence." So we find the lamplighter at his little tricks in those far-off days! These orders were issued by the Board of Commissioners of Police to the Superintendent of Lamps.

It is necessary at this point that we should quote

lamp-posts, lamp irons and other appurtenances." Where a central suspension street-lighting installation is being contemplated the advantage of such a clause is obvious.

The close relationship between the services of Police and Lighting is shown by our occupancy of part of the police stations for divisional offices and lamp-lighting muster halls in certain districts of the city. Until a few years ago the responsible Committee was the "Watching and Lighting Committee," but this has now been changed to "Police Committee," with a sub-committee taking under its wing both the Fire Brigade and Lighting. With its roots well established in the nineteenth century, it is not surprising that the Glasgow Lighting Department of to-day should be a tree of vigorous growth, and a survey of its branches should be of interest.

The total staff numbers 1,189, and the following diagram gives some idea of the scope of the Department's activities, and indicates the sections under which it has been found convenient to group the staff, for efficient control.



the Department's charter, otherwise the practice here outlined may appear to many as unnecessarily costly and extravagant. Acts of Parliament dealing with the street-lighting of Glasgow are to be found earlier than 1866, but the "Glasgow Police Act" of that year was the Department's real charter, and empowered the Corporation "to erect and maintain lamps, lamp-posts, and other appurtenances for lighting in a suitable manner, all public and private streets, courts and common stairs within the city, to light the dial plates of turret clocks and city timepieces, and to appoint an Inspector of Lighting to take charge of that work and be responsible for the good conduct of the lamplighters and others appointed by him." In this old Act it is interesting to note that powers were given "to affix to the walls of any buildings, or the railings in front of such buildings, the necessary

## Head Office.

A department is best served by giving competent superintendents full authority in the control of their sections. This is the policy carried out by the Glasgow Lighting Department, but a very careful supervision is kept by the Inspector of Lighting with the assistance of the Head Office Staff. The foremen must keep the Inspector and Head Office well advised of their activities, and, to facilitate this, each has a branch telephone to his office. The primary functions of the Head Office are:—

- (1) To assist the Inspector of Lighting to keep strict control, and to keep him advised of the activities of each branch.
- (2) To keep necessary and useful records.
- (3) To estimate and spend wisely.

This last function is, naturally, a most important one, and calls for very careful thought and care, since our annual expenditure on street and stair lighting amounts to £320,000. With such a large sum involved, it is imperative that our system of accounting should be an efficient one.

Under the Glasgow Police Act of 1866, to which we have previously referred as our charter, the expenditure on the lighting of public streets was met from a "General Police Assessment," but not so the lighting of common stairs, courts, or private streets; the cost of which had to be recovered from the individual proprietors concerned. This arrangement, besides giving endless trouble, was proving a formidable obstacle to lighting improvements. Steps had therefore to be taken to have radical alterations made, and powers were obtained, under the Glasgow Corporation Confirmation Act, 1914, to levy an assessment on all lighting services in Glasgow, with a limit of 6d. on the £1. This was subsequently raised to 9d. in the Confirmation Act of 1923. From that date our actual lighting rate has been:—

1924-25 .....	7.02 pence.
1925-26 .....	6.1 "
1926-27 .....	6.86 "
1927-28 .....	8.97 "
1928-29 .....	7.53 "
1929-30 .....	7.34 "

No further figures are available since 1930, as that year saw the beginning of the Local Government (Scotland) Act, 1929, introducing the "Consolidated Rate," and Section 19 expressly states that: "All rates leviable by a rating authority shall be levied and recovered as one rate, to be known as the 'Consolidated Rate.' The total monies raised by this rate shall be paid in the case of a burgh into a fund to be called the 'Burgh Fund,' and the expenditure of the town council payable out of rates for each branch of expenditure shall be defrayed out of such fund." So the Lighting Rate disappears from available statistics, but remains as a limit on the total expenditure on public lighting. It is important to note that in Glasgow all our departmental expense, with the exception of "Purchases of Buildings and Sites," is debited to Ordinary Revenue and Expenditure Account. It was the practice, however, in former years to transfer annually a sum from this account to capital account to cover expenditure incurred in new lighting schemes, and improvements in existing plant. The auditors, having questioned the validity of these improvements as assets, it was decided to meet all public lighting expenditure with the aforesaid exception from the income derived from the annual levied rate. As a result of our former practice the Department has an accumulated debt of £50,000, and has to meet an annual sum of £4,800 for interest and sinking fund. The present practice is certainly sound finance, but the chief drawback, we find, is when uninformed citizens and associations begin comparing the expenditure of town A with town B, ignoring the fact that the financial arrangements differ and comparisons are unfair.

The actual payment of accounts and paybills is made by the City Chamberlain, so that the only cash transactions carried out by the department are those in the sales ledger, and amount approximately to £9,000 per annum. These for the most part consist of revenue obtained from: (1) Lamps owned by private individuals, such as doctors, and charged against them; (2) sales of scrap metals and obsolete plant; (3) work done and materials supplied to other departments and councils; (4) damaged lamps. Lamps knocked down or damaged by vehicles in Glasgow are daily occurrences, and the total value of claims against motorists, etc., last year amounted to £1,300. For many years now we have agreed to accept two-thirds of the amount of these claims in full settlement when they are being met by insurance companies or large contracting bodies, on condition

that they will never dispute any of our claims whatsoever. The loss we incur is amply repaid by saving in collection costs and the expense of disputed claims, for often our evidence is slight and many of them would be difficult to prove.

Our system of accounting with reference to gas and electricity is worthy of some attention. The gas we purchase from the Corporation Gas Department, but not only do we purchase current from the Corporation Electricity Department, but we are also large consumers of a public joint stock company. A monthly return is made to all these bodies of all new lamps, lamps discontinued, and any increases in cubic feet or wattages. We also advise them of any departures made from the fixed lighting scale owing to fog or early darkness. Our basic annual scale of burning hours in Glasgow is 3,711, but the actual burning hours for the past three years has been 3,856, 3,844, 3,824. Quarterly accounts are then rendered to us by these undertakings calculated on

No. of lamps x consumpt. (cubic feet) of each x No (watts) of each x No

of burning hours.

This method of charging has been in operation with the Corporation Departments for many years, but when we first became consumers of the public company it was necessary to convince this supply authority, by argument and records of readings from meters installed in a few circuits, that if our system erred at all, it was in their favour.

### Stores.

Stores are issued on receipt of requisition forms from foremen, and goods are purchased from requisitions issued from the store to head office. Stores ledgers are kept and accounts opened for all goods, so that stocks are readily ascertained, and periodical checks can be made by head office of goods received and issued. A stores day book is written up daily of all goods received, and no account is passed for payment unless the appropriate entry is to be found in this book. The account is initialised by the stores assistant, and the day book by the purchasing clerk, and the account finally certified by the head of the department. With three persons involved, collusion is unlikely.

### Tinsmiths.

This section performs many varied duties, including metal work for other sections, and sometimes for other Corporation Departments, such as repairing police hand lamps, road repair danger lamps, and the making of direction signs. A suitable grouping of the work carried out would be:—

- (1) Overhauling defective gas burners.
- (2) Making new lanterns.
- (3) Repairing gas lanterns.

(1) With 91,000 gas burners in daily use in the streets and stairs, this branch, which employs eight men, has always plenty of work on hand. The burners must, of course, be kept in good condition by the lamp-lighting staff, but all those showing signs of "wear and tear," or developing defects, are sent in daily to the store from the divisional offices, and an equal number of reconditioned burners are supplied in their place. While the streetlighters (full-time employment) are responsible for the cleaning of their own burners, the stairlighters (part-time employment only) are exempt, and their burners are cleaned by a special maintenance staff. Only four types of burners are used in any quantities, and parts for renewal are inexpensive, and not too numerous.

- (1) Stair burner consuming .7 cu. ft. per hour.
- (2) Single swan neck burner consuming 2.8 cu. ft. per hour.
- (3) 3-Light roof burner consuming 5.5 cu. ft. per hour.

(4) 4-Light roof burner consuming 6.75 cu. ft. per hour.

The canopy of the stair burner is made of cast iron, and, after a period of service on the stairs, is brought in for heat treatment. A gas-heated muffle furnace is used, and the castings heated to approximately 700° C. After cooling, they are brushed to remove scales, and painted with aluminium paint ready for re-assembling. The brass parts are cleaned with nitric acid, and the street burners, being mostly brass, are also treated in the acid bath.

The reconditioning completed, the burners are each tested at 26/10ths pressure for their stated consumpts, and the nipples adjusted until this is accurately registered. To ensure accurate consumpt the Gas Department formerly supplied governors for fitting to street lamps, but have now ceased this practice, and the 2.8-ft. burner is not now fitted with a governor. The 3-light and 4-light roof burners (mantles in alignment) to which we are rapidly changing over, are all fitted with pressure governors set for 3-in. to 7-in. inlet pressure and 26/10ths outlet. These governors, however, are provided and maintained by the Lighting Department to maintain the high efficiency of these burners. Our experience of governors of this type has been very satisfactory, and apart from the periodic oiling of the leather diaphragm, repairs are negligible.

(2) Except in the first rush of the change over from the old round globes to the square lantern, our tinsmiths have made all the gas lanterns used in Glasgow streets. An early experience proved that tin was absolutely useless to withstand service conditions, and copper has been used exclusively. Two sizes are made and the dimensions of the lantern

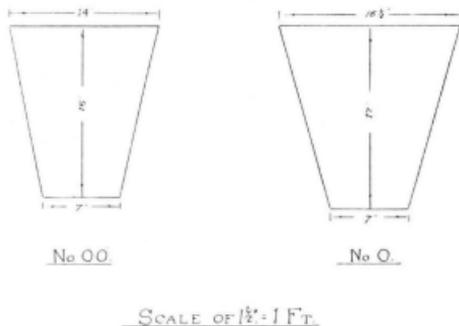


Figure 1. Glass Panes for Lanterns.

panes are shown herewith (Fig. 1), the No. 00 size for 3-light and No. 0 for 4-light burners.

No exceptional features are embodied in the lantern, but they are built for their job, and as our records show they do it for periods of fifteen to twenty years without repair. With the exception of the brass bottom trap door and the astragals, which are of brass encased in soft copper, the lantern is of 24-w.g. bright rolled copper throughout. To facilitate handling by the lamplighter in cleaning roof-light lanterns by giving him a firmer hold to raise the top, a small bolted iron handle takes the place of the usual but less secure knob. It is the kind of lantern we feel sure the manufacturer would like to turn out, if price-cutting left him no option but to produce a lantern perhaps a little less substantial. A more recent product of this section are traffic lanterns of the "Keep Left" type as shown. (Fig. 2.) In Appendix III., diagram IV., of the Report of the Departmental Committee on Traffic Signs (1933) a "Keep Left" notice is specified (Fig. 3), but nothing is laid down as to "housing" such a notice where it is internally illuminated.

In Glasgow the City Engineer has adopted a sign with the dimensions exactly twice those shown. The glass used in this lantern has white letters on a blue background, and one difficulty experienced with this combination is the necessity for using two panes—



Figure 2. Keep Left Lantern.

blue with the letters etched and an opal back pane. Panes combining the blue and white on the one glass have not been satisfactory, the blue fading out when illuminated, especially surrounding the large white area of the two E's. It is hoped that the glass manufacturers will take note, and at an early date make available the necessary "one glass" pane.

(3) Erring motorists are responsible for keeping this section busy. In Glasgow, during last year, 600 lamps were smashed, and although the pillar may only be dislodged it is very seldom that the lantern is not damaged and ready for a visit to the hospital at 20, Trongate. The motorist, of course, tries bigger



Figure 3. Dimensions of Sign as recommended by Departmental Committee on Traffic Signs.

"game" sometimes, and one splendid effort is shown. (Fig. 4.)

#### Lamp Erectors Section.

With almost 1,000 poles to erect per annum, and the majority of them in housing schemes on the out-

skirts of the city many miles apart, the question of a mobile crane became a very pressing one. At this time the erection of poles was carried out by a 2-ton hand crane (see Fig. 4) mounted on a horse-drawn



Figure 4. A motorist's effort, showing old type of Crane at work.

lorry. The crane and the necessary ballast of forty 56 lb. weights represented a heavy load for one horse, and movements were slow and laborious.

The makers of mobile cranes were approached, and tests carried out with their standard models. The cranes certainly proved marvellously mobile, but they did not exactly meet our requirements in Glasgow, where tram lines abound to so great an extent, and the distance between tram line and kerb determined the area in which it was possible to carry out our manœuvres.

Following the tests and discussions, one of the makers came forward with drawings of a crane

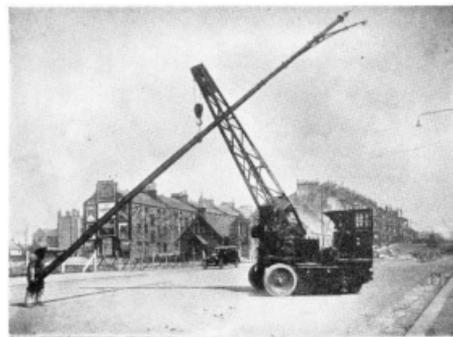


Figure 5. Mobile Crane with 37 ft. Steel Pole and Bracket.

which they felt would do our job, and on the strength of their reputation for this type of work an order was placed, and a photograph of the crane is given in Fig. 5. The crane has a maximum capacity of

two tons. With jib angle most suitable for handling the 37 ft. steel poles so largely used by the Department, 30 cwt. is the maximum load. The weight of this pole complete with bracket is 8 cwt., so that there is a good margin of safety. The crane travels on four rubber-tyred wheels, and has a road speed of six miles per hour, and is equal to all gradients to be negotiated in Glasgow. The four motions, derricking, hoisting, slewing, and travelling, are each operated by separate motors. The primary drive is by a petrol engine coupled to a generator which supplies five motors, i.e., the three above mentioned and the two four h.p. travelling motors. All these are energised by direct current at voltages varying between zero and 250.

The actual erection of a pole of the length and weight indicated is the kind of job where experience tells. In Glasgow, having had plenty of practice, our pole squad have certainly attained remarkable proficiency in this work. Apart from the special calls we sometimes have to make on the squad to go "all out," it is no mean performance for six men in one day to do the necessary excavation work and erect five poles complete with bracket arm and scroll work. The best testimonial to the success of the crane is the proposal by the Transport Department of the city to secure one for their erection work.

For the excavating work, special long-handled spades and spoons of the type illustrated in Fig. 6

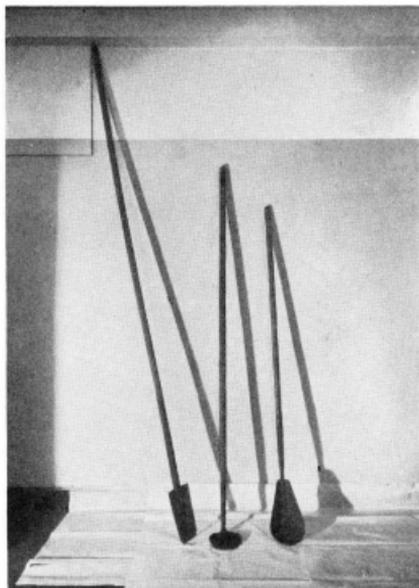


Figure 6. Tools for excavating work for pole erection.

are used. The hole is generally 6 ft. deep, unless rocky sites necessitate modification. When the pole is placed in position the aggregate is shovelled into the hole, and the necessary water poured in. It might be thought that there was a certain amount of risk with such a method, but such tests as we have carried out have proved conclusively that not only is there a saving of time and cement in this way, but that a thoroughly satisfactory pole anchorage results. Yet another advantage is that this method prevents cement being washed into the gullies, a proceeding which you may be sure does not receive the approval of the City Engineer.

With the rapid change from cast iron to steel tubular standards, Lighting Engineers will find

themselves confronted with all the problems of metal preservation. At any rate we are finding things so in Glasgow, and in planning the papers for future meetings, one on this subject might well be considered. All steel poles purchased by the Department were supplied with one coat of red lead. Unfortunately there is a tendency to confuse "red lead paint" with a coating of red lead, and the results can be disastrous. On erection the poles received one coat of good quality green glossy paint. When issuing tenders for steel poles, two coats of red oxide to B.S.I. specification are stipulated, and the quality of glossy green paint employed has been the subject of many and varied tests.

#### Electrical Department.

This section, although the youngest, has grown so rapidly that it is now the largest. From a section comprising a few men doing maintenance work only, it has grown rapidly within recent years to its pre-

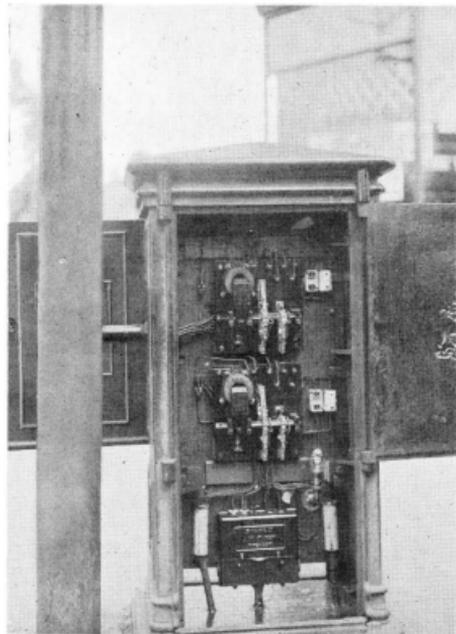


Figure 7. Showing Section-Box with Relay Switching Gear.

sent complement of 101 employees, who not only clean globes, renew lamps, repair faults, but carry out the complete installation of street lighting circuits. No work, other than the provision of a supply into the Lighting Department section box, is now undertaken by the two supply authorities in Glasgow. Figs. 7 and 8 show the interior of one of these section boxes erected and fitted by this department with relay apparatus and emergency hand circuit switches.

Our experience of underground cabling has not been a very favourable one, and practically all the cable now erected for street lighting is overhead, as it has the following advantages:—

- (1) The system is at any time easily accessible.
- (2) Temporary repairs can be quickly effected, during the night if necessary.
- (3) Maintenance is much simpler, faults being less liable to occur, and very much simpler to detect.



Figure 8. Reverse side of panel (Figure 7) showing Emergency Hand Switches.

- (4) Maintenance costs are therefore very much smaller.
- (5) The cores being not less than 6 in. apart, short circuits are less likely, and there is more freedom from chemical and electrolytic action.

The one strong objection to overhead cable is, that it is unsightly. This objection must be considered

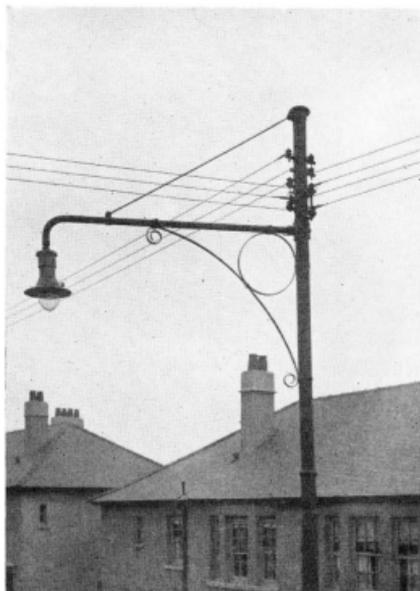


Figure 9. Overhead Cabling Arrangement.

in certain areas which are of the nature of "show" places, such as open spaces and squares, but with adequate lighting so necessary, and local authorities holding the purse strings so tightly, the comparative cheapness of an overhead installation, compared with the very much more expensive underground cabling, will no doubt overcome the appearance objection in ordinary streets. The cable used in Glasgow is No. 10 S.W.G. single core hard drawn copper conductor, with pure and V.I.R. insulation, braided and compounded. Composition insulators of a good quality are used, these being preferred to porcelain ones after many long tests had been carried out. It is essential, however, that the quality should be good, as many ineffective composition insulators are on the market. Fig. 9 shows the method of fixing the aerial cable to the pole.

While making use of time switches in certain circumstances for electric street lighting control, our policy has been to concentrate on central switching control by means of electric relays, this being the most advantageous in this very unreliable climate of ours. The following weekly report of the "switch-



Figure 10. Latest Type Motor Tower Wagon and Hand Tower.

ing on" times of a control board which operates over 2,000 lights, clearly shows the advantage over clock and hand control.

#### ELECTRIC CONTROL BOARD.

Week ending December 22, 1933.

Date.	Scale Time.	Control Time.	Difference from Scale Time.	Weather Conditions.
15/16	3.15 p.m.	4.13 p.m.	58 mins. after	Clear
16/17	"	3.33 "	18 " after	Foggy
17/18	"	3.7 "	8 " before	Foggy
18/19	"	4.5 "	50 " after	Clear
19/20	"	3.15 "	0 "	Foggy
20/21	"	3.57 "	42 " after	Clear
21/22	"	4.5 "	50 " after	Clear

The work of erecting new aerial installations, repairing faults, cleaning globes, and renewing lamps, keeps six tower wagons in constant employment, four wagons working three shifts in twenty-four hours from 7.45 a.m. to 5.30 p.m.; 5.30 p.m. to 12.30 a.m., and 12.30 a.m. to 7.30 a.m. This Department has been using tower wagons for ten years, and the following points may be of interest to authorities contemplating this addition to their equipment. The latest model, which naturally included all the good points of the older ones, has been fitted with power-driven elevating gear. Power is taken from the gear box, and transmitted by means of shafting to pinion wheel of the elevating screw. Balance weights are fitted which work on rails on the stationary section of the tower. The raising and lowering of the platform is regulated by a control lever at the rear of the wagon, and an automatic cut-out is provided to stop at maximum height. This

wagon is a vast improvement on previous ones, as will be readily seen by comparing the operating times with that of a hand raised tower wagon.

Power elevated—30 secs. to maximum height.

Hand elevated (2 men)—3 mins. to maximum height.

Even on hand operation this machine, because of the balance weights, is much faster, being raised by one man in 1 min. 20 secs. Mounted on a 30 cwt. chassis the overall length of the vehicle is 17 ft. 6 in. The wheel base is 10 ft. 9 in. by 5 ft., and the general design can be seen from the photograph (Fig. 10). Immediately behind the driver's cabin, which accommodates three people, there is press accommodation which must be ample for carrying renewal stocks of large-wattage lamps. The tower structure is in four sections, giving an extended height from ground to platform of 30 ft., and a closed height of 12 ft. 6 in. The platform 5 ft. square is stationary, since a turn-table arrangement at such a height would be dangerous. The nature of the work performed is not conducive to a high mileage per gallon, and the average works out about eight to ten miles to the gallon.

For maintenance work a few hand towers are employed, made by various makers, and our latest is shown in Fig. 10. Here again experience has dictated not a few departures from the catalogue article, some slight, but all making for ease of working and longer life. For instance, increasing distance between platform and guard rail allows employee to pass through instead of climbing over rail. A trifling matter one might say—but not to the man working on top in all kinds of weather. Tool trays as generally provided are too shallow for safe working. A spanner dropping from 30 ft. on a passing citizen is not unlikely to involve the Department in heavy damages, so we specify a minimum depth of 4 in. By fitting metal shields on the rungs of the middle section, where excessive wear was occasioned through the rubbing of the automatic locks, we eliminated a source of constant trouble. We always specify levelling jacks on all legs. The foregoing we have instanced as showing, no matter what the article, improvements can be effected by close co-operation between maker and user.

After exhaustive tests on completed electric installations the policy was adopted of renewing all electric lamps of wattages from 150-1,000 after burning 1,000 hours. With over 9,000 of these high-wattage lamps, and increasing at the rate of 800 to 1,000 per annum the clerical work involved by this decision would have been considerable if an ordinary card system had been used. By installing a "visible" card index system, with a card for each lamp, and employing "signals" to record 1,000 hours, the work of systematic lamp renewals is effectively carried out with the minimum of clerical labour. The operating of the "tote," as it is familiarly called, is only a part-time job for a junior, although it now records the behaviour of 9,000 lighting units with an annual lamp bill of £10,000. At a glance, the tote immediately reveals an invaluable check on the life of lamps used, and the behaviour of certain makes and certain wattages; but the greatest advantage is the easy method it provides of drawing up lists of lamps for renewal after burning 1,000 hours. The advance signals used show these at a glance, and by a carefully arranged grouping of these lists, the maintenance staff work of renewing is kept down to a minimum, since the travelling done by the tower wagons is confined to a single street or area. As a result of the above procedure, the "darks" or casualty lists, as they are called, are surprisingly small, and for the first seven months of this year the average number of dark lamps to be renewed each evening has been only .3 per cent. of the total.

The introduction of this system found us involved in discussions of lamp life with the makers. When

the operator records the daily casualty list, he has before him a scale which gives him the actual hours the lamp has burned, and he notes in a Premature Failure Book under the maker's name, all lamps which have given less than 600 hours. Confronted with these lists showing these premature failures the makers, of course, wanted to examine the lamps, and resulting from these examinations we had to tackle a real problem—failure from access of water. We were assured that this was the first time that any manufacturer had ever heard of water shortening the life of the lamp in such a manner. With this clue a graph was made based on the casualties each day, and with the kind assistance of the Parks Department who placed the rainfall charts for that period at our disposal, we also made up a graph of the rain-

card taken from the visible card index and reproduced in Fig. 12. The dates given record the renewal of lamps, and it will be seen that a partial recovery was made by fitting an anti-vibrator, but it was not until another type had been fitted that the recovery was complete, and the unit began to give a full life of 1,000 hours. The signals at the foot of the card which are visible as they lie in trays, show at a glance that the present lamp is due for renewal in the third week of October.

### Divisional Offices.

The present arrangement existing in Glasgow of dividing the city into thirteen lighting areas with a district office in each is a survival of an all gas

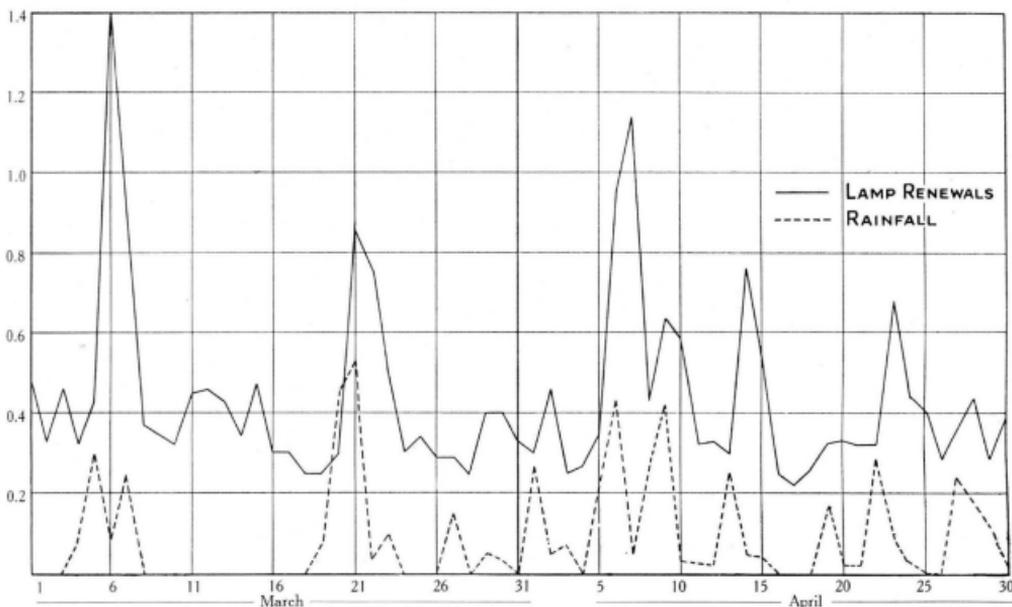


Figure 11. Rainfall and Lamp Renewals. March and April, 1932.

fall. These two graphs are shown together herewith (Fig. 11), and the striking similarity between the two is clearly shown.

The water problem was tackled in earnest. Bracket designs and the position of the cable entry holes were altered, for we found that with overhead cable the drop of the cable to a side hole had provided a lead-in for water. Having discovered other authorities with similar complaints, one lamp manufacturer made a very useful contribution to the solution—namely, a differently shaped bulb, which although it might still receive the drops of water, would receive this destructive element on a section of the surface where a more even temperature prevailed. In the older type of bulb the water had impinged at a point where a condition of stress existed, due to the differing temperatures above and below the mica disc, with resulting fracture of the glass.

The periodical examination of the cards has shown some units with excessive consumpt of lamps. These are reported to the Electrical Superintendent for examination and report. Should the report show that the lantern, wiring, and fittings are all in order an anti-vibrator is fitted. Our experience in Glasgow has been that different vibrations call for different anti-vibrators. An example of a rather stubborn unit which finally yielded to treatment is shown on

system, but with the extension of electric lighting, steps are being taken which will eliminate at least half of this number. By combining street and stair lighting (making a total of 125,000 lighting points) under one management, Glasgow operates on a very

CLASSIFICATION				REVISION/ISSUES CARD NO. 15555			
SITUATION SAUNDHALL ST.				LANTERN STANDARD			
WATTS 500		SUPPLY E.D.		FITTURE 376 POLE			
DATE	LAMP	INITIALS	DATE	LAMP	INITIALS	NOTES	
1-1-32	Os	AM	23-11-32	Os	EG	ANTI-VIBRATORY DEVICE FITTED 18/5/32	
8-1-32	Os	JC	24-11-32	Os	EG		
8-1-32	Os	JD	25-11-32	Os	CL		
5-1-32	Os	SB	17-12-32	Pu	AH	New Anti-Vibratory Device Fitted 26/5/32	
10-1-32	Os	SB	4-4-33	Pu	SS		
13-1-32	Os	DE	6-9-33	Cry	SS		
13-1-32	Os	DG	15-12-33	Os	AC		
20-1-32	Os	AH	15-2-34	Os	AC		
7-3-32	Os	SB	8-6-34	Os	DC		
22-3-32	Os	IG					
7-4-32	Os	AH					
21-7-32	Os	AB					
15-8-32	Os	AG					
7-11-32	Os	IG					

Figure 12. Sample Card from Visible Index System.

large scale, and consequently many Lighting Authorities represented at this Conference will find many of the activities touched upon, quite inapplicable to

their conditions. We think, therefore, that it might be advisable to give the routine work of these district offices in some detail, as their areas, comprising in some cases 3,000 street lamps and 6,000 stair lamps, touch the other end of the scale of Lighting Departments. Each division has a superintendent in charge, and besides his office there is ample accommodation for the lamplighters in the muster hall, which is fitted with forms, ladder and torch racks, and a lead covered bench for trimming lamps and torches. Store accommodation is provided, but the stocks of mantles, lamps, burners, etc., carried, are kept as low as possible.

Clock dials in the muster hall make known to the lamplighter the prevailing times for lighting and extinguishing. The men are despatched in groups according to the time required to reach the first point on their beat at scale time, and as each batch leaves, the superintendent records the time on a "Despatch of Men to Light" form (appendix No. 1). This is one of the most important records we have in Glasgow, and its production has been an important factor in some of the cases we have contested as to our liability for accidents on streets and stairs. The same form records any departures from scale time authorised from the Head Office or at the superintendent's own discretion. The number of lamps per beat averages 120 when all gas, increasing in number with the introduction of electrics until the figure of 500 is reached for an all electric beat of units on small standards.

On the return of the men oral reports are made to the superintendent of defects requiring attention, such as gas obstructions, glazing, burner repairs, etc., and these are transferred by him to Maintenance Lines (Appendix II.), Tradesmen's Worklines (Appendix III.), and Glazing Contractor's Lines (Appendix IV.). The glazing is done by a private firm, tenders being sent out each year for this work. As a result of the close co-operation in Glasgow between the City Engineer's Department and our own, the lamplighters have been trained to report on quite a number of matters not strictly lighting, but Corporation interests, nevertheless. Following the nightly reports, the superintendent's mail to head office next morning will often contain, besides the above worklines, reports of "missing water tobies," "broken stair rails," "defective steps and stairs," "uneven flagstones," and "defaced name tablets."

The lamplighters do not report at extinguishing time, but a time-keeping check is kept by a system of collecting checks. Each stairlighter must hand over a check to the streetlighter operating at the nearest point to his beat. This system has proved a very effective one. Roll-call of street lamplighters takes place at 10 a.m. each morning, when time-keeping checks are handed in, further reports made, and supplies of mantles, electric lamps, etc., issued to replace those fitted. The streetlighter then proceeds

to his cleaning and renewing of mantles and lamps. Stairlighters being part-time employees, report only at the beginning and finish of lighting-up time. These stairlighters are paid 35s. 2d. to 40s. 2d. per week, and their further duties consist only of keeping globes clean. Their maintenance work is done by a special staff, paid at the rate of 55s. per week (full-time employment), and they look after, approximately, 2,000 stair lights. Streetlighters receive 55s. per week, increased to 56s. after one year's service, and they are provided with the following uniform clothing:—

- 1 Uniform and extra trousers every year.
- 1 Overcoat every two years.
- 1 Waterproof every four years.

Each month the superintendent makes returns of mantles, electric lamps, and globes used, and also his present stock of these materials. From the figures he submits he, in return, receives a report from the head office, informing him of his average monthly consumpt of these materials, and how this compares with the average over the whole city. At intervals his stock will be checked by a clerk from the head office. Streetlighters now use carbide torches exclusively, with their advantages over oil of being cleaner, quicker to light, and their distinctive advantages in gusty weather. Stairlighters still use oil lamps of a special design. Experiments have been made with electric hand lamp torches, but they have not so far proved robust enough for our use.

### Surveying.

Bearing in mind that our lamplighting staff is very large, and their work scatters them over 660 miles of the city's streets, an adequate personal supervision is impossible, and to maintain discipline and efficiency it is essential that a staff of surveyors should be employed for this purpose. This staff consists of nine surveyors and six probationary surveyors. They have all started at the bottom of the ladder, and have thus years of experience as stair and street lamplighters to fit them for their work. They spend about 5½ hours each evening surveying and noting the condition of street and stair beats, dark lamps, etc., and next morning they spend about 1½ hours writing up their reports, on special report forms (Appendix V.), for the attention of the Inspector of Lighting.

Some years ago, when the Corporation decided to give street lamplighters one day off in six weeks, a system of probationary surveyors was begun. Six good type streetlighters were selected, and each streetlighter is relieved for his day off by these surveyors doing his lighting and extinguishing. Each day, therefore, these surveyors have gone over a beat, and they make their report regarding the condition of it. As a survey it is excellent, and many points which the ordinary inspection misses are revealed, such as plant defects, stiff or excessively loose cranes. Should any tendency to slackness on the part of the

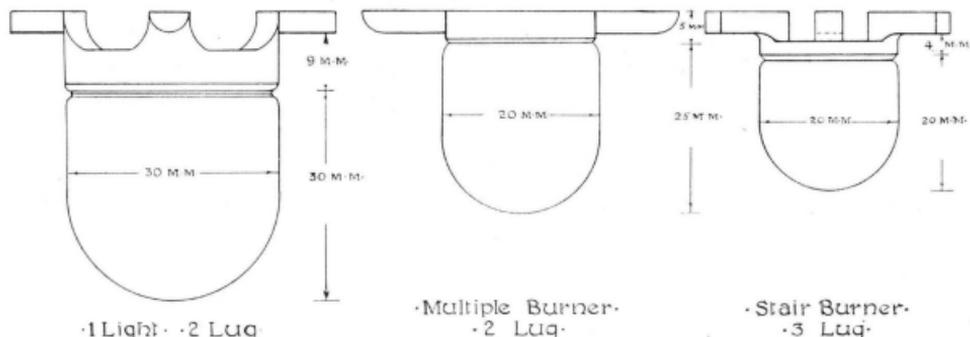


Figure 13. Three sizes of Mantles used by the Department.

lampighter be shown by the various reports when examined by the Inspector of Lighting, a "Defaulter's Report" is called for (Appendix VI.). That no undue hardship should be caused, an additional form (Appendix VII.) is presented at the same time to the Inspector, and this shows the previous reports of this man's beat. In this way an employee's first falling off is noted, and a word of caution is usually all that is necessary to set him on the right road again.

### Test Room and Drawing Office.

The present activity in housing keeps the drawing office fully employed preparing plans showing the proposed positions of the lamp standards, mounting heights, types of suspension, cabling and control wiring, supply points, and control positions. A copy of each plan is given to the foremen concerned in the erection of the installations, and another is filed for reference.

The necessity of having a test room attached to a Lighting Department is one which is often urged. We should like to emphasise the importance of making a start in this direction, even if this should only be in a very small way at first. If engineers can persuade their committees to set aside the necessary monies to equip a small test room, with the correct personnel, it will not be long before the investment will be yielding handsome results and providing an incentive to proceed with further equipment. Those who have had the privilege of visiting Watson House will readily understand what can be accomplished by a well-equipped testing station.

Our own test room was started over twenty years ago with a photometer and some essential material testing apparatus. It was not long before this new section proved its value, with the result that we have gradually increased the equipment and staff to cope with the work of: (1) Testing of materials used in considerable quantities, and (2) the required experimental and research work so very necessary in public lighting.

Extensive tests are carried out in the laboratory with all types of burners, lamps, lanterns, reflectors, refractors, diffusing glassware, etc., to ensure that the most efficient and the best suited fitting shall be installed in the streets, and so we have the necessary data to assure us that our light sources are not only placed to the best advantage, but that the best use is being made of them. A recent example was the many weeks of laboratory tests preceding the erection of an installation comprising twenty units of the new gaseous discharge lamps. These tests of various lamps, chokes, lanterns, etc., ensured that the practical tests on the streets started with every advantage.

It is interesting to note that we have an arrangement in Glasgow with the local Technical College to work with this Department in testing various articles. When the question of a cube integrator was considered, our requirements would have been best met by possessing both a 1-metre and a 2-metre cube. Eventually both will be secured, but in the meantime we have the 2-metre cube, and our smaller units are tested in the 1-metre cube belonging to the College.

The head of the test room staff looks over the stores day book each day and notes incoming materials to be passed by him. This list will include mantles, cable, glassware, burners, gas and electric fittings, electric lanterns, paints, and oils. If the first item alone is taken a very substantial sum can be lost annually through the falling off in quality from such standards as have been stipulated in contract. The mantles we use in Glasgow are of three

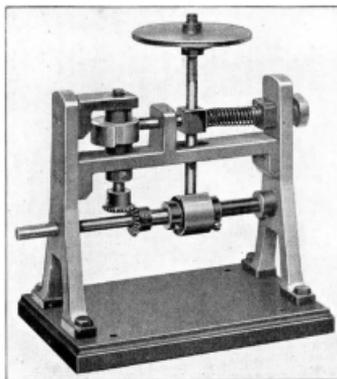


Figure 14. Gas Mantle Shocking Machine.

sizes and are shown herewith (Fig. 13). A shocking machine on the lines of that illustrated (Fig. 14) is used as a preliminary test, and our minimum requirements in shocks are, for No. 1, 300; No. 2, 600; No. 3, 3,000. We insist, therefore, that the quality of stock deliveries shall be maintained, but the fairness of our methods are recognised, and if a batch of mantles are found to be under par, replacements are immediately made. Should the British Standards Institution have a specification for an article used by the Department it is adopted as standard.

Possessing a fairly well-equipped test-room with many years of experience, we have been able to draw up detailed specifications for the manufacture of many of our materials and fittings. An example of this is the specification we issue for electric lanterns, of which there are two sizes, one to take lamps of 150 and 200 watts, and the other, lamps from 300 to 1,500 watts. The smaller of these lanterns is mounted on our standard 28-ft. pole and the larger on our standard 37-ft. pole. Although by no means perfectly satisfied with this specification, we have a very serviceable lantern evolved from many years' experience. Naturally, we expect and insist on the lantern conforming to all the details of the specification we submit, but, nevertheless, we welcome suggestions from manufacturers of new or improved ideas, for we recognise that new ideas are the keynote to "Better Lighting Practice and Improved Equipment."



