THE EDISON ELECTRIC ILLUMINATING CO.'S CENTRAL STATION IN BROOKLYN, N. Y.

The Edison Electric Illuminating Company, of Brooklyn, N. Y., have erected and put in operation an electric lighting station which in all its appointments ranks with the most advanced works of the kind in existence. The steam plant includes a perfect system for obtaining as well as for watching and recording results. The consumption of coal is brought down to a low figure, and perfected apparatus is provided for ascertaining exactly what coal is burned. Thus a statement as to the pounds of coal consumed per electrical or mechanical horse power is entitled to the fullest confidence as being based on accurate weighing of every pound of coal consumed and of every pound of ashes left.

The station is situated at 358–362 Pearl Street, Brooklyn, N. Y. It is 75 ft. front and 100 ft. deep. At present it contains fourteen No. 32 dynamos, driven by four 300 and three 250 horse power Ball compound engines. The 250 horse power engines have one 12 in. and one 16 in. cylinder, with 22 in. stroke. The 300 horse power engines have one 13 in. and one 16 in. cylinder, with 25 in. stroke. They run at the rate of about 220 revolutions per minute. The steam is supplied by eight Babcock & Wilcox tubular boilers. The following is the general system of operating the steam plant:

The coal is received and weighed, and is elevated to the floor above the boilers. Thence it is distributed to the chutes, which in the illustration are seen leading down in front of each boiler. The chutes are provided with a valve at the bottom, and are carried by scale levers, and connected with a scale beam. The chute is filled with coal, the bottom valve being shut. It is then weighed. In the illustration the scale beams can be seen near the right hand range of chutes. The weight of the chute is allowed for, so that one weighing gives directly the weight of coal. The valve is then opened, and the coal falls down upon the floor, and is used as required for the boiler. When more coal is needed, a chute full is again weighed and delivered. The ashes, as removed from the ash pan, are carefully preserved and weighed before being sent away. This keeps an accurate watch upon the quality of the coal, and gives the basis for actual efficiency per pound of real combustible matter consumed. The consumption of coal is 2·75 lb. per indicated horse power and 3 lb. per electrical horse power. Indicator diagrams are frequently taken.

The engine and boiler rooms occupy the lower floor of the building. There are foundations for twelve engines, although only seven are now in use. The engines are belted upward directly to the dynamos, which occupy the floor above them. Sufficient inclination is given to the belting to enable it to grip the wheels well. As the dynamos are grouped in a double row over each set of engines, the belting runs alternately with opposite inclinations, as shown in the cut.

The dynamos are self-exciting and shunt-wound, and are built for an output of 575 amperes at 140 volts, but in practice are run at 650 amperes at 128 volts. Each one thus represents an output of about 112 electrical horse power and can supply 1,500 lights, representing a total of 21,000 lights in operation. An allowance of fifty per cent of idle burners is made in rating, establishing the capacity of the works to a 40,000 light district. Each lamp is of 16 candle power, is run at 114 volts potential difference with a current of 0·44 ampere nearly. If the amperes of current delivered by a dynamo are divided by the amperes required by a single lamp, the lamp capacity of the dynamo will be given. Thus, if 650 is divided by 0·44, the quotient, nearly 1,500, gives the lamp capacity of the dynamo.

The Edison three-wire system as used in these works and in the district groups the dynamos in sets of two, with three wires leading therefrom. One wire runs from the positive pole of one dynamo, another from the negative pole of the other dynamo. The other poles of the dynamos are connected so that they are in series, and from the junction the third or neutral wire runs. Thus a difference of potential of 228 volts is maintained in the system. The lamps are connected from the neutral to one or the other wire, so that in a sense the lamps are two in series. If the same number are in action on each side of the neutral line, no current goes through it. If all on one side are in action, then the same current goes through the neutral wire that goes through the active side wire. Three wires are carried everywhere throughout the district, and are so interconnected and tied at all points that an almost uniform difference of potential is maintained at all points in the region supplied.

The area thus covered with a network of distributing mains is supplied at a number of points by feeders from the station. Referring to the cut of the dynamo room, an elevated regulating gallery is seen running down its center. Along each side of this gallery heavy copper bars, called "buses," in sets of three, run. There is a "bus" for positive, for negative, and for neutral lines respectively. The main wires from the dynamos connect with these "buses," and from them the feeders are taken. The feeders are lines that run to various points in the district without any side connections. The drop in all the feeders must be uniform, and is determined by the drop in the longest. This is 13 volts when in full operation. The short feeders are calculated of such size as to give the same drop.

The dynamos, as stated, are shunt-wound. They are regulated by hand. Along the sides of the regulating gallery are German silver resistance coils, which are connected in series with the shunt. From each point of connection of the feeders pressure lines are brought back to the station and are connected to a Wheatstone bridge with galvanometer, the latter immediately over the resistance coils. By throwing more or less resistance into the shunt, the potential at the ends of the feeders is kept constant. The galvanometer reads zero when all is correct. It is adjusted from time to time by a Weston voltmeter. One or more operatives are in constant charge of the work of regulating the dynamos from the gallery.

The lamps are charged for at the rate of one cent per hour of use, and are replaced free of cost to the consumer as they fail. The well known Edison meter is used to determine the amount of consumption. The meter consists of a pair of zinc plates immersed in a solution of sulphate of zinc, connected in shunt with a resistance on the main circuit, so as to receive an integral and definite portion of the current. The zinc is dissolved off one plate and deposited upon the other. A man makes the tour of the district at the proper time and removes both zinc plates and takes them to the station. There they are weighed, and the change of weight, which is loss in one and gain in the other plate, is of course exactly proportional to the ampere-hours, which by division by 0·44 gives the lamp-hours. One milligramme of zinc represents one ampere-hour. As the voltage of the system is constant, the bills are predicated entirely on ampere- or lamp-hours. The meters are found to be accurate within two per cent. By weighing both plates a check is furnished upon the operation of the meter as well as upon the weighing. Where electrical current for power is supplied, meters are also used.

To supply the more distant parts of the district without entailing too heavy a drop of potential upon the feeders, an auxiliary station has been established in the upper part of Brooklyn. This station receives its electric power from the main station and contains its own regulating gallery and system of feeders. A special set of heavy leads or transit mains communicates between the two stations.

In New York there are now five stations in active operation, representing a capacity of over a hundred thousand lights. The most recent one is the new Pearl Street station, now in process of erection. Although the building is not half completed, a four-dynamo plant, with engines and boilers, is already established in the basement. It must be noted that in the Edison system of rating stations a large margin is provided for above the stated capacity. Thus the Twenty-sixth and Thirty-ninth Street stations, of New York, while nominally of 35,000 light capacity each, can supply 25 per cent more lamps, so that each station is good for a 50,000 or even 60,000 light district. The allowance for idle lamps cannot be made as liberal now as formerly, because lamp consumption is now supplemented by consumption by power users.

Bleaching Wool with Peroxide of Hydrogen.

Prepare the bleaching bath with one gallon peroxide of hydrogen, four gallons water, and a little ammonia —just sufficient to impart an alkaline reaction to the bath. (These proportions are open to variation according to circumstances, such as the nature of the material and the degree of whiteness required, a weak bath being used for loose fabrics and where only a moderate white is required; while a strong bath such as the above is used for a good white and for piece goods.) The bath must be used in wooden or earthenware vessels, and metals should be rigorously excluded. Scour the goods in the usual way to free them from grease and dirt, then enter them into the bath and work well until they become thoroughly saturated. Next gently wring out, and pile up in a warm place for six to eight hours. The goods must not be allowed to become dry; as long as they are moist the bleaching is going on, but it ceases as soon as they get dry, in which event the goods must be re-entered into the peroxide bath. If after this treatment the goods are not sufficiently bleached, the process should be repeated.—*Textile Mercury.*

AN EASY SOLUTION.—The *Northwestern Mechanic* is responsible for the following: A man who wanted to learn what profession he would have his son enter, put him in a room with a Bible, an apple, and a dollar bill. If he found him, when he returned, reading the Bible, he would make a clergyman out of him; if eating the apple, a farmer; and if interested in the dollar bill, a banker. When he did return, he found the boy sitting on the Bible, with the dollar bill in his pocket, and the apple almost devoured. He made a politician of him.

White Acid.

"White acid" is a name used by glass etchers to designate mixtures of hydrofluoric acid with various chemicals which are used for matting the surface of glass. The discovery of white acid is due to Berzelius, who, while engaged in his investigations on the properties of glass, made the discovery that fluoride of ammonia had the property of matting or opaquing glass. Since that time it has been found that other alkaline fluorides possessed the same power, and during the last few years this has been taken advantage of on a large scale for producing ornaments on glass of the greatest beauty. It is employed, principally, for producing ornamental figures on door lights, although it is used very extensively for decorating glass ware for table use, and also for the various sorts of globes used on lamps and gas fixtures. Extremely fine effects may be obtained on mirrors, and the silvering may be placed on either the same or the opposite side from the etching.

During the last few years, etching on glass has shown itself as a formidable rival to the sand blast, the work generally being indistinguishable from that produced by the latter, except that acid is capable of producing effects of a much greater fineness and delicacy. The grinding is much more even and therefore more easily cleaned.

In Germany, where the art has been carried to a much higher point of perfection than elsewhere, a number of formulæ for matt-etching are in use. Within a short time some of these have been published in various scientific journals, but they all belong to the category of what might be called slow acids, and are very unreliable and uncertain in their action and possess very poor keeping qualities. They are made without the ammonia salt and are dependent on soda and potash for their action, take a long time to work, and are too uncertain for practical use.

There is no doubt whatever but that the white acid compounded with fluoride of ammonia is the best. In using other white acids, spots and streaks often form in the glass, and these cannot always be removed by repeating the etching. With ammonia acids, however, any streaks which may appear, either from applying the acid unevenly or from imperfections in the glass, may be removed by repeated etchings. The following recipe is one which is used by several practical glass etchers and is said to give good results. It is of German origin, and the only objection to it is that it is too complicated, which objection may also be raised to other recipes from the same source.

In a container of lead the following mixture is made:

Distilled water	500 parts.
Fluoride of ammonia (strong)	500 "
Sulphate of ammonia	50 "
Sulphuric acid	100 "

This solution is ready for use within two hours and may be tested by immersing a piece of clean glass, which should get a nice, fine matt surface after five or six minutes.

In practical experience the writer has found that a simpler method of preparing the acid than the foregoing is capable of giving good results. Besides being cheaper, it is possible to recover the materials in it, should it for any reason get out of order.

A container of sufficient size is filled one-third full of ordinary commercial hydrofluoric acid. Carbonate of ammonia is then added. About equal parts by weight may be used. When effervescence has ceased, a small slip of clean glass is immersed in the mixture and permitted to remain 6 or 8 minutes. Upon withdrawing, it is rinsed in clean water, wiped, and dried. If examination shows that it has become evenly translucent over its entire surface, the mixture is all right and may be used for regular work. If, however, it is deeply and irregularly etched, with some parts clear and some parts ground, the acid is in excess and carbonate should be added. If, on the other hand, the glass seems to be only partially affected by the acid, and, while being slightly ground all over, is transparent, too great an amount of ammonia has been used, and acid must be added.

With a little experience, it is possible to keep the balance between the alkali and the acid, so that good results can be obtained. All white acids are subject to change in their actions from day to day, but in none of the recipes the writer has used can it be so easily regulated as in the foregoing. Before trusting any important work to the action of white acid, the acid should be tested with a clean piece of glass, and by following the hints given, the acid can be corrected to give the proper action.

In preparing glass for etching, any of the ordinary resists may be used. The drawing may be either put on glass by means of a ruling pen dipped in asphaltum properly diluted; by means of a brush; or by means of the somewhat antiquated process of covering the entire plate with Brunswick black and scraping away the parts which it is desired to grind. The best method, however, is that in which tin foil is used, a description of which must be deferred to some future time. The design can also be transferred or photographed on glass if desired. NICHOLAUS T. NILSSON.

14 Marion Pl., Chicago.

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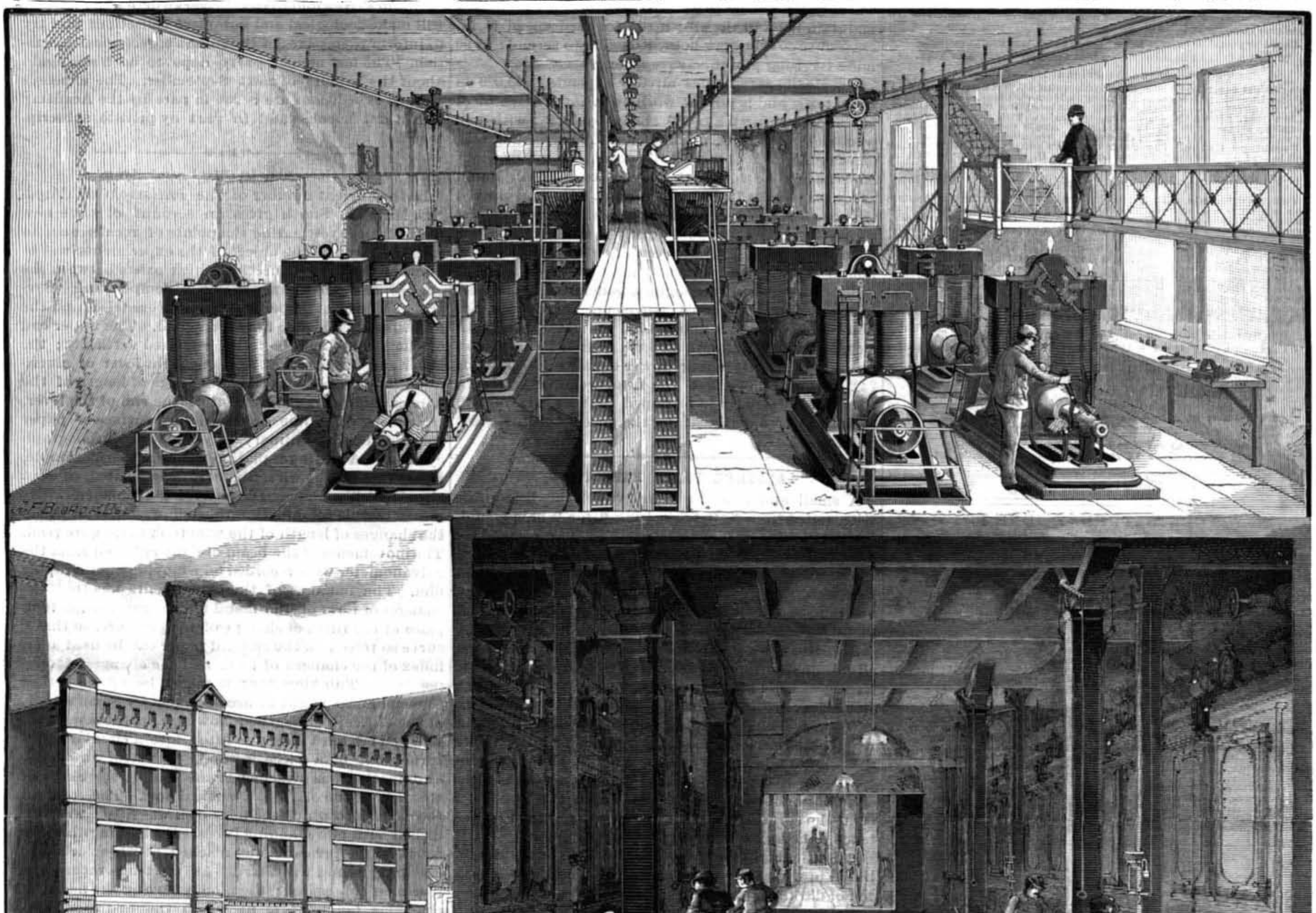

Front view of the station. The dynamo room and regulating gallery. The engine room. The boiler room and coal scales.

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