

### A CHINESE TELEPHONE SYSTEM.

What is said to be the only Chinese telephone system in the world is in operation in the city of San Francisco. There are altogether about 18,000 Chinese citizens, of whom 1,500 are merchants. Of this number 270 are subscribers to the telephone.

These Chinese merchants were prompt to understand the saving of time and great convenience in the use of the instrument. Though looked upon, for a time, with some superstitious dread, familiarity has accustomed the people to its use and it has now become an indispensable concomitant of the regular office equipment. The central office heretofore has been too small to allow any increase of the subscribers, but the company has recently acquired a property and is fitting it up so as to accommodate any number. It is expected that with greater facilities twice as many instruments as are now in use will be installed.

The system in Chinatown is entirely independent and is for the Chinese only. To communicate with outside subscribers a separate charge is made. A white merchant using the Chinatown system must also pay extra. The Chinese subscribers can and do use the long distance wires upon payment of the customary charges.

Altogether there are seven Chinamen employed in the office, a chief operator and three assistants, besides three messenger boys who are on duty day and night, the office being never closed. In respect to facility the Chinese telephone operators are quite equal to the whites.

It is said that the voice of the Chinaman is superior to all others in the distinctness with which it can be transmitted by wires. In calling subscribers the operator, instead of using numbers to designate each one, as customary among the whites, is compelled to call the names of the individual or firm that is wanted, a feat of memory of which only a Chinese operator is capable; and not only, it is said, is he equal to this, but also carries in his mind the probable haunt of the man required should he be unable to ring him up at his regular place of business.

The operators of the Chinatown system are in no relation to the metropolitan office. They are hired and paid by the Chinaman who controls it. The main company install the instruments and keep the wires in repair, allowing their Chinese agent a certain amount for each subscriber, the agent collecting the bills and securing new subscribers.

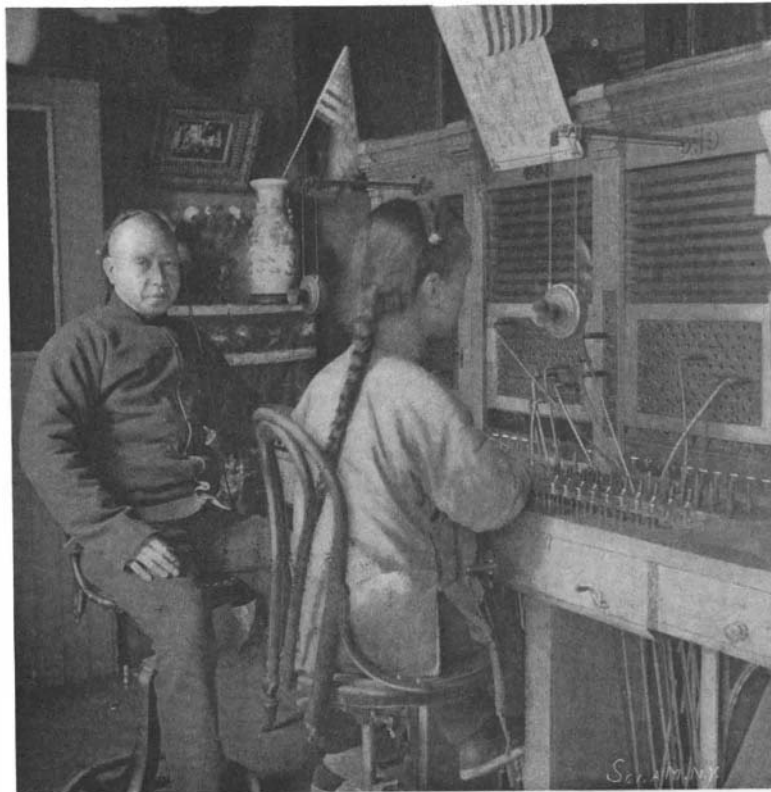
The San Francisco experiment has proved a successful one financially and is extremely popular among a people even as loath to accept new ideas as Chinamen are; and it is believed that one result of the local experiment will be the early introduction of the telephone throughout the whole Chinese Empire as soon as conditions of peace are assured.

### THE NEW EDISON STORAGE BATTERY.

Probably no invention of recent years is of such vast electrical importance as the new accumulator which Thomas A. Edison has added to our store of electrical devices. Electricians were most agreeably astonished when Dr. A. Kennelly confirmed the rumors which had been rife many months, and gave the first full, clear description of the battery in a paper read before the American Institute of Electrical Engineers. The paper was published in last week's SUPPLEMENT and editorially discussed in these columns, so that our readers are now more or less familiar with the cell. Through the courtesy of Mr. Edison we were enabled to examine the battery, to prepare the drawings which accompany the present article, and to give some additional information which may prove of interest.

For the new cell an absence of deterioration is claimed which has never been characteristic of the most approved lead batteries. Its storage capacity per unit of mass is said to be unusually large. The time required for charging and discharging is exceedingly short. To these merits must be added cheapness in

manufacture and durability. The negative pole or positive element and the positive pole or negative element are both similar in construction and respectively composed of iron and superoxide of nickel. When placed in their containing-cell the plates are separated by sheets of gutta percha. The electrolyte of this nickel-iron battery is a solution of potassium hydroxide. Each plate consists of a sheet of steel, 0.024 inch in thickness, perforated so as to form a



A CHINESE TELEPHONE CENTRAL OFFICE IN SAN FRANCISCO.

grid with rectangular holes. In each opening of the grid a pocket or shallow box containing the active material is placed. In order to enable the electrolyte to reach the active material the boxes or pockets are perforated with many holes so as to form a kind of screen, which although it conceals the active material, permits the free entrance of the electrolyte.

The boxes or pockets consist of perforated crucible steel cut from a long strip 0.003 inch thick. To fit these boxes the active material is hydraulically compressed in the form of briquettes.

The positive briquettes are composed of a finely-divided compound of iron and a nearly equal volume of thin flakes of graphite. The negative briquettes are composed of a finely-divided compound of nickel and an equal quantity of fine flakes of graphite. In

respective grids; and the assembled plates are thereupon subjected to a hydraulic pressure of some 100 tons in order to close the boxes and to force their metal sides over the adjacent sides of the recesses of the steel grid. A single, solid steel plate is thus produced. Both grids and boxes are nickel-plated in order to secure a good electrical connection between them. At any point the maximum grid thickness, after hydraulic pressure has been applied, is 0.024 inch, the pocket thickness being 0.1 inch. The cell in which the assembled plates are contained is composed of sheet steel containing the potash solution.

The charging current deoxidizes the iron compound to spongy metallic iron and conveys oxygen through the electrolyte to the nickel compound, forming a hyperoxide of nickel. In discharging, the current passes from the positive pole and through the external circuit to the negative pole and its attached iron or positive plate, and then through the solution to the superoxide plate, causing the oxygen to move back against the current and partially to reduce the nickel to superoxide, and to oxidize the spongy iron.

Since the potash solution theoretically serves as a conveyor for the oxygen, the amount of solution required is merely that which is sufficient to wet the negative material. The plates are hence packed as closely together as possible, because there will be less resistance and less weight.

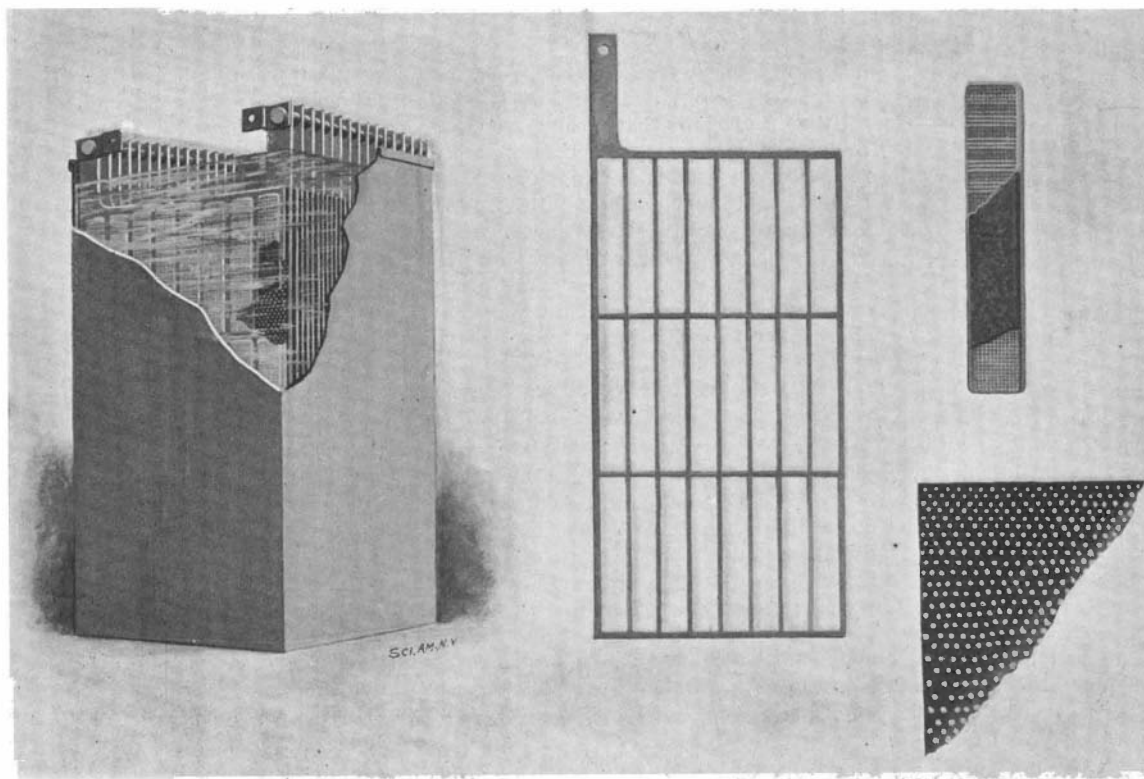
The initial voltage of the discharge is 1.5 volts; the mean voltage of full discharge is approximately 1.1 volts. The storage capacity of the cell per unit of total mass is 14 watts per pound or 30.85 watt hours per kilo. The mean normal discharge of the power-weight per unit mass of total cell is 4 watts per pound, or 8.82 watts per kilo, corresponding with a normal discharge period of 3½ hours. At a high rate, however, a cell can be discharged in about one hour. Charging and discharging rates are the same. Overcharging or discharging affects only the electrical efficiency. No active material is ejected from the briquettes even under deliberate overcharging and discharging. Whatever gas is produced appears externally.

Changes of temperature seem to have no effect upon the cell. The electrolyte does not corrode any of the parts. The electromotive force being below that necessary to decompose water, no local action apparently occurs. Mr. Edison claims that a charged or discharged negative nickel plate can be removed from the working cell and dried in the air for a week, apparently without injury, and that when restored its charge seems practically undiminished. On the other hand, the positive iron plate if subjected to similar treatment soon loses its charge by the oxidation of the spongy iron, with a liberation of heat and an appreciable rise in temperature. When replaced, however, in the cell, the storage capacity of the plate is unaffected on recharge. According to Dr. Kennelly, Mr. Edison hopes to manufacture the new cell at a cost which will not exceed that of the lead battery.

Zeper calls attention (Klin. Monats. für Augenheilk.) to the irritation of the conjunctiva, often amounting to conjunctivitis, and to the severe itching of the hands and face, which attack the workmen employed on the large bulb farms in separating dried hyacinth bulbs in August and September. The author attributes this to the presence of an acarus which he considers may work its

way under the skin, but he also mentions the fact that masses of brittle crystals are found on the bulbs, the cells of which are well known to contain many rapheids, and it is possible that those entering the skin may give rise to the irritation described.—Bost. Med. and Surg. Journ.

Freight can be carried on trolley cars within the city limits of Detroit.



THE EDISON STORAGE BATTERY—SHOWING ALSO GRID, POCKET FOR ACTIVE MATERIAL, AND PORTIONS OF GUTTA PERCHA PARTITION.

both plates the graphite does not enter into any of the chemical actions, but merely assists the conductivity of the briquettes. The iron and nickel compounds used are obtained by special chemical processes.

Each briquette when placed in its box is covered by a lid fitted over the box or pocket, so that the briquette is closely enveloped on all sides. Thus prepared, the boxes are placed in the openings or holes of their