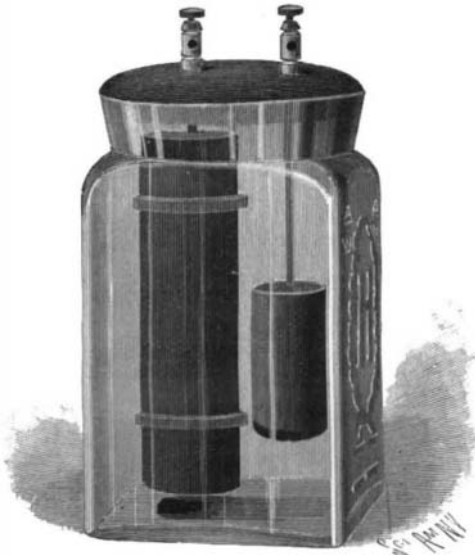


A POWERFUL OPEN CIRCUIT BATTERY CELL.

The value of primary batteries designed for open circuit work depends upon their freedom from local action, a minimum of internal resistance, quick recovery from an accidental short circuit and non-deterioration by evaporation. The Harrison cell shown in the accompanying illustration possesses many of these features



A POWERFUL OPEN CIRCUIT BATTERY CELL.

besides having a high electromotive force and a larger current discharge in proportion to its size than is usual in other open circuit batteries. It is quite simple in construction, requires very little care, and operates quickly after it is set up. The glass jar is about 3 inches square by 5 inches high and has a bell-shaped mouth paraffined, on which sits a wood cover holding the elements in suspension below. Cast in the jar is a line for water indicated by a "W" and another line above marked "A" for acid, making a very convenient guide for filling. The exciting fluid is sulphuric acid of 66° Baumé. The elements consist of a cylinder of peroxide of lead about an inch in diameter encircled by rubber bands and a cylindrical short zinc bar of the same diameter, 2 inches long, amalgamated with mercury to protect it from the acid. The rubber band on the lead element prevents the zinc from coming in contact therewith in case the rod supporting the zinc becomes loose.

In setting up the battery the acid is added to the water and the whole allowed to stand until the solution is cool, then the elements are immersed in the solution and the battery is ready to operate. Convenient binding posts are on the cover for connecting the cell to the line or to other cells in series.

Four of these cells have been in use in our office on our open call bell circuit for several months, requiring little or no attention, and have given good satisfaction.

When exhausted, the zinc becomes spongy and soft and the strength of current diminishes, but the battery can be quickly renewed by putting in a fresh zinc and fresh acid. Each cell is rated to give 2.45 volts and 40 ampere hours, so that the electrical energy produced costs but little over one cent per watt hour, making it a very economical battery.

The small size of the cell, its cheapness, its remarkable recuperative power and high voltage, adapt it to the open circuits of burglar alarms, telephone transmitters, electric bells, and to the operation of dentists' and physicians' outfits.

The cell is manufactured by Harrison Brothers & Company, Philadelphia, Pa., who are introducing it through the Thermo-Electric Company, 103 Times Building, Park Row, New York, from whom additional information may be obtained.

A CHINESE TYPEWRITER.

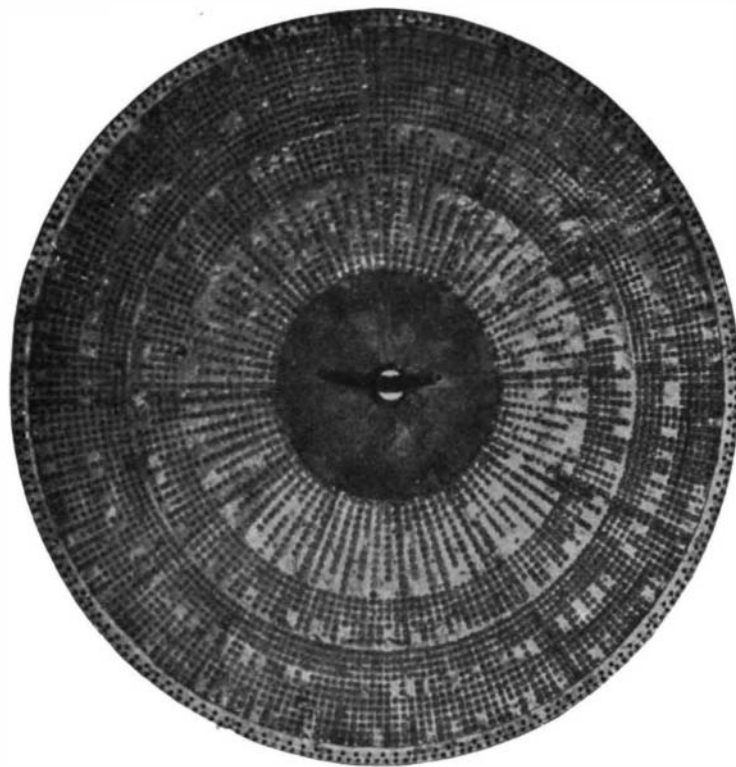
Some little time ago we referred to the various typewriters of the world, and stated that, up to the present time, no machine had ever been invented for use with the Chinese language. We are now informed, however, that the Rev. D. Z. Sheffield, of the American Board Mission, President of the T'ung-cho College, for Chinese students, has invented and perfected a remarkable typewriter, which bids fair to revolutionize the

writing of Chinese, specially for foreigners, who have in most cases turned their whole attention to the speaking and reading of the language, and have avoided the great difficulty of learning to write it.

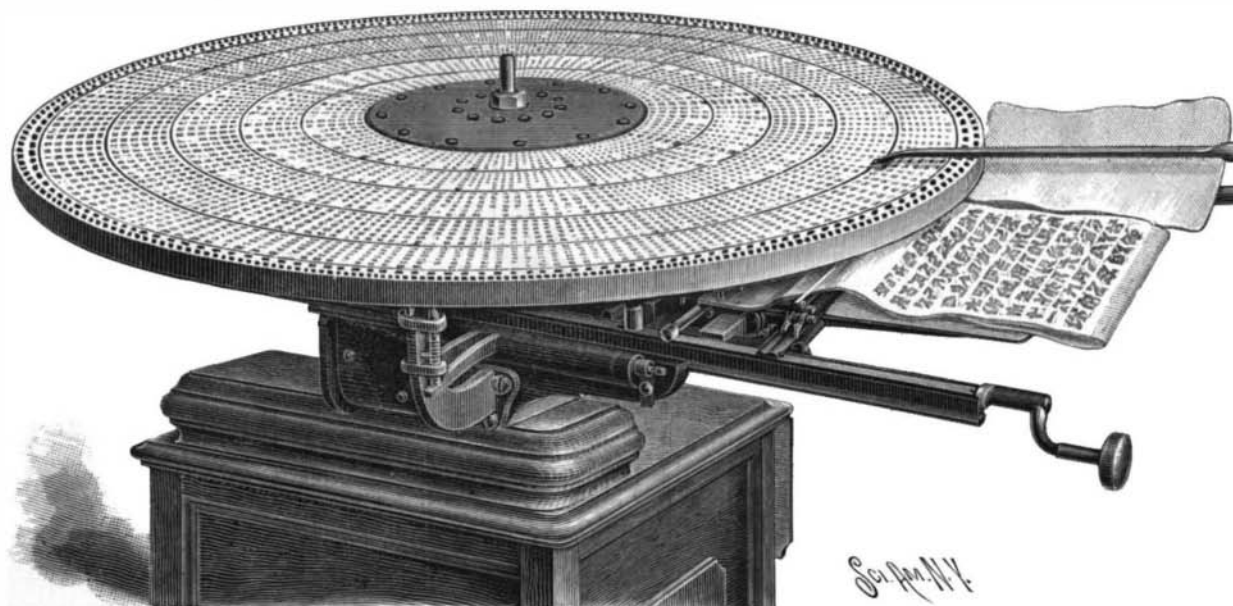
The Chinese language consists of at least fifty thousand characters, and a careful analysis of the classical works, as well as of the spoken language, has shown that not more than five thousand are in general use, while four thousand are ample for almost every purpose. The typewriter which Dr. Sheffield invented writes this number, and naturally the machine has required great labor in order to perfect it.

Through the kindness of Mr. Charles F. Gammon, of the Imperial Tientsin University, Tientsin, China, we are enabled to present an illustration of this remarkable machine. The four thousand characters are grouped in alphabetical order according to their accepted spelling in English, a large number of those most commonly used being placed in a separate group regardless of spelling. The type are cast on the under part of the large wheel, the upper side of which is covered with printed characters, each one exactly over the type it represents. The carriage moves freely to the right or left, and projecting from it there is a pointer which is used to locate the characters to be printed. In operation the wheel is revolved with the left hand until the group or line in which the desired character to be found is opposite the carriage, and the carriage is then moved with the right hand to the right or left until the pointer covers the character sought for. To the right will be seen a little crank, one turn of which inks the type, while a small hammer forces the paper against the type, leaving a clear impression. The type locks during the printing and is automatically corrected if slightly out of place, the characters being brought into perfect alignment. The mechanism performs the operation of spacing, etc., as in other machines.

At first thought it would seem that even with this machine the writing of Chinese would be slow and tedious, but when it is considered that the written character consists of from two to twenty-five strokes, which even the best Chinese scholar writes slowly, as they handle the brush delicately, and that a character signifies, not a letter, but a whole word, it will be readily seen that Dr. Sheffield's machine saves a great amount of both time and labor, while it offers the advantages of other machines, namely, uniformity, accu-



TYPE WHEEL FOR 4000-CHARACTER TYPEWRITER.

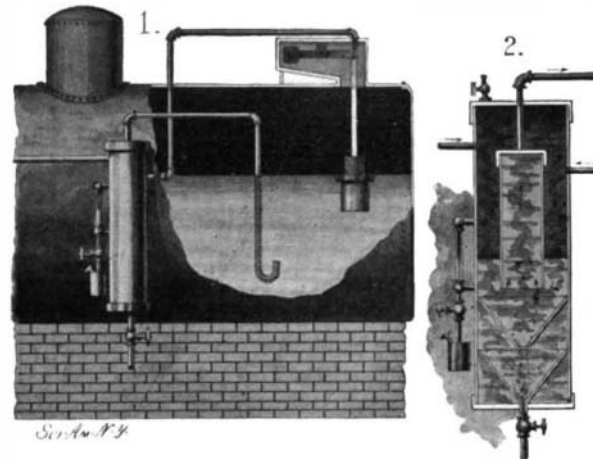


A TYPEWRITER FOR WRITING 4,000 CHINESE CHARACTERS.

acy, exact spacing and neat work. Our second engraving shows the under or type side of the wheel after it is removed from the machine, and in addition to the multitude of characters shows the holes around the circumference into which the locking pin goes during the operation of printing. Dr. Sheffield's typewriter is a triumph of American inventive skill.

A FEED-WATER PURIFIER AND SKIMMER FOR BOILERS.

By means of a simple device which has been invented by Herman W. Nye, of Elmwood, Neb., the feed-water



A FEED-WATER PURIFIER AND SKIMMER FOR BOILERS.

can be purified before entering a boiler, an apparatus being also provided which is designed to remove the foreign matter floating on the surface of the water in the boiler.

Of our illustrations, Fig. 1 is a sectional side elevation of the improvement as applied. Fig. 2 is a section of the purifier.

To the side of the boiler is attached a vessel which receives the feed-water to be purified, and which is filled with water and oil. Within the vessel a tube is fitted extending with its lower open end into the water. From the closed upper end of the tube a pipe leads to the boiler. In the bottom of the vessel two funnels are mounted, one above the other, the lower funnel being provided with a valved pipe, wherethrough the sediment collected can be removed. The feed-water as it enters the vessel flows down through the stratum of oil, whereby the impurities are removed, enters the lower end of the tube, and passes purified to the boiler, through the pipe connected with the closed upper end of the tube.

Into the upper end of the purifying vessel there also discharges a pipe, the other end of which passes into the boiler below the level of the water. This end of the pipe extends within a float or skimmer consisting of a cup which has a perforated or reticulated upper end, and which is counterbalanced to rise and fall with the water. The apparatus is designed to conduct the upper layer of the water in the boiler back to the purifying vessel, where its impurities are removed, before it is returned to the water compartment.

American Locomotives for the East.

The Baldwin Locomotive Works, of Philadelphia, have just secured the contract for the first locomotive for use in the development of the section of Palestine which is associated with the "Zionist" movement, and the Great Central Railway, of England, has placed an order with the same firm for twenty freight locomotives of the same character and design as those intended for the Midland Railway, of England, and which we have already illustrated.

Howell Gun Carriage.

The gun carriage designed by Rear-Admiral Howell, for which Congress appropriated \$50,000, has been disapproved of by Gen. A. R. Buffington, Chief of Ordnance. He gives several reasons for his action. The gun carriage is designed to be used with the large sea-coast guns of calibers from 8 to 12 inches. It is much larger and heavier than the Buffington-Crozier carriage now in use and has three hydraulic cylinders as compared with two in the latter design.