

cloth, which incloses the tablet of the plate and prevents short-circuiting by confining the active material to its place.

The capacity of the chloride cells is from 5 to 6 ampere hours per pound, with a discharge rate of one-half ampere for each plate. Notwithstanding this high capacity and the high rate of discharge, the efficiency of the cell is very high, the loss in current being less than 10 per cent, and the watt efficiency is from 75 to 85 per cent.

A large plant of chloride cells having a capacity of 1,894 ampere hours has been placed in the Provident Life and Trust Company's building in Philadelphia, which, on a recent test, exceeded by nearly 50 per cent the guarantee given by the company. The chloride battery plant, used in connection with the Germantown, Pa., electric lighting station, has a capacity of 1,000 ampere hours, which is soon to be doubled.

This battery has been found to be efficient in trac-

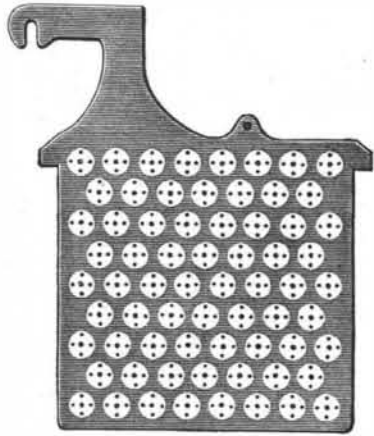


Fig. 2.—CHLORIDE ACCUMULATOR PLATE.

tion work. Thus two sets of chloride batteries of ninety-six cells each have been in use on the Metropolitan Railway at Washington since last April. The car has run 8,000 miles and has been run for three days continuously, while the batteries have remained unchanged.

Storage batteries diminish in capacity with increased discharge, so that when cells are called on for heavy rates of discharge, this feature becomes one of importance where economy is a consideration.

Fig. 3 is a diagram of curves showing the capacity of the chloride accumulator under these varying conditions. These curves show the results of various tests. It will be seen by comparing the different results that in every case there is shown to be a difference in capacity of only 1/2 between the lowest and the highest rate of discharge. Thus, while the smallest element, weighing 50 pounds, has a capacity of 320 ampere hours when discharged in 24 hours, its capacity is still

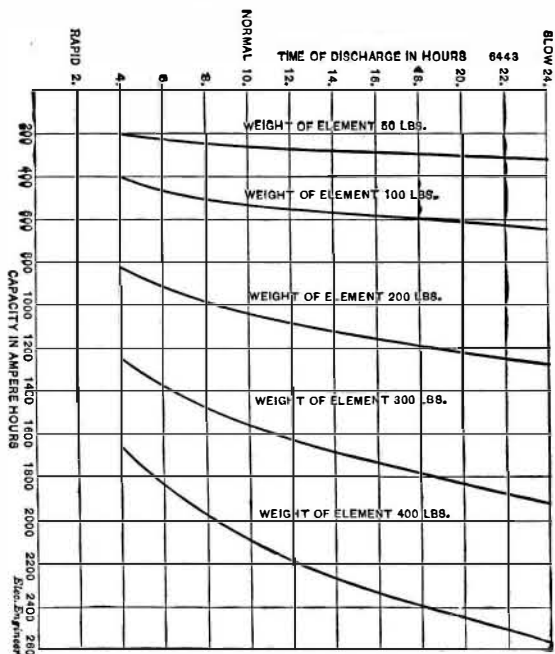


Fig. 3.—CURVES SHOWING CAPACITY OF PLATES.

as high as 210 ampere hours when discharged in four hours, which is six times its previous rate.

We understand that the largest storage batteries in the world are being made on this principle. As to the matter of durability, the manufacturers claim, and users testify, that this cell is practically indestructible. Further particulars regarding the chloride accumulator may be procured from the Electric Storage Battery Company, W. W. Gibbs president, Philadelphia, Pa.

Physical and Chemical Ingredients of a Man.

A notable object of interest is described as among the contents of the National Museum, Washington, showing the ingredients which go to make up the average man, weighing 154 pounds. A large glass jar holds the ninety-six pounds of water which his body contains, while in other receptacles are three pounds of "white of egg," a little less than ten pounds of pure

glue, thirty-four and one-half pounds of fat, eight and one-fourth pounds of phosphate of lime, one pound carbonate of lime, three ounces of sugar and starch, seven ounces fluoride of calcium, six ounces phosphate of magnesia and a little ordinary table salt. The same man is found to contain ninety-seven pounds of oxygen, fifteen pounds of hydrogen, three pounds and thirteen ounces of nitrogen, and the carbon in such an individual is represented by a foot cube of coal. A row of bottles contain the other elements going to make up the man; these being four ounces of chlorine, three and one-half ounces fluorine, eight ounces phosphorus, three and one-half ounces brimstone, two and one-half ounces each of sodium and potassium, one-tenth of an ounce of iron, two ounces magnesium, three pounds and three ounces of calcium.

Lemons and Oranges.

The Florida lemon season, which commenced early in September, is about ended. Only a small portion of the crop, estimated variously at from 25,000 to 50,000 boxes, came to this city. The percentage of handsome Florida oranges has been small, the bulk being rusty or "horny," and prices have been unsatisfactory to the growers. The average freight on a box of lemons from Florida to New York is fifty cents, while from Sicily the cost for transportation is but thirty-two cents, with duty amounting to as much more. The railroad charges from California on a similar package are eighty-seven and a half cents, but the crop in California is small, and as yet only specimen lemons have been seen here. Nearly three million boxes of lemons came into the United States from Mediterranean ports during last year. The lemon season with local dealers begins November 1, when the first new Sicily lemons are due, and continues the year through. While the over-importation of Mediterranean lemons last year has left a large supply of old stock on hand, there are just now no good lemons to be had here. During November of last year 120,000 boxes of new-crop Sicily lemons were sold in New York, but none have yet reached this port this season. The first cargo of Messina lemons is, however, expected daily, and another steamer, carrying above 20,000 boxes of the same high grade, is due in a few days. The crop of Florida oranges this season is the heaviest known, a conservative estimate being 4,500,000 boxes, while it is believed by other authorities that 5,000,000 boxes will go out of that State. The weather in Florida during the summer was highly favorable for the development of the fruit, and many young groves are coming into bearing for the first time. The fruit is ripening earlier than it has for several years past, and is reaching this city in heavy quantities, but prices are very low, due to decay caused by recent rains. Recently there arrived, besides large quantities of the fruit bound for other points, about 60,000 boxes, while but a few days previous 42,000 boxes were thrown on this market. The heaviest receivers are the Florida Fruit Exchange, who sell the product of above 8,000 growers at auction. An average price of recent sales is \$1.60, and this nets the grower but sixty-five cents a box on the tree, the return heretofore having been about a dollar a box. Since the middle of September 25,000 boxes of Florida oranges have been sent to England by the exchange, with generally satisfactory results.

Legal Uses of Photography.

The legal uses of photography were shown by the testimony of Mr. Spencer, the photographic expert of Washington C. H. The case was the famous Stubblefield-Munford controversy, which has been dragging through the courts of Fayette County for years. The litigation involves 1,500 acres of the finest farming land in Fayette County.

During Monroe's administration this tract was willed by one of the old Munfords to his five heirs, and the present suit was brought on the deed of sale signed by them. The Munford heirs deeded the land to Stubblefield, who afterward sold parts of it to different parties, who have had to pay twice for their land by decision of court.

The case the other day was an appeal asking a new trial in order that new evidence may be introduced. The new testimony is the photograph of the original deed of sale made by Mr. Spencer. All previous decisions have been made in favor of the Munford heirs on the ground that Anna Munford, one of the original five heirs, had never signed the deed to the Stubblefields.

The deed of sale, discolored and yellow with age, was taken to Mr. Spencer by the attorneys for the defendants. The closest examination failed to disclose any evidence of more than four signatures, and only the fact that the space for the fifth remained caused the attorneys to think that it had once existed.

Under the closest watch of the clerk of the court, who could not allow the original to leave his hands, Mr. Spencer photographed the deeds. On the plate he saw traces of the signature, and, on enlarging the negative ten times, the entire name was as plainly seen as when first written. The presiding judge was much in-

terested in Mr. Spencer's evidence, and left the bench that he might more closely examine the negatives.—*Cincinnati Tribune.*

Recipe for the Attainment of Old Age.

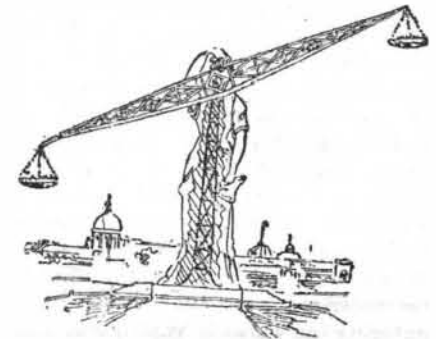
"The reason I have lived so long and kept always so well and hearty," said recently Miss Eliza Work, of Henrietta, N. Y., who will be 100 years old if she lives six weeks longer, "is because I never drank tea or coffee, and, above all, never got married."

Miss Work keeps house for her nephew, George W. Lincoln, and keeps no help. She was born at St. Johnsbury, Vt., on January 8, 1794, and came to Monroe County eighty years ago with her brother. At the age of 91 she traveled alone to her native place, and declares that she was not a bit tired, either going or returning.

"I have done a big day's work every day for more than ninety years," she says, "and I expect to do a great many more. I have never had occasion to use spectacles yet, and my teeth are the same teeth I have always had. My brother lived to be 101, and would have lived much longer if he had never married. He drank coffee and tea, too. People who marry and drink coffee and tea ought not to expect to live very long."

A NOVELTY FOR THE MIDWINTER FAIR.

Among the applications for permission to make novel exhibits at the coming midwinter fair in San Francisco is one by Edward M. Greene. It is a mammoth scales of Justice. The figure of Justice is 150 feet high. The cross beam of the scales she holds in her hand is 300 feet long. Each scale is a car capable of holding fifty people, who may be carried to a height of 288 feet. The whole arrangement is to be manipulated by machinery placed beneath the base of the



MAMMOTH FIGURE OF "JUSTICE."

statue. There is telephonic communication between each car and the engine room and everything may be regulated smoothly and quickly. The *Chronicle* thinks there is no doubt that the statue would make a unique display and might perhaps share the honors with the electric tower.

The Search Light in Warfare.

The Spanish cruisers Alfonso XII., Conde de Venadito and Melilla steamed on the night of November 13 near the Moorish encampment, not far from Melilla, and at about 11 o'clock suddenly illuminated the whole country around, taking the Moors by surprise and pouring shells upon them with unerring accuracy by the light of the powerful lamps. A terrible cannonade continued from the ships and the forts the remainder of the night, and according to the report many were killed. The lights seemed to have terrified the Rifians fully as much as the destruction that followed, for they offered no opposition, but ran about like madmen seeking shelter in caves.

A Word to Mail Subscribers.

At the end of every year a great many subscriptions to the various SCIENTIFIC AMERICAN publications expire.

The bills for 1894 for the SCIENTIFIC AMERICAN, the SCIENTIFIC AMERICAN SUPPLEMENT, and the ARCHITECT'S AND BUILDER'S EDITION of the SCIENTIFIC AMERICAN are now being mailed to those whose subscriptions come to an end with the year. Responding promptly to the invitation to renew saves removing the name from our subscription books, and secures without interruption the reception of the paper by the subscriber.

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Treating the Sewage of a Large City.

Glasgow is now resolutely grappling with its sewage problem, a difficulty which, sooner or later, every city, large or small, is compelled to face. The efforts to satisfactorily solve what has been aptly described as the puzzle of the sanitarian and the despair of the engineer may be viewed on broader lines of interest, says *Industries*, than on the merely local grounds connected with the municipal affairs of that city. For full half a century the legislators of Glasgow, though inactive, have been keenly alive to the importance of the problem. It is now nearly forty years ago since the opinions of Sir Joseph Bazalgette, Mr. Bateman and Professor Anderson were sought; while in 1874 Sir John Hawkshaw, as royal commissioner, took the matter up, and reported fully on the whole scheme. Nothing, however, was done, and to this day—though the imperative necessity of action is as fully admitted as fifty years ago—the Clyde remains, to put matters plainly, a huge open sewer—a fact which fully demonstrates itself with every recurrence of warm weather, more especially if accompanied by drought.

Turning to the various modes now in vogue for sewage disposal, the first, viz., gravitation, is considered quite impracticable for Glasgow, owing to the strenuous opposition offered all along the coast to any project which, by detracting from the amenity of the neighborhood, might in the least degree depreciate the value of residential property. The second method—irrigation—is, for a variety of reasons, deemed hopeless in Glasgow; while a third mode, viz., filtration, has been likewise discarded, on the ground of excessive cost.

The only feasible course open to Glasgow appears, therefore, to be that of precipitation, and the first practical effort to solve the problem by chemical treatment will be watched with keen interest not merely by those locally concerned, but also by sanitarians of every shade of opinion throughout the kingdom. Parliamentary powers were sought and obtained in 1891, and some 30 acres of land at Dalmarnock were acquired for the erection of works capable of dealing with about one-fifth of the sewage of Glasgow. Mr. G. V. Alsing, who has had valuable experience at Bradford and Sheffield with the system adopted, was appointed engineer, and early last year the tender of Messrs. John Goldie & Son, contractors, for the sum of £45,000, was accepted, and the work is now in course of execution. The mode in which the sewage will be dealt with may be briefly summarized as follows:

On entering the works it runs direct into the catch-pits, where the heavier constituents are precipitated by gravity, and removed by the same agency into sludge tanks, whence in the form of cakes, moulded in presses by compressed air, it will be utilized as manure for agricultural purposes. The lighter and more aqueous flow from the catch-pits will be lifted by centrifugal steam pumps into the mixing chamber, where the chemicals—sulphate of alumina and milk of lime—are added for precipitation of the sewage. The liquid then passes into the precipitation tanks, twenty-four in number, each 45 ft. by 50 ft. in depth, and with a capacity of 80,000 gallons. The work of separation over, the fluid on the surface is emitted through self-floating valves—the invention of Mr. Alsing—into a corresponding number of aerating tanks of similar dimensions. The effluent is then discharged as a clear and colorless stream into the Clyde, after filtration in sixty filters covering some three acres of ground.

When in full operation ten million gallons of sewage will be treated every 24 hours; while provision is made for extensions capable of dealing with double that quantity. The total estimate, inclusive of land, is £100,000. The authorities of Glasgow have to cope with fifty million gallons of liquid sewage per diem, in addition to 1,000 tons of solid refuse; and any system which promises to aid them in their arduous duties and to purify the Clyde will be watched with keenest interest on all hands. This river at present is in a condition which most adversely affects the steamboat companies who make Glasgow their port.

Ten Miles Above the Earth.

One of the most interesting experiments with balloons that has ever been undertaken was that of Messrs. Hermite and Besancon, at Paris-Vaugirard. They succeeded in sending a balloon to the unprecedented elevation of 16,000 meters, or about 10 miles. There were no people in the balloon, but it carried a variety of self-registering instruments designed to record the temperature, the atmospheric pressure, etc. The little balloon was started on its lofty trip about noon, when the air was remarkably still and clear. It rose rapidly, and in three-quarters of an hour had attained an elevation of 10 miles, at which height it remained for several hours.

It was there subjected to an atmospheric pressure only about one-eighth as great as that at the surface of the earth, and M. Hermite explains its floating for so long a time at a constant height by supposing that the temperature does not vary sensibly with the elevation of the floating body after the latter has attained an altitude where seven-eighths of the atmospheric

pressure is lacking and where there remains no trace of water vapor.

But toward 6 o'clock, when with the decline of day the temperature began rapidly to fall, the balloon started back toward the earth, arriving with a gentle motion which did not disturb the instruments it carried, at 7:11, at Chanvres, near Paris-Vaugirard, from which it had started.

The balloon was visible with a telescope during the entire time. It shone like the planet Venus seen by day. By means of a micrometer attached to an astronomical telescope the apparent diameter of the balloon could easily have been measured, and this would have furnished a means of calculating its altitude independent of the record of the barometer which it carried.

The barometer and thermometer were furnished with automatic pens driven by clockwork, by means of which diagrams of the changes of pressure and temperature that the balloon experienced were obtained. At the height of about 7½ miles the thermometer marked a temperature of 60 degrees Fahrenheit below zero. Then the ink in the registering pens of both the thermometer and the barometer became frozen and the records were interrupted.

But, as the balloon continued to rise, the ink thawed again, and at the ten-mile level the automatic records were renewed. The temperature registered there was only about 6 degrees below zero. The increase of temperature is ascribed to the effect of the unclouded sun heating the air in the basket that contained the instruments. The lowest record of the barometer was 103 millimeters, or a trifle more than four inches.

M. Hermite calls attention to the fact that the density of the air at the height of ten miles, where the balloon remained during most of the afternoon, is less than that existing upon the plains of the moon, on the assumption that the atmospheric density on the moon is proportional to the force of gravity at the surface of that orb.

If this is correct, then the instruments would have behaved about the same if M. Hermite had been able to place them on the moon as they did when he sent them only ten miles above the earth.—*Youth's Companion*.

Chinese Silver Ware.

The extraordinary popularity of silver for ornaments in China is referred to thus by the American consul at Amoy: "Silver is to the Orient what gold is to the west. To the artist, the scholar, and the collector it is the king of all the precious metals. Its popularity is not due to its cheapness. Jade, which rivals silver in public esteem, is much more expensive than gold. There may be another reason for the small use of gold as an ornament by the Chinese. In designation of rank and title a gold button stands at nearly the bottom of the list. Then, on the other hand, golden yellow is the imperial color, and none but those around the Son of Heaven are allowed to use it for wearing and other purposes." Silver jewelry and curios in China are universal: the poorest coolie's wife has usually silver bracelets and earrings. In curios and bric-a-brac the number of silver articles is legion.

The greatest manufacturing center is Canton, but Amoy, Foochow, Nanking, and Peking possess artists and guilds whose workmanship is famous all over the empire. One class of designs consists of miniature reproductions of features of daily life, and is adapted for earrings and watch charms. Among the most familiar objects are the pagoda, sampan (or native boat), junk, the sedan chair, the small-footed lady's shoe, the Goddess of Mercy, the Celestial Poodle, the King of the Fishes, the sitting Buddha, the dragon, the flying serpent, the begging priest, the tiger, lion, horse, pig, buffalo, elephant, turtle, crocodile, monkey, cat, and dog. The largest does not exceed two inches in length, and they diminish to dainty little objects no larger than a grain of corn. The work and finish are admirable, the features and hair of the human beings and animals and the scales of the fish and crocodiles being reproduced with the highest care and skill.

Another class consists of imitation cordage. The metal is solid, but the surface is so cleverly wrought out that at first sight each piece seems a rope, cord, or braid. Some are as fine as sewing silk, while others are as thick as clothes lines. The silver is alloyed with a small percentage of copper to increase its hardness and to allow the fine carving and engraving impossible in the softer substance of pure silver. These silver cords are used for bracelets, anklets, necklaces, belts, sword hangings, and horses' harness. Though stiff, they are not rigid, and can be bent in every direction. A third class comprises household ornaments, such as match boxes, ash cups, joss sticks, bowls, sandalwood urns, plates for opium pipes, button boxes, and so on without end. They are of the same general type and about the same value as those made in America and Europe. A fourth class includes filigree work and tissues made from fine silver wire, and is marked by the highest skill and beauty. It is, and has been for centuries, a favorite kind of work among the Chinese. There is but little doubt that Marco Polo brought speci-

mens of it to Europe from Nanking, and in this manner aided in the after development of the guilds of Italy and France. The designs sometimes are marvelous. One from Foochow consisted of a bouquet, over which was loosely wrapped a silken veil. It was so perfectly made that the veil looked as if it might blow away at any moment. Through its flimsy folds the flowers and leaves were all visible. Another artistic gem was a little bouquet in which ferns, lilies of the valley, and similar botanical beauties were perfectly photographed in metals.

In selling his goods the Chinese merchant in silver ware gives the weight of the metal, its fineness, and its value as bullion, and then as a separate item the cost of the workmanship. Thus a bill for a pair of corded bracelets was as follows: Silver (4½ ounces 85 per cent fine), \$4.20 (Mexican); workmanship, \$2.15; total, \$6.35 (Mexican). The first item is mathematically correct, and can be depended upon as the intrinsic value of the material used in the manufacture.

Pittsburg Natural Gas Supply.

Concerning some new and large gas wells, whose supply is intended for Pittsburg, the *American Manufacturer* says:

The Swagler well No. 1, struck about a month ago on Jacob Swagler's farm, in Somerset Township, Washington County, twelve miles east of Washington, Pa., is regarded as the largest gas well in the world. It belongs to one of those private lines laid by Pittsburg manufacturers, and was drilled by the Monongahela Natural Gas Company, which was organized four years ago with a capital stock of \$1,000,000. It is stated that the gas started in the fifth sand, at a depth of 2,700 feet, and its roar was heard fifteen miles away. The drillers worked with cotton in their ears and communicated by signs. The Monongahela Company had thirty-two wells in that field, but all were plugged, in order to use the product of this one great gusher. The Monongahela Company is composed of H. W. and David B. Oliver, of the Oliver Iron and Steel Company, and some of the stockholders of the Republic Iron Works. A short time since the Somerset Township leases of Monongahela Company, including but one well, the Swagler, was sold to the Philadelphia Company, and it is now sinking five other wells.

About two weeks ago the Philadelphia Company, of Pittsburg, which virtually controls by lease and traffic arrangement the business of supplying natural gas fuel to private residences in Pittsburg and Allegheny, brought in its 913th gas well. This well is located in the Monroeville field, thirteen miles from Pittsburg. This company has eleven first-class wells in reserve, ten being located in South Buffalo Township, Armstrong County, twenty-eight miles north of Pittsburg. The company's experts say natural gas will be found as long as oil, and its supply has been ample for thirty years, but it may have to be piped long distances. The original gas fields of Murrsville and Grapeville, in Westmoreland County, are running low, but substitutes have been found, the drillers having made a complete circuit of Pittsburg within a radius of thirty miles during the last seven years.

Simultaneous with the success in Washington County, south of Pittsburg, was the discovery of natural gas in a westerly direction in New Sewickley Township, Beaver County. This is about twenty miles distant from Pittsburg. At the usual depth no gas was found, and the well was drilled 500 feet deeper, when the gas forced its way to the surface with such a pressure—300 pounds—as to blow out the packing.

Wooden Water Mains.

A recent paper read before the American Society of Civil Engineers by Mr. James D. Schuyler, M. Am. Soc. C. E., on "The Water Works of Denver, Colo.," contained some very interesting observations and figures relating to this subject. He states that 16 miles of 30 inch wooden conduit were constructed in that work in addition to a considerable length of 44 inch pipe. The timber used was California redwood, and the 30 inch conduit was constructed to stand under a head of 185 feet. We understand from the paper named that the total average cost of the 30 inch pipe was \$1.36 per lineal foot, of which about forty-eight cents constituted the cost of trenching and back filling. A gang of eight to sixteen men laid from 150 to 300 feet of the same size conduit per day. These mains were composed of staves, dressed very smooth to cylindrical sides and radial edges, and were held to the cylindrical form by mild steel bands placed at a distance apart depending upon the head, but never exceeding 17 inches. The pores of the wood are filled with the water under pressure so that it oozes through to a slight extent, thus realizing the condition for permanent preservation. The pipe is framed in the trench and all handling in full size sections is avoided; at the same time the interior finish is so smooth that the most advantageous conditions of flow are secured.

Mr. Schuyler estimates that the use of these wooden conduits effected a saving of over \$1,000,000 in this particular work.