

Utilization of Garbage.

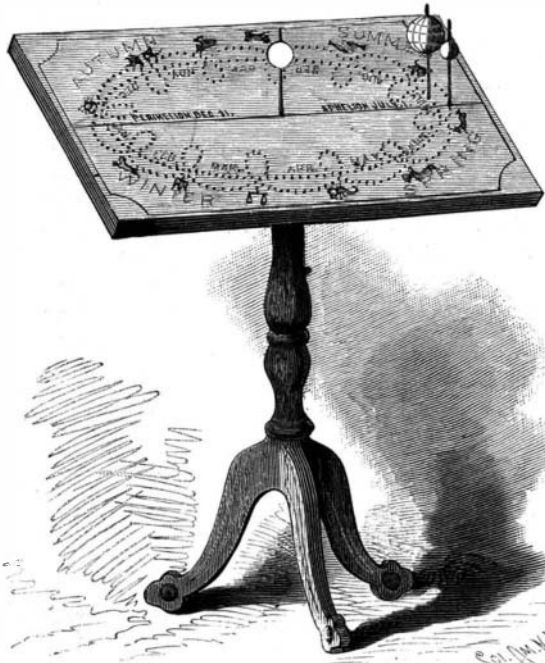
The process of garbage disposal is, according to the *American Architect*, probably carried on now with greater perfection in St. Louis than anywhere else in the world. In the new establishment just completed there, at a cost of nearly a quarter of a million dollars, by the company which holds the contract for disposing of the garbage of the city, the carts bringing the material ascend an inclined plane to the third story of the receiving building, where they discharge into enormous vertical cylinders, which are surrounded by steam jackets. Superheated steam is forced into the jackets, and the water, which constitutes from 75 to 80 percent of the garbage, is thus evaporated, or rather distilled off, the vapor being condensed, and the condensed water, which is perfectly harmless, and even drinkable, allowed to run off to the sewer.

At a certain stage of the drying, naphtha is pumped into the cylinders and allowed to remain there for thirty or forty hours. This dissolves out all the fats, oil, and grease from the mass. Other chemicals are said to be mixed with the naphtha, but this is probably for the sake of mystification, the naphtha alone being quite sufficient for the purpose. After the proper time has elapsed, the naphtha, with its dissolved oil, is pumped out again into stills, where it is distilled by steam heat, the volatile naphtha being allowed to run back from the condensers into the storage tanks, while the fat, which is left in the stills as a brown, oily mass, is drawn off into barrels. It may be bleached, so as to be perfectly white, and it is said that the pure and delicate Ivory soap, which has gained such popularity all over the country, was originally made of refined garbage grease, before it was found advisable to use cottonseed oil instead. After extracting the grease, the residuum in the cylinders is dried a little more, the last vestiges of naphtha being driven off in the process, and is then removed through a door at the bottom. It is now a brown mass, free from all unpleasant odor, and apparently dry, although it still contains 5 or 6 percent of water. As it has not been heated sufficiently to cause destructive distillation of the solid portions, it contains practically all the nitrogen of the fresh garbage, with, of course, all the alkalies and phosphates; and, after grinding coarsely and packing in barrels or bags, it commands a ready sale all over the United States. The dealers usually analyze a sample and fix their price mainly in accordance with the proportion of nitrogen found in the sample; but the St. Louis "garbage tankage," as it is called, readily brings in

New York and Boston from nine to twelve dollars a ton, and the demand for it far exceeds the supply.

AN IMPROVED TELLURIAN.

This tellurian is more especially designed for use in schools, to show without much trouble, and in a very effective manner, the causes of the seasons and the

**NICHOLS' TELLURIAN.**

relative positions of the sun, earth, and moon. It has been patented by Mr. Grant B. Nichols, of Wapakoneta, Ohio. It comprises an inclined table on a suitable stand, with a central recess, in which is a rod carrying a ball representing the sun, around which is a series of 365 apertures, made in the surface of the table in an ellipse, representing the path of the earth around the sun. These apertures are preferably numbered according to the days in the month, the names of which appear at their respective places, and a vertical rod carrying a globe representing the earth is designed to be placed in one of the apertures. Another series of apertures, also preferably marked or numbered, represent the path of the moon relative to the elliptical path

of the earth, a rod carrying a ball representing the moon being placed in one of these apertures. The rod carrying the ball representing the earth may at any time be inserted on the proper date in the aperture provided for it, the rod carrying the moon being likewise placed in correct position, when the relative positions of the different bodies will be practically illustrated. The apertures for the rod carrying the ball representing the earth are all of the same depth, but those in the path of the moon are of different depths, so that the moon's orbit about the earth is not so much inclined as the earth's orbit about the sun, the moon being thus always represented in the proper position relative to the earth and sun.

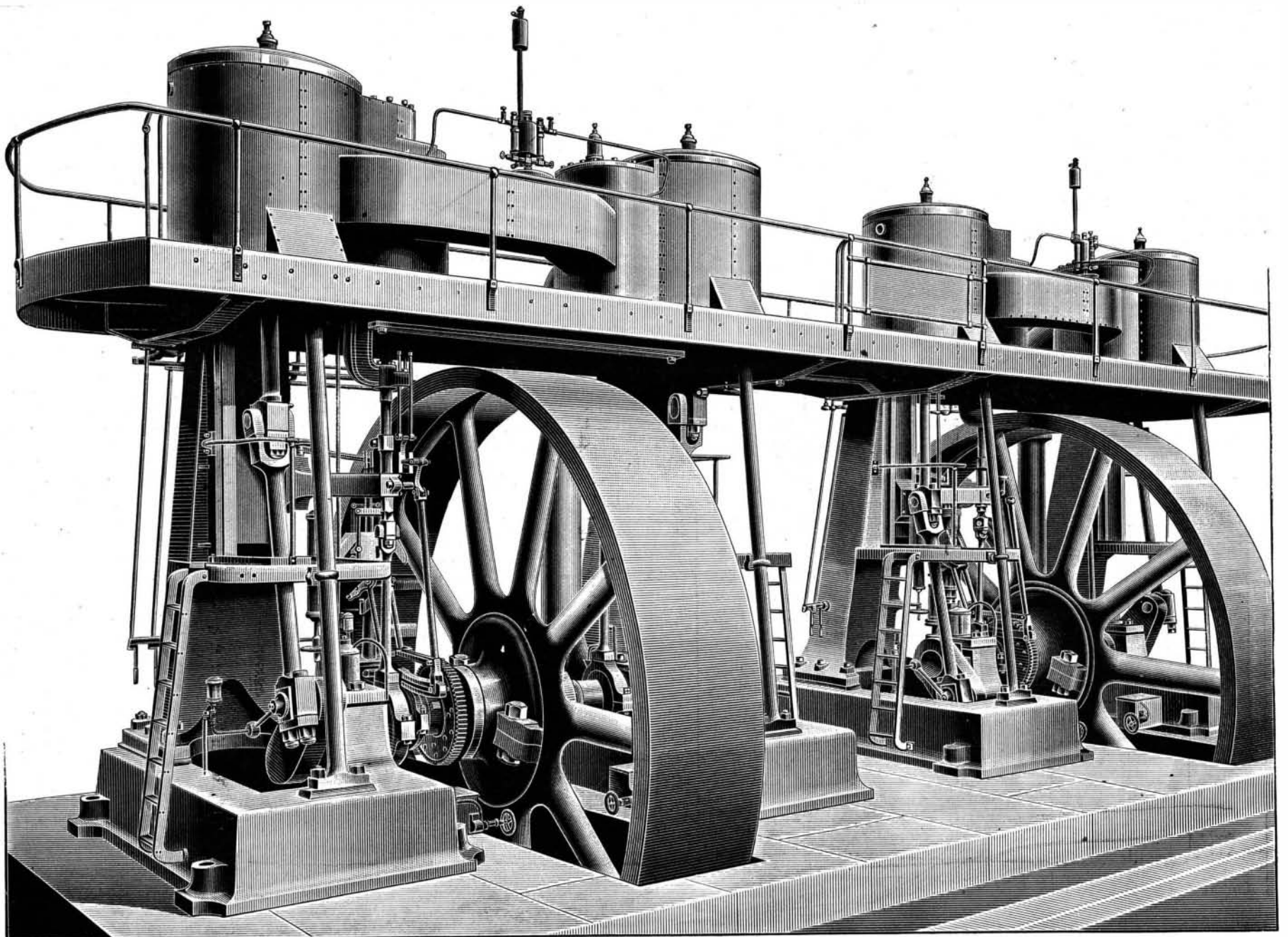
ELECTRIC LIGHT ENGINES, MANCHESTER CORPORATION.

We illustrate the engines constructed by Messrs. Galloways, Limited, for the Manchester corporation.

We are indebted to the *Engineer*, London, for our engraving and the following particulars:

The engines are arranged at either side of a gangway, this gangway giving access to the upper staging of all the engines in the installation. The steam pipes below are in duplicate, as also are the steam valves on the boilers and the stop valves on the engines, so that either series may be used at will. The lower pipe over the gangway is the water supply from the tank over the boiler house; this pipe supplies the Korting ejector condensers. The engines have high pressure cylinders 17 inches diameter, low pressure 34 inches diameter, with a piston stroke of 3 feet, and they are intended to run at a varying speed of from 75 to 90 revolutions per minute. The admission of steam is controlled by expansion valves arranged in accordance with Messrs. Galloway's plans, the gear consisting of a block working in a slotted link directly in connection with the governor. The governor is of the parabolic type adopted by Messrs. Galloway some years ago with unequivocal success, but in this case a portion of the center weight has been removed and a spring substituted to give a varying load. Both cylinders are steam jacketed, and a receiver is formed round the jacket of the high pressure cylinder, so that the two cylinders have apparently the same diameter.

THERE are 11 American cities that spread over more territory than Paris, while Berlin is exceeded in area by 17 of our cities.

**IMPROVED COMPOUND ELECTRIC LIGHT ENGINES.**

The Action of Acids upon Glass.

Experiments made with flasks of different kinds of lime-alkali glass proved that the loss of weight resulting after heating with diluted acids to 100° for six hours was always the same with the same kind of glass, and was entirely independent of the strength of the acid or of its chemical composition. Sulphuric, hydrochloric, nitric, and acetic acids gave identical results. Only very strong acids had less effect than dilute ones, which again have less action than pure water. Similar results were obtained in working at temperatures of 160° and 190° with pieces of glass tubing inclosed in sealed tubes. The influence of the degree of concentration was, however, more pronounced than in the previous experiments and was again in inverse ratio to the strength of the acid used. The dissolving action of the acids is therefore governed by the amount of water contained in them. Bearing in mind that the action of water upon glass consists in the liberation from it of alkali, which again further increases its vulnerability to water, the passive part played by the acid may be readily understood. In the case of glass containing an unusually large amount of alkali, the action of the acid, however, is more pronounced than that of pure water, the decomposition being analogous to that of many natural silicates. Lead glass exhibits the same peculiarities as lime-alkali glass, according to the proportion of lead contained in it. The nature of the base in combination with the silica likewise seems to influence the resisting capacity of the glass. Thus a zinc-lime-soda glass (Jena thermometer glass 16 III) was more attacked by concentrated acid than lime-soda glass of equivalent composition. The action of pure sulphuric acid is less strong than that of boiling water, but at very elevated temperatures its vapors produce a more marked effect.

Dry carbonic acid does not affect glass, hence the action of the atmosphere primarily depends on the aqueous vapor contained in it. The liability of a glass to suffer changes by atmospheric influences can therefore be ascertained by estimating colorimetrically the amount of alkali separated on treatment with water. Glass, especially when rich in alkali, is capable of absorbing water, which can only be completely expelled by heating to about 500° C. The water combines chemically, forming hydrates, which represent the intermediate stage in the process of the decomposition of the glass by the action of water. An important part played by the alkali split off by water seems to consist in its facilitating the formation of such hydrates.

VIADUCT FOR STREET RAILWAYS, CINCINNATI.

The business portion of Cincinnati occupies a plateau nearly three miles wide, rising abruptly about eighty feet on the north side of the Ohio River, and beyond this is an irregular line of bluffs some 400 feet high, over and beyond which the city has spread. One of these hills is known as Mount Adams, and our illustration represents a view on the Mount Adams and Eden Park Railway, forming part of the street railway system of Cincinnati, the park being on a hill in the eastern part of the city, and containing two hundred acres. The heights are all reached by inclined planes, cable roads, and in some instances by electric lines.

There are six inclined planes, on four of which the electric cars are transferred from one level to the other and continue their course, the planes being provided with triangular shaped trucks with platforms on a level, so that the electric cars are readily run on or off at the terminals. In the Cincinnati electric roads the double trolley is employed, both arms of the circuit being thus more equally balanced than with a track return, and the necessity of tearing up the streets is avoided, while the possibility of destruction of water and gas pipes by electrolytic action is entirely removed. The cars are also provided with electric heaters, and the closed cars have vestibules at the rear end, with an opening at one side. We are indebted for our illustration to the *Street Railway Journal*, New York:

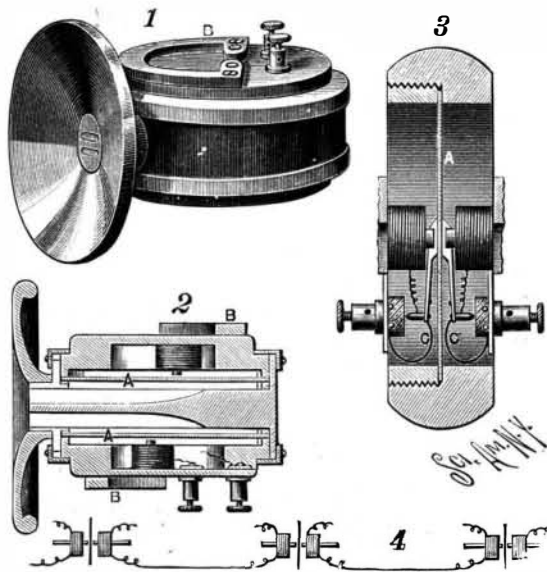
THERE are 10,000 copyrighted volumes of American poetry in the Congressional Library at Washington.

A NEW TELEPHONE.

Mr. Eloy Noriega, the well known electrical inventor of the city of Mexico, has recently patented in Mexico some improvements in telephones, for which greatly improved results are claimed.

The double receiver, shown in perspective in Fig. 1 and in section in Fig. 2, is sensitive to weak impulses and gives excellent results with the normal volume of sound and current at the transmitting end of the line.

This instrument has a cell or casing provided with

**NORIEGA'S TELEPHONE.**

two separate chambers containing diaphragms. The two chambers terminate in an ear piece. Each diaphragm is in the field of a polarized magnet attached to the side of the casing, and the bobbins of the two magnets are connected with the telephone line.

In Fig. 3 is shown in section a double telephone, in which two polarized electro-magnets are supported on opposite sides of the iron diaphragm. The diaphragm carries two arms of insulating material, one on either side of the diaphragm, each provided with a metallic electrode at its free end, which rests on a contact block attached to the binding post. The metallic electrodes are connected with the bobbins, and the arms which support them are connected with delicate curved springs extending to the blocks attached to the binding posts.

This instrument may be used for receiving from separate lines, also for transmitting to two circuits. It may also be arranged for use as a repeater, for repeating from one line to another, as indicated in Fig. 5.

The magnets used in these instruments are made from a new alloy of iron and tungsten, which is more efficient than iron or steel. The inventor claims the efficiency of these magnets ten times greater than that of the ordinary steel magnet.

Maryland Ship Canal.

The construction of a ship canal across the Maryland

veys, which were carried out by Major N. H. Hutton. Five routes were surveyed. In 1882 another route was surveyed by Capt. Thomas Turtle, Corps of Engineers, U. S. Army, which, with an early survey made by Mr. B. H. Latrobe, makes seven separate routes which have been more or less thoroughly surveyed.

Dyeing Leather.

BY J. J. HUMMEL AND H. R. PROCTER.

In applying basic coal tar colors to cotton, it is well known that the latter requires to be mordanted with tannic acid. In the case of leather tanned with sumac and other similar tanning matters, such preparation is of course unnecessary, not only because the leather already contains tannic acid, but because the substance of the leather itself as a protein compound has a natural attraction for the coloring matter. Nevertheless, very poor results are frequently obtained in dyeing leather, e. g., skivers with the basic colors, the colors being pale or irregular. An examination of the dye liquors in these and other cases revealed the fact that the coloring matter was very largely precipitated, due no doubt to tannic acid dissolving off the leather.

Two methods of getting rid of the defect naturally occur to one, viz., to remove the excess of tannic acid present by previously steeping the leather in tepid water, or to render the excess inert by fixing it upon the leather in an insoluble form.

Both methods were tried, with the result that the second proved to be the most reliable and effective. To this end it is merely necessary to work the leather in a tepid bath (45° C.) containing the requisite quantity of tartar emetic for $\frac{1}{4}$ - $\frac{1}{2}$ hour, then to wash, before proceeding to the dyeing operation.

By adopting this simple precaution, the dye liquors are maintained in a perfectly clear condition, and since they are invariably unexhausted, they can be used for dyeing further quantities of leather; moreover, the dyed colors are perfectly level, and many shades darker than without this preliminary treatment. The leather itself is in nowise injured, and since the antimony is in a perfectly insoluble form as a tannate, there can be no fear of injurious consequences arising in the ordinary use of such leather.

Dr. Cook's Arctic Expedition.

The steamer *Miranda* sailed from New York July 7, bearing Dr. Cook's Arctic exploration party. She has been chartered for two months and a half, to take a party to explore the coasts of the frozen North.

There were fifty passengers aboard, most of whom are scientists and sportsmen, a few of whom are going simply for the crisp northern air. The scientific men will make researches along the coasts of Labrador and Greenland, and the sportsmen will shoot polar bears and reindeer.

The *Miranda* will stop at points in Nova Scotia and Cape Breton, cruise around Newfoundland, cross Davis' Strait to the west coast of Greenland, where some of the party will remain to explore the fjords and to examine the fossil beds, the Norse ruins and the other things of interest to scientists.

The *Miranda* will enter Melville Bay later and go to

the headquarters of Lieutenant Peary, and perhaps the sites of the winter quarters of Kane, Greely and Hayes will be visited. The return will be along the coast of Greenland and Labrador to New York, where it is expected the vessel will arrive on September 15.

Among the party were William H. Brewer, professor of agriculture, Yale University; C. Fred Wright, of Oberlin College; Professor B. C. Jillson, Professor G. W. Dove, of Andover; L. L. Dysche, professor of zoology, Kansas State University;

Professor Charles E. Hite, of the University of Pennsylvania; Professor Elias B. Lyon, of Chicago; and Professor A. A. Freeman, of Andover.

THE Bhatgur reservoir, a great artificial lake in India, said to hold about 4,641,000,000 cubic feet of water, acts as a feeder to the Nira Canal. It is formed by a masonry dam 103 feet high and 3,020 feet long.

**VIADUCT IN EDEN PARK, CINCINNATI, FOR STREET RAILWAY CARS.**

peninsula between the Delaware and Chesapeake Bays is again being agitated by the citizens of Baltimore, Md., a mass meeting having been held at that city June 25 to devise ways and means of promoting the project. At this meeting a permanent committee of 21 members was appointed to investigate the subject and to report to the city councils. The movement to construct this canal was started many years ago, and in 1878 the federal government appropriated money for making sur-