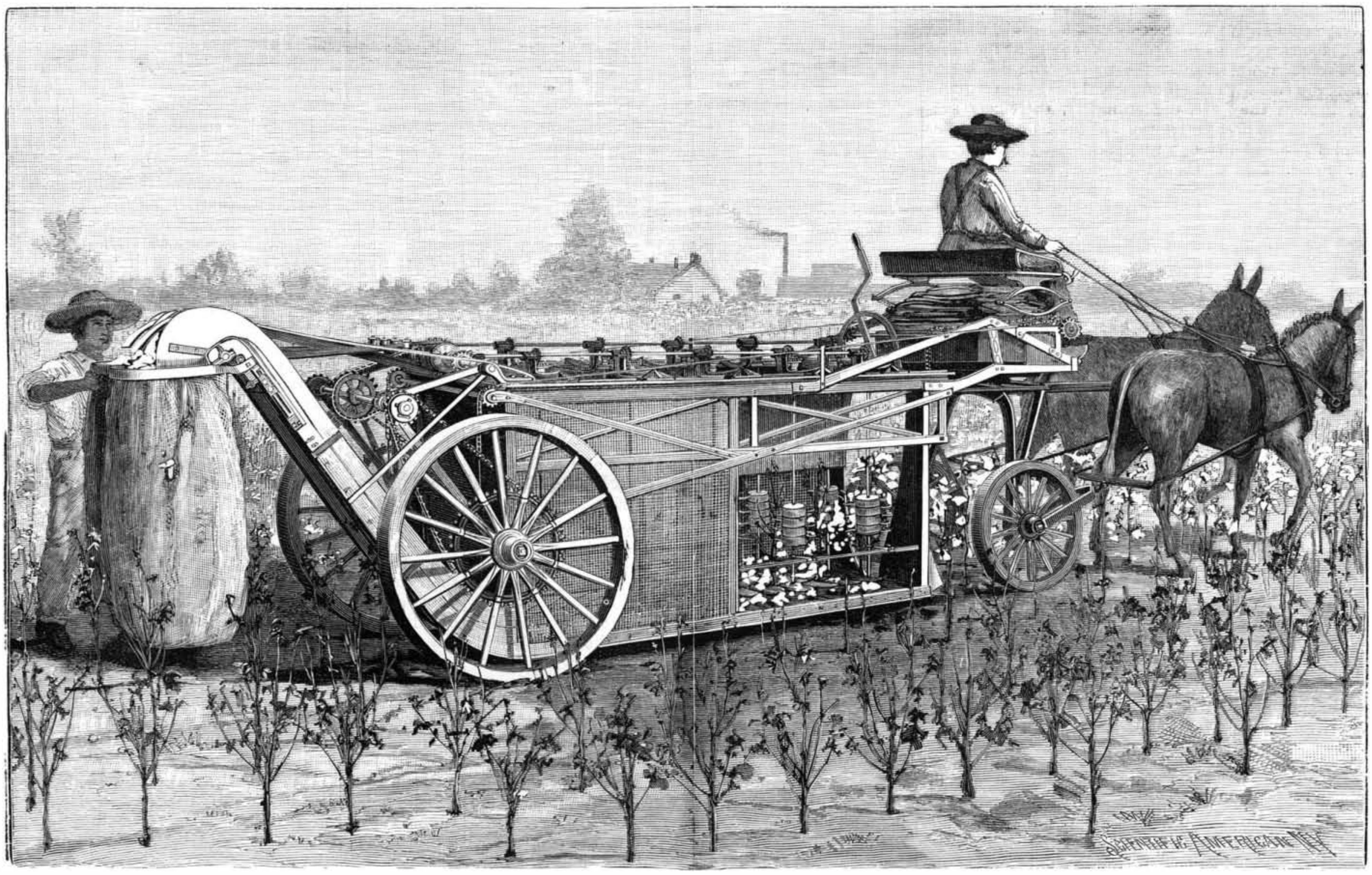
packed, and can be purchased not only in every village and city of this country, but in most of the cities of Europe.

THE SOUTHERN COTTON HARVESTER.

One of the subjects of invention which seem to have baffled inventors for many years is a practical cotton harvester. The cotton crop is a peculiar one, presenting the necessity of dealing with the delicate fiber and at the same time with twigs, and green and ripe bolls. In harvesting cotton by hand labor, the harvest time is subdivided into three different periods, the first of the crop being gathered from the lower portions of the plant, the second part of the crop being gathered from the central portion, and the third part from the upper portion of the plant. It will thus be seen that the problem is a complicated one, and it is not strange that there should be many failures before cotton harvesting by machinery becomes a commercial success.

To a large extent, cotton planters in the South have been hampered by the difficulty in obtaining labor at the right time, and, as a result, serious losses have followed; but at length a machine has been perfected which reduces cotton harvesting to a certainty. To run this machine, two men and a single team are required. It will harvest from 5,000 to 6,000 pounds of cotton per day at a cost of $3 to $4, as against forty men picking not over 150 pounds each per day at a cost of $30. This machine, which is the subject of our engraving, is so simple as to hardly require an explanation. A general description will render its construction and operation clear.



A NEW COTTON HARVESTER.

The machine consists of a frame suspended on ordinary wagon gear and inclosed in wire cloth. Within the frame are journaled two series of vertical shafts, upon which are placed beaters having spring arms. Through the bottom of the frame extends a slot, through which the stalks of the cotton plants pass. In the bottom of the frame are arranged conveyors which carry the cotton beaten from the plant rearwardly and upwardly, and deliver it to bags attached to the elevators at the rear of the machine. The slot through which the stalks pass is furnished with series of swinging plates which open only as the stalks pass, thereby keeping the bottom of the machine closed and retaining all of the cotton detached from the plants. The beaters are made adjustable, so that they can be placed at a suitable height to engage the ripe bolls as the machine passes along. One of these machines has been in operation this season in Alabama, yielding the results we have described above.

The New York office of the Southern Cotton Harvesting Company is located at 319 Broadway.

Mr. Isaac Blum is president of the company, and we are informed that Mr. L. R. Turner has been largely instrumental in bringing the machine to perfection.

Stick to a Legitimate Business.

Well directed energy and enterprise are the life of American progress, and safety lies in sticking to a legitimate business. No man—manufacturer, trader, or banker—has any moral right to be so energetic and enterprising as to take from his legitimate business the capital which it requires to meet an emergency.

Apologies are sometimes made for firms who have failed, by recurring to the important experiments they have aided, and the unnumbered fields of enterprise where they have freely scattered their money. We are told that individual losses sustained by those failures will be as nothing compared with the benefits conferred on the community by their liberality in contributing to every public work. There is little force in such reasoning. A man's relations to a creditor are vastly different from his relations to what is called the public. The demands of the one are definite, the claims of the other are just what the ambition of the man may make them.

The histories of honorably successful business men unite to exalt the importance of sticking to a legitimate business; and it is most instructive to see that, in the greater portion of the failures, the real cause of disaster was the branching out beyond a legitimate business, in the taking hold of this and that tempting offer, and, for the sake of some great gain, venturing where they did not know the ground, and could not foresee the pitfall.

Let Us Have Good Roads.

Colonel Albert A. Pope deserves the thanks of the present generation, and will undoubtedly receive those of posterity, for his untiring efforts in favor of the improvement of American roads. We need not repeat what has been often said here and elsewhere, that the crying need of our country is decent ordinary roads, over which the farmer can haul his produce to market and the city merchant can distribute his goods to his circle of rural or suburban customers with economy, speed, and convenience. As with all inveterate evils, it is hard for us, accustomed to the old system, to realize the difference which a better one would make in our condition. The number of horses and mules owned in the United States is about sixteen million, and the cost of keeping them is probably not less than two hundred million dollars a year. It is found, by hundreds of experiments, that one horse, working all day, and day after day, can do as much work on a good macadamized road as eight horses can on a road covered with gravel from four to six inches deep, as is usually the case with suburban roads after the annual repairing. Now, bad as are these repaired suburban roads, every person of experience will acknowledge that the labor of pulling a vehicle over them is as nothing in comparison with that involved in wallowing through a Virginia, or Ohio, or Indiana, or Kansas highway after a rain, or when the frost is coming out of the ground. Indeed, it is not necessary to make any invidious distinction in favor of any of the States, for the mud of Connecticut or New York, or the sand of Southern Massachusetts or New Jersey, have little to fear, as regards capacity for retarding locomotion, by comparison with the loam of the Mississippi Valley.—*Amer. Architect.*

A Trip to a Fixed Star.

Dr. David Gill, lecturing recently on "Fixed Stars," hit upon the following adroit method to illustrate the distance to Centauri. The doctor said, as reported in the Boston *Globe*:

"We shall suppose that some wealthy directors, for want of outlet for their energy and capital, construct a railway to Centauri. We shall neglect, for the present, the engineering difficulties—a mere detail—and suppose them overcome and the railway open for traffic. We shall go further, and suppose that the directors have found the construction of such a railway to have been peculiarly easy, and that the proprietors of interstellar space had not been exorbitant in their terms for right of way. Therefore, with a view to encourage traffic, the directors had made the fare exceedingly moderate, viz., first-class at two cents per 100 miles. Desiring to take advantage of these facilities, a gentleman, by way of providing himself with small change for the journey, buys up the national debt of England and a few other countries, and, presenting himself at the office, demands a first-class single to Centauri. For this he tenders in payment the scrip of the national debt of England, which just covers the cost of his ticket; but at this time the national debt from little wars had been run up from $3,500,000,000 to $5,500,000,000. Having taken his seat, it occurred to him to ask: 'At what rate do you travel?' 'Sixty miles an hour, sir, including stoppages,' is the answer. 'Then when shall we reach Centauri?' 'In 48,663,000 years, sir.'"

Manufacture of Cod Liver Oil.

The process of manufacturing cod liver oil at Portugal Cove, Newfoundland, is as follows: It requires, as a rule, 2½ gallons of liver to produce a gallon of oil. The livers are first carefully washed, and must then be "cooked" at once. For this process they are first put into a large tin boiler, which is plunged into a large iron boiler filled with hot water, the water not being allowed to touch the livers, which are thus gently steamed till a quantity of oil is floating on the surface. This is dipped out and filtered through bags of moleskin. The last filtration leaves the oil perfectly transparent, and without any unpleasant taste or smell. The oil is exported in 60 gallon casks.

Trees in French Cities.

One of the chief beauties of the larger French cities, and second only to their magnificent edifices and monuments, are the trees.

The almost interminable vistas of chestnuts and acacias stretching along the broad and superbly paved avenues as far as the eye can reach, their bending branches almost touching one another in one endless arch of verdure, form not only a delightful perspective for the eye of resident and visitor alike, but serve to add beauty to cities already beautiful, and grace and symmetry to whatever might be harsh and forbidding.

It must not be presumed, however, that the existence of this veritable *rus in urbe* is the result of Nature's handiwork alone, for science and art have each in turn lent their aid in converting these great centers into tremendous forest gardens.

In short, the planting as well as the maintenance of the trees in French cities is an item of no little import in the annual budget prepared by the municipal council. Nor does this body look upon their preservation as a matter of less consequence than the repairing of its roadways or the lighting of its streets.

The climate and soil of France are not suited to the nurture and growth of every sort of tree: so that those chosen to line the avenues and boulevards of her cities must be selected with no little judgment.

Chestnuts thrive wondrously. They grow well on a not too rich or generous soil, but require at the same time frequent watering at the roots. The elm is also a favorite tree with the professional landscape gardeners, though they are, unfortunately, extremely susceptible to the destructive work of worms and insects. Maples grow slowly, but they are hardy and strong in the end. Add to these the acacia, the linden, the sycamore, the oak and the buttonwood, and the list of trees that live and thrive to advantage in the great Continental cities approaches completion.

France imports a great many of her fruit as well as shade trees, and the utmost precaution is taken as to where these shall be planted. Handfuls of earth from each and every spot where a tree is to be placed are carefully examined and analyzed. Upon ground rich and moist the trees from the United States grow best. A sandy soil is most favorable to resinous trunks, and so on in proportion to the teachings of science and arboriculture.

In squares and parks, though more especially along the principal thoroughfares, where the trees are planted about twenty feet apart, particular attention is given to the replacing of the dead or dying by healthy trees of the same species. In this way the line of perspective is never broken, nor is the vision repelled by the absence of a single trunk.

It would seem that a great many American cities, with their tremendous expanse of stone, brick and iron facades, might profit in the provision of shade and verdure by the example set by the cities of France. Sidewalk locomotion would be facilitated in the summer months by equal protection from the sun's rays on both sides of the street, while grace combined with genuine utility would serve to make the avenues as attractive, perhaps, as some of them are now forbidding.

Charles Kingsley, the great essayist, if I mistake not, is authority for the statement that verdure is just as essential to life as air itself, and that the kitchen garden of the laborer goes as much to add a touch of sunshine to his moral being as a bunch of roses to an invalid or the royal park to the Queen of England. The proof of the theory, which is a truer one than may at first appear, is in the witnessing of the crowds of poor that flock in summer time to any spot where grass and foliage exist. The French know this. They plant trees and lay out flower beds in every available corner within their cities' boundaries, while the benefit wrought thereby is too self-evident to demand interpretation. HORACE G. KNOWLES.

United States Consulate, Bordeaux.

Iron Cinder Paint.

According to a memoir recently published by Mr. A. Sahlin, the cinder from puddling and excandescent iron furnaces can be converted into red paint of more or less body. The difficulty consists in reducing the cinder to a sufficiently fine powder; this is effected by means of a Blake crusher and a Cyclone pulverizer. The result of the operation would be to obtain 40 per cent of cinder in a state in which it can be put into fine paint, simply mixed with the ordinary oil mixture. The remaining 60 per cent can still be utilized as a coarser dark red paint, such as is used by the railway companies to preserve iron and steel from oxidizing. The treatment of the cinder is as follows: To 1,000 kilogs. of cinder crushed so as to enable it to pass through a sieve of 100 perforations to the square centimeter add 170 to 200 kilogs. of sulphuric acid of 66° B., the quantity of acid being in proportion to the lighter or darker shades of paint required. This mixture is worked first by hand, and then in a mechanical mixer; when the compound is thoroughly well mixed, it is put into a bin and there allowed to sweat. This chemical action manifests itself by a rise in temperature to 150° or 155°. The cinder consists principally of silicate of protoxide of iron, and the sulphuric acid eliminates the weak silicic acid, and a sulphate of protoxide of iron is formed. If this is calcined by the admission of air, it is converted into free sesquioxide of iron and sulphurous acid, which is extracted. The sweating lasts about four days, and then shows itself accompanied by exhalations of steam and a greenish discoloration of the powdered cinder. As soon as the reaction ceases each of the retorts of the calcination oven is filled with 220 kilogs. of the mass. The fire of the oven is fed with raw petroleum and compressed air. The retorts are raised to a cherry red heat, and the cinder during the calcination is removed in order to bring it as much as possible into contact with the air, so that the oxidation may be rapid. In three or four hours the dark and heavy cinder is converted into a red, light and somewhat doughy mass. If, after being analyzed with reactive paper, the acid is found to be completely volatilized, the cinder is allowed to get cold and is then pulverized in a Cyclone pulverizer. The only difference in the pulverization is that all it produces is now reduced to a powder sufficiently fine for the most delicate paint without leaving any residuum. The pulverizer reduces 360 kilogs. of calcined cinder per hour, and produces an excellent paint, the graduation of color of which rests with the operator, according to the quantity of sulphuric acid used in the preliminary operation.—*Colliery Guardian, from the Revista Minera.*

Rubber Varnish.

BY RALPH W. GRAY.

The varnish business, like the manufacture of rubber goods, is what is known as a secret business. There are in the United States about a hundred factories devoted to the manufacture of varnishes for furniture, carriage, and house work, with a few that devote their energies to manufacturing fine goods for artists. The use of varnish primarily is to give luster and durability to whatever it covers. In India rubber work the varnish is put on not alone to add durability, but to prevent the efflorescence of the sulphur. The bases of most varnishes are linseed oil and spirits of turpentine, but to those that are to be used on hard surfaces where a special luster is required, certain gums are added to give brilliancy and hardness. These gums are all of the resin families, the best being the hard fossil gums known as Kauri and Zanzibar gums. Certain varnishes are made from amber and a fine varnish is also made from celluloid. The more elastic a varnish is to be, the smaller the percentage of gum that is put into it. It follows, therefore, that in making rubber varnishes little or no gum is used.

As the bulk of rubber varnish is made of linseed oil, the secret of the business would naturally lie in its preparation. Many of the rubber factories have in connection with their plant a small brick building where is set a large caldron in which the oil is boiled. The operation is more or less attended with danger from fire, and it is therefore conducted at some distance from the main building. Considerable skill is acquired by the men who have charge of manufacturing the varnish, and as a rule those who are expert in this line do nothing else, and they receive good wages. This is just, as they incur considerable peril, many accidents having occurred in which the laborers have been badly injured.

The oil, after having been boiled to the proper consistency, either with or without the addition of a certain percentage of sulphur, Prussian blue, or resin, is taken in the light, clear pasty mass to the varnishing rooms, where it is thinned with spirits of turpentine and applied to the goods by means of brushes. There are no special tests for the quality of varnish, the ordinary way of examining it being to spread a thin film upon a piece of glass and to look through it toward the light, with a view of examining its clearness. Often the piece of glass is put in the sunlight, where the film will dry, and allowed to stand for a year. A first class varnish during this period should not shrink largely, nor should it crack. Linseed oil, however, is capable of absorbing a great quantity of oxygen, and unless carefully and skillfully boiled, will continue the process and crack.

Chemically, very little is known concerning the drying of linseed oil, but it is likely that the subject will be investigated thoroughly before long, with the means that are now within reach of the modern chemist. As linseed oil itself is a powerful oxidizer, those who purchase it for use in varnish are very particular in getting exactly the kind they need, and will not take chances on any brands, even if the price be considerably to their advantage. A piece of canvas spread with a linseed oil varnish that has not finished its oxidization will in the course of time be thoroughly destroyed, and the same effect will be produced upon a thin rubber surface. Hence it is quite important that this fluid be carefully tested before use. Some manufacturers make a varnish for rubber boots and shoes of the oil alone boiled to the proper consistency, while others add various driers and certain gums. It is a question if it would not be wise for these same manufacturers to examine carefully the various gums used in the regular varnishes to see if a certain percentage of them added to the linseed oil would not give an added brilliancy and a better durability. Of course this amount would naturally be very small, as Kauri, for instance, if added in too great proportions would have a tendency to crack when the goods are stretched.

In an experiment recently tried in a large rubber factory, ten per cent of Kauri gum was added to the varnish and found to be altogether too much; three per cent, however, gave a very pleasing result and seemed to have a luster that was not shown in the regular oil varnish. Varnish for rubber work, as a rule, is applied before the goods are heated; therefore, it has the chance of additional drying during that operation. Many of the goods when they come out of the heater are quite sticky, but a very little airing remedies this. To-day on almost all rubber goods that are put on the market there is found to be a very fair quality of oil varnish. A good grade of rubber when covered with varnish gives a far better result than a poorer grade, as the solvent often strikes through the shoddy or poor grade rubber and appears on the cloth itself, giving a stained effect and, furthermore, materially weakening the body of the rubber. In experimenting with varnishes a variety of solvents have been tried for the purpose of cutting the boiled oil. Of these any of the hydrocarbons will answer, because they are indifferent to atmospheric action and possess great solvent power. Oil of turpentine, however, is the best, and benzine the cheapest, of the various solvents in use.—*India Rubber World.*

Hot Water for Hemorrhage.

Dr. Julius Scheff, Jr., of Vienna, according to the current number of *Ash's Quarterly Circular*, recommends strongly the use of hot water for arresting hemorrhage after tooth extraction. "We are accustomed," he writes, "to stop hemorrhage by the method that has been used for generations, viz., by the direct application of cold water to the wound. Practitioners started with the idea that heat caused expansion of and induced increased bleeding from the vessels; but, on the other hand, cold caused contraction. In an ordinary case of extraction hemorrhage from the arteria dentalis, or from the gums and periosteum, soon ceases; but it frequently happens, even when the patient does not suffer from hemophilia, that there is difficulty in arresting the flow of blood." Dr. Scheff mentions three cases occurring in his practice in each of which there was a history of profuse hemorrhage after extractions. "I allowed one patient," he says, "to take a great quantity of cold water, and yet there appeared not the slightest diminution in the bleeding. I then took a glass syringe and continuously applied hot water, in drops, to the wound, from which the blood previously trickled without cessation. After a few seconds the bleeding diminished, a coagulum was formed, and the bleeding finally ceased. With the second patient, I used hot water at once, and the flow of blood was arrested. In the third case the wound had been bleeding freely for a long time; I plugged the alveolus with iodoform gauze, and on removing the plug the wound bled afresh. I then employed hot water; the hemorrhage ceased and did not recur." Dr. Scheff applies the hot water by means of a syringe, injecting it by drops into the socket of the tooth. The arrest of hemorrhage in surgical operations by the application of heat is a recognized resource, and it would therefore seem that this principle might with advantage be applied in cases of tooth extraction, especially as the mouth is able to bear a very high temperature without inconvenience. In fact, water so hot that it causes pain when the finger is inserted in it will in many cases be tolerated in the mouth.—*Lancet.*

A Three Thousand Foot Well.

An artesian well over 3,000 feet deep has recently been bored at Galveston, Texas. The water supply of that city is furnished by thirteen artesian wells varying in depth from 825 to 1,350 feet. The water obtained from this source, while being of good enough quality for fire and manufacturing purposes, is totally unfit for drinking and domestic uses. In view of this fact, it was decided that the city was justified in the investment of $75,000 in an attempt to obtain a good water supply, and therefore the artesian well was bored. The first 57 feet of the well consists of a 22 inch casing. Inside of this a 15 inch pipe extends to a depth of 870 feet. Next a 12 inch pipe extends to a depth of 1,200 feet. A 9 inch pipe was then inserted to a depth of 2,363 feet, and from this depth a 5 inch pipe extends to a depth of 3,070 feet 9 inches. No rock whatever was penetrated in reaching this depth and the water supply sought for was not obtained. Further work has been abandoned, and the hope of obtaining a flow of fresh water on the island given up. Wells will be sunk on the mainland fourteen miles from the city, and water brought across the bay by means of iron pipes. The estimated cost for this work is $800,000.