IMPROVED WATER SOFTENING APPARATUS.

Mr. P. A. Maignen exhibits at the London Health Exhibition a new process of softening water, which is equally applicable on a small scale for domestic purposes as for dealing with the largest quantities. The desirability of reducing the hardness of water is too well appreciated to require much comment. Permanent hardness is due to the presence of sulphates of lime and magnesia, which cannot be disposed of in so simple a manner as the bicarbonates, but remain in the water after exposure to boiling or treatment by Dr. Clark's process, and give it a permanent hardness which, in the case of London water, reaches as much as 4 deg., and sometimes even 7 deg. Clark's process—which, as far as it goes, is exceedingly efficient, and which in one form or another is practically the only system in general use at the present time—is not applicable for ordinary houses, on account not only of the first cost and bulk of the installation, but of the care and attention required in working it; and although Mr. Porter's modification of it has been successfully applied for softening water for large mansions, it cannot be denied that the apparatus is bulky and somewhat complicated.

Mr. Maignen's process, says *Engineer*, deals with permanent as well as temporary hardness, and consists in mixing with the water to be softened a fine powder called anti-calcaire, which acts upon the salts in solution, and precipitates them. The anti-calcaire is composed of three reagents, prepared in a highly triturated state, the composition varying according to the nature of the water. These reagents have different degrees of solubility, and act in three distinct periods of time, first upon the carbonate of lime, and then upon the sulphates of lime and magnesia. When a small quantity of water has to be softened—such, for instance, as is required for use in a dressing room—it is sufficient to put in the ordinary water jug at night as much anti-calcaire as will cover a shilling, filling up the jug after the introduction of the powder. In the morning the water will be found perfectly soft and clear, the objectionable sulphates and carbonates having been precipitated to the bottom in the form of a fine powder, which is of course removed before filling the jug again. We have ourselves tried the process in this way with the Kent water, and found it exceedingly efficient.

The same system may be applied on a large scale in the scullery or kitchen by using a tub, the water being drawn off by means of a tap; and if time cannot be allowed for complete subsidence by gravitation, the remaining precipitate may be removed by filtration through a "Filtre Rapide." When storage capacity in tanks can be obtained for a couple of days' supply, water can be softened even on a large scale without further outlay for plant, as on account of the rapid subsidence of the precipitates it is sufficient to mix with each day's supply the proper proportion of the powder, and allow it to stand for not more than twelve hours before drawing off. One tank would then be in use while the other was being cleaned.

Another method of applying the process is shown in Figs. 1 and 2. This consists of two cisterns, in one of which the softening is performed, and in the other the filtration.

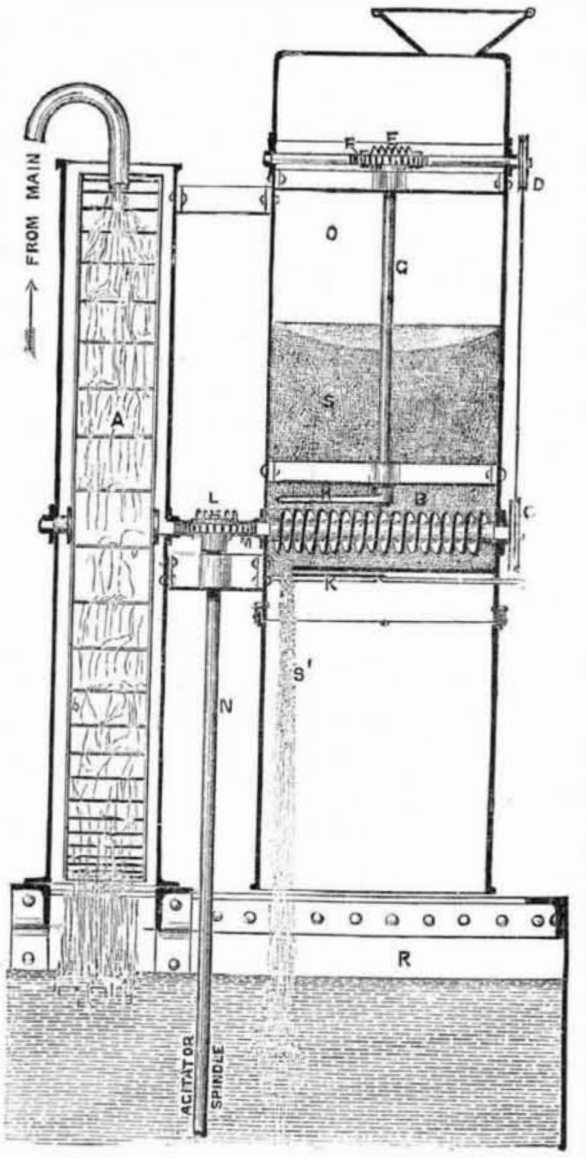


Fig. 2.—MAIGNEN'S APPARATUS.

Water is admitted from the main by a ball valve in the usual way, but instead of passing direct into the cistern, it flows through a pipe and is delivered over the small water wheel, A, shown to an enlarged scale in Fig. 2. This wheel is contained in a light iron casing open at the bottom, and is revolved by the action of the water as it passes into the cistern, the speed of revolution varying according as the supply is greater or less. The anti-calcaire powder is contained in the upper part of the circular casing, O, into which the spindle of the water wheel is extended in order to communicate motion to a small feeding worm.

In the bottom of the casing is an opening, the size of which is controlled by a slide, and as the worm revolves the powder is screwed forward to this opening, and falls in a greater or less stream into the cistern below. At the same time by suitable gearing the arm, H, agitates the powder so as to preclude the possibility of its hanging in the casing, and an agitator in the tank, worked by a worm and wheel, thoroughly stirs up the water, and produces an intimate mixture with the powder. As soon as the precipitate is formed a part of it sinks to the bottom, from whence it is removed from time to time by means of a plug in the bottom of the cistern. The remainder is carried forward with the water to the filter tank, where it is separated, and the clear, softened water passes on to the collecting reservoir. No labor is required beyond that for occasionally filling in the powder and removing the precipitates. The filtering frames will go for a couple of months without requiring attention, and are then readily cleansed in about half an hour by dashing water upon the cloths.

The engraving shows an apparatus for dealing with 12,000 gallons a day, the space occupied being 8 ft. by 4 ft. by 5 ft. high. A plant of this description is in operation at the Exhibition, softening the water for the aquarium and fish breeding tanks. Fish cannot be kept in hard water in a healthy condition in a confinedst ate, and at the beginning of the Exhibition, when the ordinary water was being used, a white fungus was observed on all the fish, and many of the young ones died. As soon, however, as the softening process was got to work, the fungoid growth disappeared, and the fish became healthy. Mr. Maignen's process is now in course of introduction in several large and important establishments, and will very soon be in operation at the new works of the Southwark and Vauxhall Water Company at Battersea. For drinking water the hardness can readily be reduced to 1½ deg., but for dye works and ordinary washing and manufacturing purposes 4 deg. or 5 deg. generally answers sufficiently well. One of the chief advantages of anti-calcaire is the perfect control it gives, as, by varying the composition or quantity of powder used, the result can be adjusted so as to meet every different requirement.

A Flowing Well near Lockport, N. Y.

Adam Ruhlman & Son have a pond on the Wakeman farm from which they supply ice to Lockport and other places. This fall they decided to increase its capacity, and drilled an artesian well to flood it. The drill passed through 114 feet of solid limestone rock, when it struck a water seam from which the water spouted high above the top of the well, and has been flowing at the rate of 25 000 barrels of ice cold water a day. It is one of the greatest artesian wells in existence.

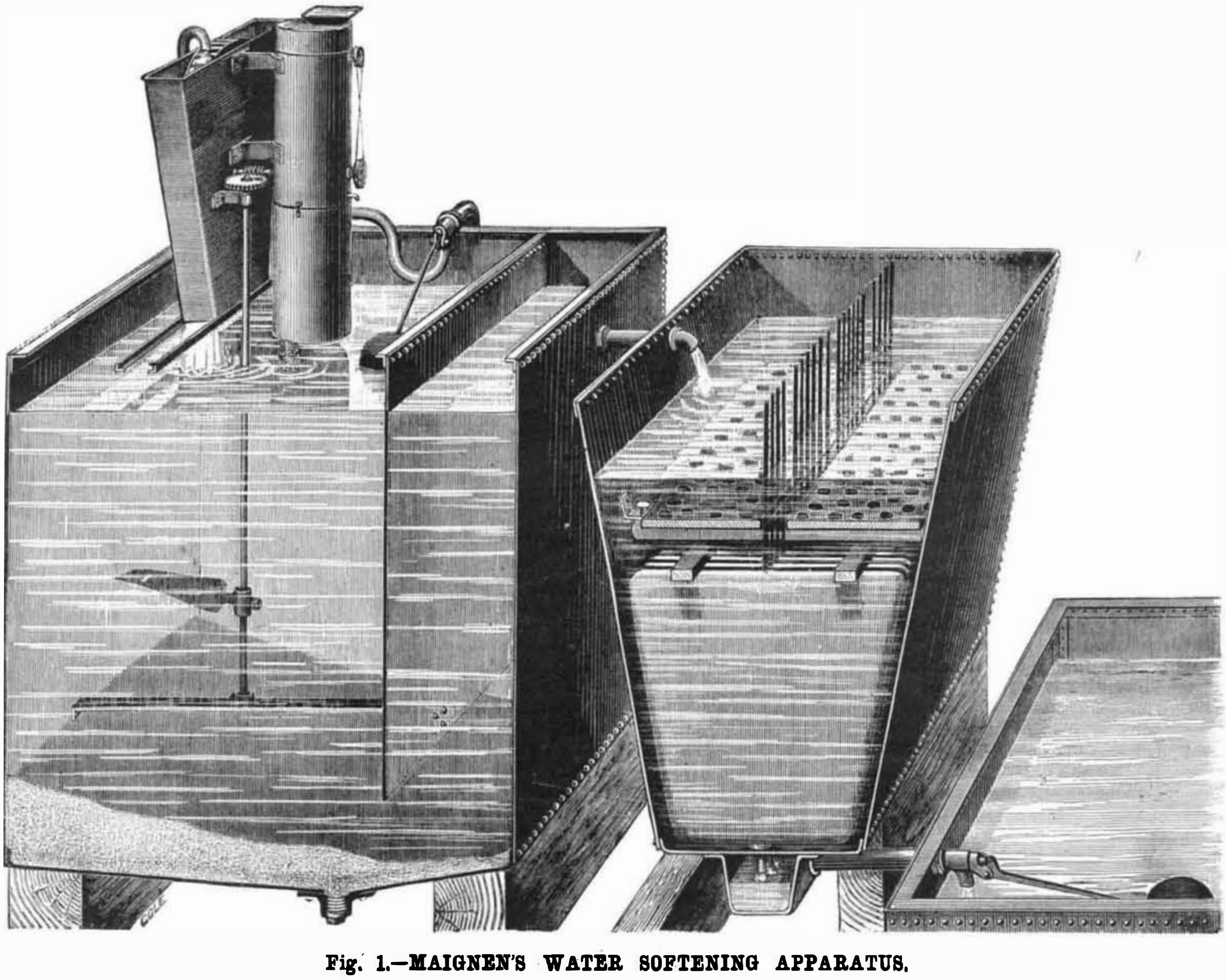


Fig. 1.—MAIGNEN'S WATER SOFTENING APPARATUS.

Power of Water to Move Gravel.

Mr. A. Del Mar writes from San Francisco to the London *Mining World:* I notice with pleasure that English mining capital is more and more attracted to hydraulic mining. It is the surest kind of mining, because you can thoroughly prospect the ground beforehand. By means of a common ground auger, costing a few pounds, and a couple of men, whose wages will not exceed a few pounds more, you can determine in advance the entire auriferous contents of a mine. It is the most profitable kind of mining, because the cost of washing a cubic yard of gravel rarely exceeds sixpence, and usually varies between one and two pence sterling; while the yield of gold is rarely less than sixpence, and usually varies between one and five shillings per cubic yard. It requires less capital to be sunk in machinery than any other kind of mining. The entire outfit consists of a wrought iron pipe and nozzle to bring the water in, and wooden sluice boxes to wash the gravel in. The pipe is always good for what it cost; the sluices boxes can be reduced to boards, and in that condition will readily fetch half price.

The discrepancies that appear in the prospectuses of certain hydraulic mines capitalized in England concerning the power of water to move auriferous gravel induce me to offer a few remarks. There can be no general rule on this subject, because there is no general hardness of gravel. In many of the placer mines of this State, in the old Roman mines on the river Quiroga, of Spain, and in some of the ancient placers of the Piedmont country in Italy, the gravel is exceedingly hard. Miners call it "cement." Its texture is that of cemented rubble, and only the heaviest streams of water can break it down. In other of the placer mines of this State, in those of the Rio Grande of Brazil, and in those of the river Boeza in Spain, the gravel is exceedingly soft. It runs so easily that water having no pressure at all will break it down. At the Hathaway Mine, Nevada County, Cal., I have directed a 500 inch head of water, with 300 feet of pressure, upon a gravel bank for ten or fifteen minutes before it showed signs of yielding. At the Babu Mine, Brazil, I could not get from the existing ditches more than 80 feet of pressure, and yet this broke the bank down faster than I could wash the dirt in the sluices. To call this Brazilian stuff gravel is a misnomer. It is a fine red dirt, of the color and almost the fineness of snuff.

Between these two extremes there is every conceivable grade of gravel. There is also a great difference in the pressure of water, and, therefore, a vast range of efficiency on the part of water to move gravel. A few instances will afford some idea of how much this differs. There is a small hydraulic opening in Placer County, Cal., where the pressure of water is only 60 feet, and the quantity of water moved per miner's inch of water is only one cubic yard. At the North Bloomfield mines (now closed by injunction of the Supreme Court), the pressure of water varied from 180 to 260 feet, and the quantity of gravel moved averaged about four yards to the miner's inch. At a gravel mine in El Dorado County the pressure was 350 feet, and this moved twenty yards of gravel to the inch of water. At the mines of Santa Lucia, Brazil, the property of Prince d'Eu, I moved twenty-five yards of gravel to the inch of water, the pressure being about 112 feet. In the mines of the Boeza, the pressure being 150 feet, and the gravel loose and uncemented, I calculated the work of water at ten cubic yards to the inch. In San Bernardino County, where I am erecting some works at the present time, I am to have a head of 200 feet, and the gravel being loose and friable, I have estimated on twenty yards to the inch. The sluices are of ordinary grade.

How to Make Battery Carbons.

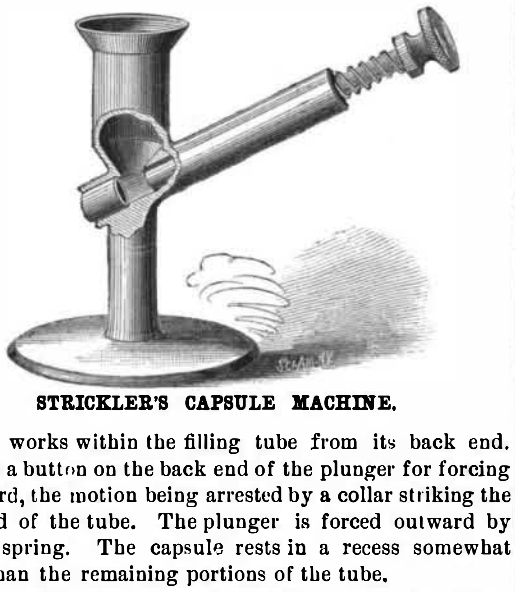
The *English Mechanic* tells a correspondent how to make carbon candles: Take, for instance, a carbon for use in an ordinary 5 x 7 Fuller or Bunsen battery. Make it, say, 2 x 8½ inches. Procure two pieces of sheet iron or brass, preferably brass, but the former will answer, 3 x 10 inches, not less than ¼ inch thick and perfectly flat. Then make, or have made, from a rod of metal ½ inch square and about 22 inches long, a rectangular frame of three sides, whose internal dimensions will be 2 x 10 x ½ inch or thereabouts. These three pieces constitute the mould, and in order to complete it, it only remains to place the U-shaped frame between the two plates, fastening the whole firmly together by means of screw clamps, and you will have an oblong box, open at one end. See that the parts fit as closely as possible. Next pulverize in an iron mortar a quantity of gas retort carbon or common coke, taking care to have a little more than is sufficient to fill the mould. The finer the coke powder, the better. Place it in a glass or earthenware dish, and pour upon it a small quantity of sirup or dissolved sugar. Mix and knead the mass thoroughly with the fingers, adding by degrees a little of the sirup until it becomes sufficiently moist to bind well when pressed together.

Set the mould on end, drop in enough of the mixture to fill it about one-third, and stamp it down lightly with a ¼ inch rod. Continue the operation until the mould is full, then get a piece of wood or metal nearly large enough to fit the mould, for use as a rammer. Place one end in the opening, and strike it smartly with a mallet. The mass will be driven down about 2 inches and tightly compressed. With a little water mix up some plaster of Paris to the consistency of dough, and press it into the opening, having previously removed the rammer. Force it down, and continue adding the plaster till the end is thoroughly closed. The contents of the mould are now ready for the "carbonizing" process. Make a good coal fire, place the mould upon it, and expose to a red heat for an hour or more. Allow it to remain until the fire has gone out. When cold enough to admit of being handled by the fingers, remove it, and if the experiment has been properly conducted, you will find the carbon complete.

It is true that a carbon made in this way is not so dense as the commercial article; but for ordinary battery purposes it will be found equal to any, and all that can possibly be desired.

CAPSULE MACHINE.

The engraving shows a machine recently invented by Mr. J. Strickler, of 297 Main Street, Poughkeepsie, N. Y., for filling gelatine capsules with quinine or other dry medicinal powders. The powder passes from the hopper into the filling tube, placed transversely below the hopper and inclined to the horizon, to facilitate the fall of the powder toward the end of the tube in which the capsule is held. The



STRICKLER'S CAPSULE MACHINE.

plunger works within the filling tube from its back end. There is a button on the back end of the plunger for forcing it forward, the motion being arrested by a collar striking the back end of the tube. The plunger is forced outward by a spiral spring. The capsule rests in a recess somewhat larger than the remaining portions of the tube.

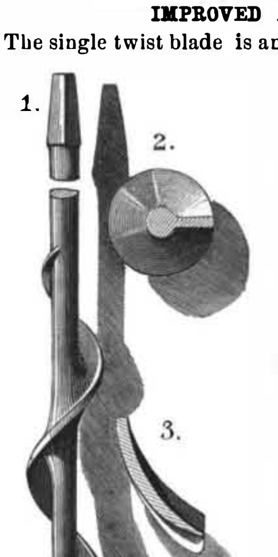
The capsule is held in place by the finger of one hand, and the plunger pressed down by the other. This forces the powder into the capsule, and the operation is repeated until the proper amount of powder has been put in. The forward end of the plunger is made slightly concave, for the purpose of leaving a convex surface on the powder to fit the cap when put on the filled capsules. When properly filled, the capsule may be expelled by pressing the plunger inward to its full extent. The return spring motion of the filler gives it an easy and quick filling action, and as the plunger passes beneath the hopper there is no liability of the powder clogging.

Peculiar Result of a Mill Accident.

The Duluth *Tribune* makes the following statement: "It was more than three weeks ago that John Johnson, a laborer in the Duluth Lumber Company's mill, was injured by being struck in the head by a stick flying from a saw The stick broke the skull just over the left eyebrow, and when Dr. Davis dressed the wound he took out a piece of the skull about an inch and a half large, exposing the brain. For some time Johnson's recovery was very doubtful, but he improved, and is now doing well. The peculiarity of the case lies in the fact that the wound has not entirely healed yet, and that it appears as though it would not heal; for the wound reached the nasal cavity, and now the patient actually breathes through that hole in his skull—that is, he can breathe so when he chooses to. He is now doing well, and promises to fully recover, except that he will always have the choice of breathing through his nose, his mouth, or the hole in his forehead."

IMPROVED AUGER BIT.

The single twist blade is an integral portion of the bit, and constitutes a quick, flat screw thread around the solid center stem that terminates at its forward end in a gimlet screw. The advance edge of the blade has a sharp cutting edge, Fig. 3, and spread sharp lips. It will be seen from this that the bit has but one edge or side cut. A hole can be easily, speedily, and smoothly made with it, and as the passage for the chips is larger than in the ordinary double-twist drill, a quicker and readier escape is allowed them, thereby reducing the liability to choke. Greater facility is also afforded for sharpening and repairing the bit. As it has a solid central stem, the bit may be broken or cut away at any point in the twist, and a new end gimlet screw and cutting edge formed.



This invention has been recently patented by Mr. W. M. Dimitt, and particulars can be obtained from Mr. C. H. Irwin, of Martinsville, O.; it is applicable to hand and machine augers.

Vegetable Culture in Bermuda.

Consul Allen says that onions, potatoes, and tomatoes comprise almost the entire production of Bermuda, and give employment to the greater portion of the inhabitants, and the prosperity of the colony depends largely upon the success of the crop and the demands of the markets. In onion growing the seed used is grown in the Canary Islands, and is imported in the months of August and September; it is sown in the months of September, October, and November, thickly in beds, the ground having been heavily manured with stable manure two or three months before sowing. The white seed is sown first, and produces the earliest crop, the shipment of which commences in March. When the plants are sufficiently large—about six to eight inches high—they are transplanted into beds about four feet wide, the plants being set about seven inches apart each way. The plants from the white seed are transplanted as soon as they are large enough, but those from the red seed are not usually transplanted until the beginning of January, and the ground requires to be only moderately manured. If transplanted too early, and the soil is too rich, the bulb is likely to split into several pieces, and is worthless. After transplanting, the soil requires to be lightened once or twice, and the weeds removed before they mature. As soon as the top begins to fall, the onions are pulled and allowed to lie on the ground for two or three days, when they are cut and packed in boxes of fifty pounds each and sent to market. All the onions are delivered at the port of shipment in boxes, ready for the market, and for the past two years the producer has been compelled by law to place his name or initials conspicuously on each package. It is estimated that a large profit on the outlay is realized, when the crop is large and the market good, an acre of ground sometimes returning as much as £120 to £170.

For the cultivation of potatoes the seed was formerly nearly all imported from the United States, but of late years has come largely from New Brunswick, Nova Scotia, and Prince Edward's Island. The ground for potatoes is usually plowed or broken up with the spade and raked, the seed cut into pieces with one or two eyes, and planted by forcing into the ground with the fingers to the depth of about four inches, in rows about twenty inches apart, and about eight inches in the rows. From six to eight barrels of seed are used to the acre. When the plants are a little above the ground, the soil is lightened between the rows with a fork, and when about six inches high the earth from between the rows is hoed round the plants, only one hoeing being required. For growing tomatoes the seed is imported every year, and is sown about October, and transplanted in December, into rows about six feet apart, and the plants are put about four feet apart in the rows. As soon as transplanted, the ground round the plants is covered thickly with brush —chiefly the wild sage which grows over the hills—not only to protect from the wind, but to keep the fruit from the ground. The brush is usually raised once by running a stick under and lifting it enough to clear the soil of weeds, no other cultivation being required. Six or seven quarts of fruit from the hill is considered a fair crop. The fruit is rolled in paper, and packed in boxes containing about seven quarts each. Consul Allen says that the price of land in Bermuda varies from £30 to £40 an acre, and in some cases not more than one-eighth is susceptible of cultivation. It is estimated that there is an annual export of 350,000 boxes of onions, the box containing about fifty pounds, and of potatoes 45,000 barrels.

Excavating in Quicksand by Freezing.

By a comparatively recent invention of Herr Poetsch, a Prussian mining engineer, the work of sinking shafts, and possibly other difficult work in tunneling and excavating in quicksands, has been greatly facilitated. The plan is to actually freeze the sand or running ground, for a little larger section than is required to be excavated, so that it can then be worked as in solid rock until the permanent walls are built up. This is effected by putting down bore holes, lined with iron tubes closed at the bottom, as near together over the whole section to be worked as deemed necessary for the rapidity of work desired, and circulating through these and interior cotton tubes a freezing mixture. A brine composed of chlorides of calcium and magnesium, having a freezing point about 36° below F., is caused to circulate through these pipes by a small force pump, abstracting heat from the surrounding water-bearing stratum until it is frozen into a solid mass.

An interesting illustrated description of this apparatus and its working will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 420.

Trade Marks.

A foreign contemporary has discovered that trade marks are nearly as old as the industry of the human race. Ancient Babylon had property symbols, and the Chinese claim to have had trade marks 1,000 years before Christ. Gutenberg, the inventor of printing, had a law suit about a trade mark, and won it. As early as 1300 the English Parliament authorized trade marks, and the laws of America have also protected them. Extraordinary means have been required at all times to guard against the fraudulent use of marks of manufacturers. If we have no means of identifying the trade mark, the best goods at once lose their value. This was early discovered, and probably the successors of Tubal Cain were the first to use distinctive marks on their productions.