## NEW INVENTIONS.

An improved attachment for gas burners, patented by Mr. George E. Smith, of New York city, is designed to prevent gaslights from being accidentally extinguished. It consists of a conical topped box, having a central diaphragm, apertures being made very near the middle of the box, and the diaphragm to permit the box to be mounted upon a gas burner. In use the cone of the box stands just below the tip of the gas burner. At the base of the gas burner a small aperture is made, through which gas constantly escapes when the gas is turned on for use. When the gas is lighted at the burner in the usual manner the escaping gas at the pin hole also ignites and continues to burn. Should the gas at the burner become extinguished by accident or from being blown out, the flame from the pin hole will immediately ignite the escaping gas from the burner. The conical shape of the box and the central diaphragm serve to protect the pin hole jet from becoming extinguished except when the gas is wholly turned off by the usual gas cock.

Heretofore vehicles have been constructed either with ordinary wheels only or with flanged or car wheels only, and with this construction it is very difficult for a vehicle with ordinary wheels to run on or from a track, and likewise it is very difficult to run a vehicle with flanged or car wheels from a track, in case an impediment or obstruction on the track is to be avoided, without damaging the wheels or the entire vehicle. Mr. José de Cauterac, of Madrid, Spain, has patented a vehicle which is equally well adapted to run on an ordinary road or on rails.

An improved game board for playing with marbles has been patented by Albert Benson, of Melrose, Mass. The invention consists in a circular board slightly inclined toward the middle and provided in its upper surface with a series of concentric circular grooves. A series of grooved radial arms, with baskets or boxes at the outer ends, are provided at the inner ends with tenons fitting in mortises in the edge of the circular board, which is provided with a sliding tally strip adjoining each radial arm.

An improved atomizer has been patented by Mr. George Schlauch, of Lancaster, Pa. The invention consists in the combination, with the vessel and its discharge tubes, of the double-acting air pump provided with valves and air conductors, whereby a continuous discharge of air will take place through the air discharge tube when the pump is worked, and a continuous delivery of spray will be maintained.

Mr. William Riley, of Dannemora, N. Y., has patented an improvement in the manufacture of felted hats and machine therefor. The invention consists in combining jet pipes and a hot water supply pipe with a hat block, and in combining cold and hot water supply pipes having rose jets with the hat block and stretcher.

An improved vapor burner has been patented by Mr. William H. Russell, of Sedalia, Mo. This invention is an improvement in that class of gasoline or hydrocarbon burners in which a jet of the heated and volatilized liquid issues through an orifice opening between an upper and lower plate, which spread the flame, and in which a screw valve regulates the admission of oil to the burner.

Mr. Edmund T. Lukens, of Oxford, N. J., has patented an improvement in that class of devices which are designed for the purpose of opening, closing, and locking blinds and shutters from the inside of the house. It consists of a sliding and rotating shaft passed through the window casing, and carrying on its outer end two beveled pinions, the extreme one of which is fixed to the rotating shaft, while the other pinion is rotated by the shaft which slides longitudinally through the pinion, the pinions gearing at one and the same time with a horizontal gear wheel that forms part of the shutter or blind hinge to hold said shutter or blind locked in any desired position, the extreme pinion being disengaged from the horizontal wheel when the said shutter or blind is to be opened or closed by the action of the inner and sliding pinion.

### The Census of Great Britain.

On the night of April 4 the population of the United Kingdom of Great Britain and Ireland, including the islands in British waters (the Isle of Man and the Channel Islands), together with the army and navy and merchant seamen abroad, was found to be 35,246,562, an increase of 4,147,236 as compared with the returns of the census of 1871. The females exceed the males by a little over 700,000. The percentage of population for England was 69·8; for Wales, 3·8; for Scotland, 10·6; for Ireland 14·6. The remainder, 1·2 per cent, was distributed between the Isle of Man (0·2), the Channel Islands (0·3), and the army, navy, and seamen abroad (0·7).

The density of population in England and Wales is 440 to the square mile. The greatest density is in the mining and manufacturing counties. Lancashire has over 1,700 to the square mile, and Middlesex (outside of London), 1,364. Six counties in England and one in Wales have over 500 to the square mile. London has 486 286 houses and a population of 3,814.571, having increased over half a million in the past ten years. The density of population in London is now 32,326 to the square mile.

Liverpool ranks next London in England, with a population over 550,000; Birmingham has over 400,000; Manchester and Leeds each exceed 300,000; Sheffield and Bristol have over 200,000 inhabitants each. Curiously the population of Manchester has fallen off 10,000 since the census of 1871.

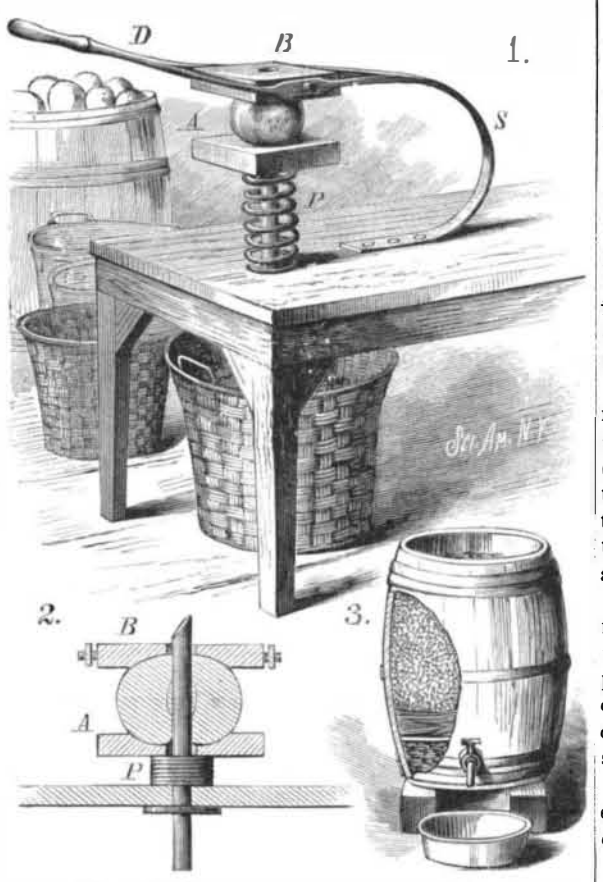
## HOW TO MAKE GOOD CIDER AND TO KEEP IT.

In localities where the apple crop is abundant the preparation of cider for market is a profitable industry when intelligently undertaken, and there are few beverages more palatable and less harmful than cider when properly prepared. Unfortunately, there are few farmers who really know how to make good cider or how to care for and keep it when made.

In the first place, apples not perfectly sound and well ripened are not fit for making cider. The russet is one of the best of apples for this purpose, but other and more commonly available varieties need not be slighted.

To prevent bruising the fruit intended for the cider press should always be hand picked. After sweating each apple should be wiped dry, examined, and any damaged or decayed fruit thrown out and used for making vinegar cider.

In the grinding or pulping operation the seed is often crushed and is apt to taint the juice, so that despite the loss and extra time required it is always better to core the apples before grinding them, as the cider will not only taste and look better but keep better. A cheap and handy coring machine is shown in Fig. 1. In this the coring tube, which may be of tin (free from iron rust), projects through a common bench or table, and is surrounded by an ordinary furni-




CORING MACHINE. FILTER.

ture spring, P, which supports a piece of wood, A. This has a hole in the center of it, over and partly into which the apple is seated. The lever, D, on which the piece of wood, B, similar to A, but having an aperture only large enough to admit the coring tube, is loosely hung by side pins, is held in position by the spring, S. The operation of the machine will be readily understood by referring to Fig. 2, in which it is shown in section.

All ironwork about the mill or press (rings, rivets, etc.) should be tinned or coated with good asphaltum varnish, as the color and sometimes taste of the cider is apt to be affected by contact with the rusty metal.

In pressing the pomice many of the best cidermakers prefer to use hair cloth in place of straw between the layers, as it is more cleanly and does not affect the taste of or add anything to the expressed juice.

As the cider runs from the press it should be filtered through a hair sieve into a clean wooden vessel capable of holding as much juice as can be extracted in one day.

Under favorable conditions the fine pomace will rise to the surface in about twenty-four hours—sometimes less—and in a short time grow very thick. Then it should be watched, and when white bubbles begin to appear at the surface the liquid should be drawn off slowly from a faucet placed about three inches from the bottom of the tank, so as not to disturb the lees.

The liquid drawn off should be received in clean, sweet casks, and must be watched. As soon as white bubbles of gas appear at the bunghole it must be drawn off (racked) into clean casks as before, and this racking repeated as often as necessary until the first fermentation is completely at an end. Then the casks should be filled up with cider in every respect like that already contained in it and bunged up tight. Many cider-makers add a gobletful of pure olive oil to the cider before finally putting in the bung and storing.

If it is desired to keep cider perfectly sweet—and this is rarely the case—it should be filtered on coming from the press, and then sulphured, by the addition of about one-quarter ounce of calcium sulphite (sulphite of lime) per gallon of cider, and should be kept in small tight full barrels. The addition of a little sugar—say one-quarter of a pound per gallon—improves the keeping qualities of tart cider.

An easily constructed cider filter is shown in Fig. 3, and consists in a barrel provided with a tap near the bottom. The lower part is filled with dry wood chips covered with a piece of flannel. Over this a layer of clean rye straw is packed down, and then the barrel is nearly filled with clean quartz sand, not too fine.

When the first fermentation of cider has been checked and the liquid barreled it should be allowed to stand until it acquires the proper flavor.

Much of the excellency of cider depends upon the temperature at which the fermentation is conducted. The casks containing the juice should be kept in a cellar, if possible, where the temperature does not exceed 50° Fah. When left exposed to the air, or kept in a warm place, much of the sugar is converted into vinegar and the liquor becomes hard and rough. On the contrary, when the fermentation is conducted at a low temperature nearly the whole of the sugar is converted into alcohol and remains in the liquid instead of undergoing acetification. The change from alcohol to vinegar (acetous fermentation) goes on most rapidly at a temperature of about 95° Fah., and at a lower temperature the action becomes slower, until at 46° Fah. no such change takes place. Independently of the difference in quality of fruit used the respect of temperature is one of the chief causes of the superiority of the cider made by one person over that made by another in the same neighborhood.

The more malic acid and less sugar present the less the tendency to acetous fermentation; hence it often happens that tart apples produce the best cider. But cider made from such apples can never equal in quality that prepared at a low temperature from fruit rich in sugar, which, if properly cared for, will keep good twenty years.

When the first fermentation has subsided and the liquor has developed the desired flavor in storage it is drawn off into other barrels which have been thoroughly cleansed and sulphured, either by burning in the bunghole a clean rag dipped in sulphur, or what is better, by thoroughly rinsing the inside with a solution of bisulphite of calcium prepared by dissolving about a quarter pound of the sulphite in a gallon of water.

The isinglass—six ounces or more (in solution) to the barrel—should be stirred in as soon as transferred, and then a sufficient quantity of preserving powder of bisulphite of lime (not *sulphate* or *sulphide*), previously dissolved in a little of the cider, to entirely check fermentation. The quantity of this substance required rarely exceeds a quarter of an ounce to the gallon of cider. A large excess must be avoided, as it is apt to injuriously affect the taste.

Some makers sweeten their cider by additions, before fining, of sugar or glucose, the quantity of the former varying from three-quarters of a pound to one and a half pounds, while as a substitute about three times this quantity of glucose is required. Sweetened cider, when properly cared for, develops by aging a flavor and sparkle resembling some champagnes. Such ciders are best bottled when fined.

The following are the methods by which some of the beverages found in the market under the name of "champagne cider," are made:

| | | |
|---|---|---|
| 1. Cider (pure apple) | ..... | 3 barrels. |
| Glucose sirup (A) | ..... | 4 gallons. |
| Wine spirit | ..... | 4 " |

The glucose is added to the cider, and after twelve days storage in a cool place the liquid is clarified with one-half gallon of fresh skimmed milk and eight ounces of dissolved isinglass. The spirit is then added and the liquor bottled on the fourth day afterward.

| | | |
|---|---|---|
| 2. Pale vinous cider | ..... | 1 hogshead. |
| Wine spirit | ..... | 3 gallons. |
| Glucose, about | ..... | 30 pounds. |

The liquid is stored in casks in a cool place for about one month, when it is fined down with two quarts of skimmed milk and bottled.

Much of this and similar preparations are doubtless sold for genuine champagne.

| | | |
|---|---|---|
| 3. Fine apple cider | ..... | 20 gallons. |
| Wine spirit | ..... | 1 gallon. |
| Sugar | ..... | 6 pounds. |

Fine with one gallon of skimmed milk after two weeks' storage in wood, and bottle.

### To Protect Lead against Corrosion.

Prof. Emerson Reynolds describes a process for the protection of lead against corrosion, which is done by coating it with a film of sulphide of lead. He recommends the following method: Take 16 grammes of solid caustic soda, dissolve it in 1·75 liters of water, and add to the liquid 17 grammes of nitrate of lead, or an equivalent of other lead salt, with 250 cubic centimeters of water; raise the temperature of the mixture to 90° C. If sufficient lead salt has been added the liquid will remain somewhat turbid after heating, and must then be rapidly strained or filtered through asbestos, glass-wool, or other suitable material, into a convenient vessel. The filtered liquid is then well mixed with 100 cubic centimeters of hot water, containing in solution 4 grammes of sulpho-urea or thio-carbamide. If the temperature of the mixture be maintained at about 70° C., deposition of sulphide of lead or galena, in the form of a fine adherent film or layer, quickly takes place on any object immersed in or covered with the liquid, provided the object be in a perfectly clean condition and suitable for the purpose. When the operation is properly conducted a layer of galena is obtained which is so strongly adherent that it can be easily polished by means of the usual leather polisher. It is not necessary to deposit the galena from hot liquids, but the deposition is more rapid than from cold solutions.

### The Coast Survey.

Though hampered by lack of means, the U. S. Coast Survey is steadily prosecuting a very important work. The extension of the triangulation from the coast inland, begun by Peirce, is going on under Superintendent Patterson in twenty-five States.

The Mississippi River has been surveyed as far up as Memphis, nearly nine hundred miles above its mouth. Important surveys and explorations have been made in far-off Alaska; soundings across Behrings Strait have developed a remarkable ridge extending between Asia and America—a circumstance hitherto unknown. The new surveys of the James and the Delaware are nearly completed, and the entire Gulf of Mexico sounded and mapped from the Mississippi to Yucatan and from the Bahamas to the coast of Mexico. To the present superintendent belongs also the "Coast Pilot," a directory of the Atlantic and Gulf coasts, long urgently needed by seamen. Although Bache had some idea of a publication of this kind it never took shape in his mind, and he left behind him only a few vague and disconnected notes of little practical value. Patterson conceived and put into execution the unique and elaborate plan which is now being carried out, and which will when completed form the most complete series of coast directories ever published by any nation.

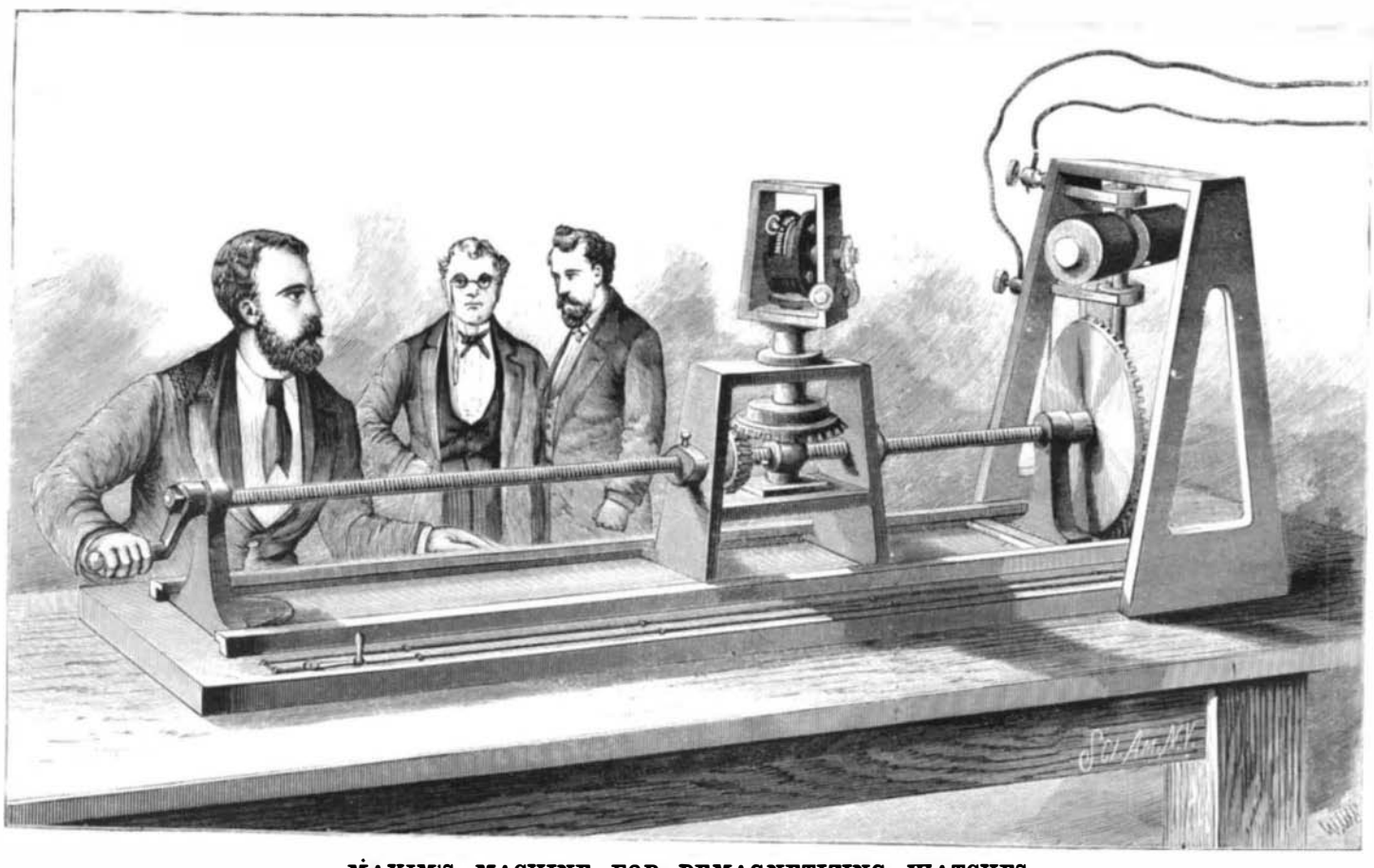
This plan proposes the publication of (1) a very complete description of coasts, bays, and rivers, as far as the head of navigation—a carefully prepared itinerary, in fact—giving in plain language detailed information on every possible question of interest to mariners—this to be issued in a series of five large volumes, illustrated with valuable views and charts; (2) a more condensed series in three volumes, embracing the same extent of coast but with less detail; (3) a single "handy volume," containing sailing directions for the whole coast from Maine to Texas. A work of a similar character is likewise to be prepared for the Pacific coast.

Meanwhile the topographical and hydrographic work is being rapidly executed—the latter being now almost entirely performed by officers of the navy, who, since the close of the war, have become once more available for marine surveying. In short, but few years can elapse ere the whole of the Atlantic coast and that of the Gulf of Mexico will show an unbroken border of surveyed topography and hydrography extending from Passamaquoddy to the Rio Grande.

### NOVEL MACHINE FOR DEMAGNETIZING WATCHES.

With the extensive use of dynamo-electric machines there arises a difficulty which is experienced by almost every one who comes into proximity to one of these machines; that is, the magnetization of one's watch so that its time-keeping qualities are seriously interfered with, or it stops altogether. Several methods of demagnetizing watches have been proposed, some of which operate with a certain degree of success, but all are more or less troublesome and uncertain.

Mr. H. S. Maxim, the well known mechanical and electrical engineer of this city, has lately perfected a piece of apparatus which is exceedingly simple and perfect in its action, and it may be used not only on watches and other small machinery affected by magnetism, but also on tools of any form or size.



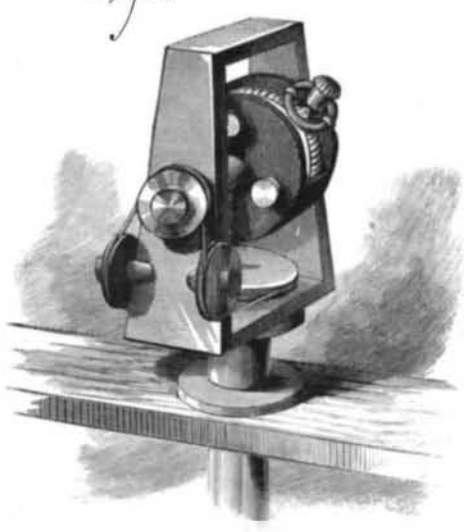
MAXIM'S MACHINE FOR DEMAGNETIZING WATCHES.

The device consists of a bar electro-magnet, mounted on a vertical spindle so as to revolve endwise in a horizontal plane. It receives a current from a dynamo-electric machine or galvanic battery, which is transmitted to the magnet wires through springs bearing on the insulated collars above and below the magnet, these collars being connected with the terminals of the magnet wire. The frame supporting the magnet spindle is attached to the end of a bed piece having on its upper surface ways for the carriage supporting the watch. This carriage is moved along on the bed piece by a screw having at one end a crank and at the other end a bevel wheel which meshes into a pinion on the magnet spindle.

The watch holder is mounted on a hollow vertical spindle opposite the poles of the magnet, and takes motion from the screw through a bevel wheel fixed to its lower end, and driven by a pinion carried by the carriage but rotated by the screw, the screw being slotted and the pinion being splined for that purpose. The watch holder is supported by a frame attached to the end of the hollow vertical spindle, and a small wheel is supported inside of the watch holder frame by a fixed shaft running downward through the hollow spindle and attached to the lower portion of the carriage.

The chuck in which the watch is placed is revolved by a belt passing over a pulley on the end of its shaft, under guide pulleys and around the fixed wheel, so that as the watch holder frame is revolved in a horizontal plane the watch is revolved in an ever-changing vertical plane.

Fig. 2.



ENLARGED VIEW OF WATCH HOLDER.

The operation of demagnetizing a watch is very easy. The watch is placed in the holder, and the carriage is moved up as near the electro-magnet as possible. The shear nut on the carriage is then brought into engagement with the screw, and the magnet is rotated rapidly, the watch at the same time receiving a compound rotary motion which brings every side of the watch in opposition to the poles of the magnet. The electrical circuit is thus completed through the magnet by means of the switch at the side of the bed piece, and the rotary motion is continued until the carriage has reached the end of the screw remote from the magnet, when the electrical circuit is broken and the work is completely done. It was our good fortune to witness this operation on a watch that was so thoroughly magnetized as to be incapable of making a single stroke of the escapement lever. When it was taken out of the machine its motion was perfectly free and normal, and the most delicate tests failed to reveal a trace of magnetism.

The theory of the action of this machine seems to be that the watch is subjected to rapid reversals of polarity in a gradually weakened magnetic field until the final reversals were practically *nil*.

Mr. Maxim informs us that the machine illustrated is intended for the Paris Electrical Exhibition. That is certainly a good field for an exhaustive trial. Messrs. L. & A. Mathey, the well known importers of fine watches, No. 16 Maiden Lane, this city, have the exclusive agency for this ingenious instrument. It may be seen in operation at their establishment, where watches may also be sent for demagnetization.

### Improvements in New York Harbors.

The annual report of General Newton to the chief of engineers, just submitted, describes at length the progress made last year in the improvement of navigable channels about New York. The most important operations were at Hell Gate. At Hallett's Point there has been continous work in grappling and removing the *débris* from the explosion of 1876. During the last fiscal year (ending June 30, 1881) there have been removed 9,823 tons of broken stone. The total amount of stone removed from this reef since the explosion is 81,907 tons. The full depth of 26 feet at mean low water has been obtained for the area embracing about two-thirds of the reef. Over the remaining one-third there are still shoal points having 19 to 20 feet over them at mean low water.

The work at Flood Rock has also been carried on without interruption. The length of galleries driven during the year was 6,211 lineal feet, and the stone removed amounted to 21,528 cubic yards. The total length of galleries on June 30, 1881, was 13,523 lineal feet. The total number of cubic yards of stone in place removed was 39,608. The work of excavating now proceeds almost as rapidly as it is possible to push it with the due regard to economy; and it is probable that it will require nearly two years to complete the excavations preparatory to the final explosion. The area already covered by the excavations is 4 844-1,000 acres. As the galleries extended to greater distances from the shaft it became necessary to provide means for ventilation, for which purpose a ventilating fan twelve feet in diameter driven by a twelve by eighteen vertical engine was placed at the opening of the shaft.

It is estimated that nearly two and a quarter million dollars will be required to complete the work, including the removal of the *débris* at Hallett's Point to a depth of twenty-six feet at mean low water, removing Heel Tap and the reef at the North Brother, with some work on Frying Pan, Pot Rock, and in extending channels and excavations in the middle reef (Flood Rock.)

In Buttermilk Channel a considerable amount of dredging has been done, about 80 000 cubic yards of material in place having been removed, increasing the width and depth of the channel. Originally the channel, which lies between Governor's Island and the Brooklyn shore, was obstructed by a large shoal with a minimum depth of 9½ feet at mean low water. It lay in the direct track of navigation and too near the wharves of Brooklyn for the safe passage or maneuvering of large vessels.

No work was done upon the improvement of Gowanus Bay (Brooklyn), or upon the proposed ship canal at Harlem River, the right of way not having been secured by the commissioners appointed by the Supreme Court. A small amount of diking and dredging has been done at Flushing Bay, and also at Newtown Creek.

### Curious Experiment in Magnetism.

The following experiment is described by M. Obalski, in a communication to the Academie des Sciences:

Two magnetic needles are hung vertically by fine thread, their unlike poles being opposite one another. Below them is a vessel containing water, its surface not quite touching the needles; they are hung so far apart as not to move toward one another. The level of the water is now quietly raised by letting a further quantity flow in from below. As soon as the water covers the lower ends of the needles they begin to approach one another, and when they are nearly immersed they rush together. The effect appears to be due to the fact that when the gravitation force downward is partly counteracted by the upward hydrostatic force due to immersion, the magnetic force, being relatively greater, is able to assert itself.

OLD MEN AS SCIENTISTS.—Recently Prof. Huxley said that 99 men out of every 100 became simply obstructive after 60 years old, and were not flexible enough to yield to the advance of new ideas. The world, he thought, would be benefited by any man who had taken part in science being strangled after 60.