

EVAPORATION OF LIQUIDS.—WAHL'S IMPROVED VACUUM PAN.*

Evaporation and concentration of liquids is an operation of special importance in most every one of the chemical industries. Solutions of sugar, glucose, glue, extracts of dyewoods, tanbark, meat, and other substances, wort, milk, and a great many other liquids have to be concentrated by evaporation, to either advance them in the course of manufacture or to bring them into a marketable condition. For all these purposes vacuum pans are now generally used, as they allow the evaporation to be carried on at a comparatively low temperature, and thus largely diminish the chance for liquids becoming colored or undergoing changes in their chemical composition. But although these dangers are diminished, they are by no means entirely obviated, for even in vacuum pans of the best construction, solutions are colored and decomposed to a more or less extent. Cane sugar is converted into molasses, glue into glycine, while all other substances are colored in a more or less degree, owing to the long time during which the liquids are exposed to the temperature in the vacuum pan.

Mr. C. Wahl, of the firm of Wahl Bros., of Chicago, who in many ways have advanced the manufacture of glue, fat, and other animal products, conceived the idea that a pan might be constructed in which the liquid would have to remain the shortest possible time while being evaporated. The construction of the vacuum pan, illustrated in the accompany cuts, Figs. 1 and 2, is the result of his endeavors, which, as it will be seen, were crowned with perfect success.

Fig. 1 shows a view of the pan and a part of the inside arrangements; the pan is provided with the usual attachments, eyeglasses, D, a condenser, F, vacuum gauge, thermometer, etc., but the liquid to be evaporated, instead of being filled into the pan in one bulk, passes gradually through the spiral shaped canal or gutter, A, which is shown separately in Fig. 2. The space formed between this continuous channel and the bottom of the pan is used as a steam jacket, the heating capacity of which is increased by a coil of steam pipe, B, running along on the bottom of the channel. *d* and *c* represent the inlets, and *e* and *f* the outlets for the steam. The liquid to be concentrated runs in at *b*, and after being concentrated issues at *g*, and runs into a vessel, G, located about thirty feet below the vacuum pan. Where the localities do not admit of this latter arrangement, the concentrated liquid must be pumped out, in which case vessels to be used alternately will be found convenient for the reception of the concentrated mass. It will be seen that the operation of this pan is continuous, and that its working can be regulated with the precision of clockwork by the admission of liquid through the faucet, *b*. While in the old style pans large batches containing up to fifty barrels are treated at the same time, being exposed to the high temperature for hours and more, in Wahl's pan every drop, so to speak, is treated by itself, and leaves the pan after having attained the desired concentration, which is accomplished in a few minutes, owing to the effective application of heat, which has to penetrate a low column of liquid of one-half to two inches height at the utmost.

The high column of liquid in the old style pans also causes violent ebullition and overboiling, which cannot happen with this improved apparatus. At the glue works of Messrs. Wahl Bros., of Chicago, these pans have been in successful operation for some time past, and parties desiring any further information will receive prompt answer by addressing them. The use of this pan is not confined to the evaporation of liquids, but the principle involved may also be applied in the cooling of liquids, such as wort, etc. The drying of lard oils and other substances can also be effected in this apparatus in the shortest possible time and without discoloration and decomposition.

Hurricanes and Waterspouts on Lake Tahoe.

Lake Tahoe, Nev., is famous for squalls, hurricanes, and waterspouts. At Tahoe City a remarkable display was recently observed. The attention of a fishing party at the outer end of a long pier was attracted by a loud roaring, and looking across the lake toward Glenbrook saw a hurricane approaching with a long wave or water swell, fifteen feet high in advance.

Knowing that this would sweep the whole line of the pier, all present beat a rapid retreat to the shore. When at a safe distance the party turned to gaze upon the incoming wall of water. While thus employed they were startled by a tremendous roaring to the northward, and a moment after a cyclone from that direction struck the lake. This sent before it a huge wave which had soon attained the height of that coming from the southward. In a few minutes the two waves came together. When they struck a column of water and spray was sent into the air to the height of at least 100 feet. The collision of the two waves was followed by a report that sounded like a heavy clap of thunder. A moment after this grand shock of the waters five or six huge water-

spouts made their appearance, all within an area of three or four miles, and carried great columns of water and spray to the height of several hundreds of feet. These circled to and fro over the lake for some ten or fifteen minutes, and then one after the other subsided, and for a time thereafter there was almost a dead calm. Waterspouts are very frequently seen on the lake at this season. This is owing to the peculiar situation of the lake, under the crest of the main ridge of the Sierra Nevada range of mountains. When a fierce gale from the west crosses the ridge it plunges down the great cañons, and thus are brought to bear on the lake conflicting currents of air. When a hurricane is blowing from the west immense volumes of air appear to be dammed up and compressed behind the ridge of the Sierras, which at times escape and come over and down the gorges in tremendous puffs. No navigator of the ocean, remarks the *Virginia* (Nev.) *Enterprise*, sees half as many waterspouts in a three years' voyage as are seen by persons residing at Lake Tahoe in a single season.

The Connellsville Coke Industry.

The Pittsburg *Manufacturer* has obtained from parties interested in the Connellsville (Pa.) coke industry the following facts respecting the magnitude of the business of that district. The 8,000 coke ovens of the district have a daily producing capacity of 15,000 net tons.

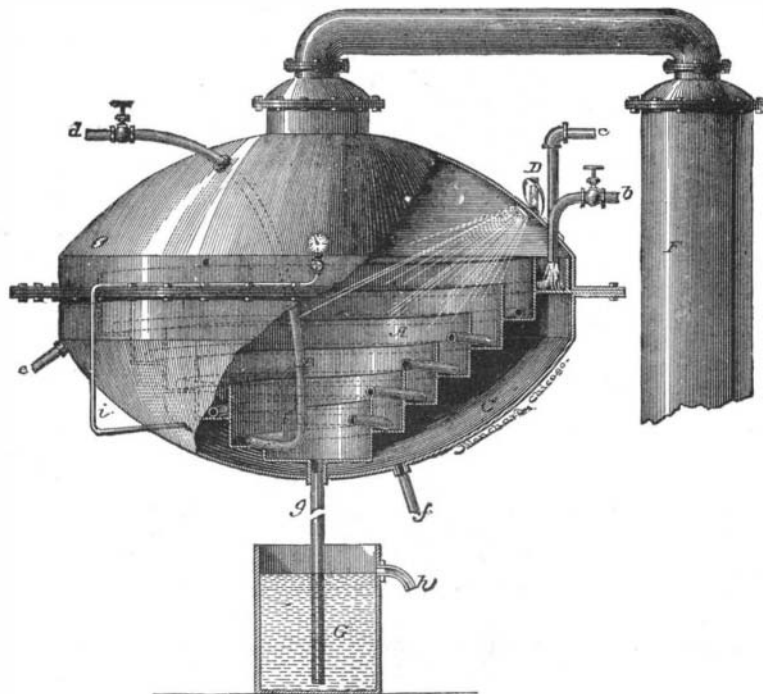


Fig. 1.

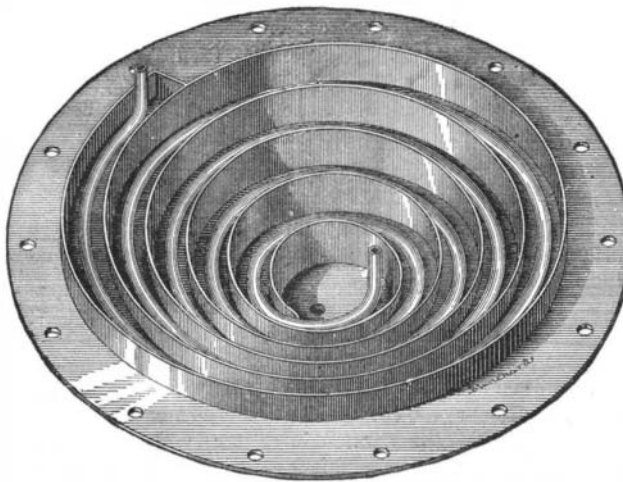


Fig. 2.—WAHL'S IMPROVED VACUUM PAN.

The most of the coke goes to the West and Northwest. Some of the most distant markets to which it is shipped are: Colorado, Utah, New Mexico, and Arizona. Freight charges to these points range from \$20.00 to \$45.00 per net ton. It is mostly used in iron making blast furnaces, and in the far west for smelting the precious metals, etc., but it is also largely used in foundries and other works. Its chief distinguishing merits are its high percentage of carbon, its freedom from impurities, and its hardness and consequent ability to bear a heavy burden in the furnace. Following is an analysis of Connellsville coke: Water at 225°, 0.030; volatile matter, 0.460; fixed carbon, 89.576; sulphur, 0.821; ash, 9.113.

The most amazing feature of this industry is the enormous waste of gas it involves, and of the by-products that would be got were the gas saved and purified.

The Color of Water.

Experiments made by J. Aitken confirm the usual notion that pure water has a blue tint; but he finds that the theory of selective reflection is insufficient to account for all the variations as to tint met with in the case of natural accumulations of water. Whitish particles are suspended in the water of the Mediterranean, and the tint varies from deep blue to chalky blue-green, according to the proportion in which these particles may be present.

Forests and Climate.

A paper has been prepared by Dr. Schomburgk, the Director of the Botanical Gardens at Adelaide, on the influence of forests on climate. The object of the author is to prove that the destruction of forests usually has the effect of reducing the rainfall, while, on the contrary, the planting of trees broadcast over a country is one of the best methods which can be adopted for ameliorating its climate and increasing the annual fall of rain. It cannot, indeed, be proved that the climate of South Australia is altering for the worse in this respect. In fact, a comparison of the meteorological records will show that the annual average rainfall for the colony during the past ten years has been 21.1 inches, as compared with 20.1 inches for the previous ten years. The fact is, that in the agricultural districts of the colony, and especially in those which were not originally timbered, the bringing of the land into cultivation has had the effect of slightly favoring the fall of rain. Plowed land attracts moisture to a much greater degree than the unbroken soil. In considering the effect which the removal of forests *per se* has in altering the climate in South Australia, the only direct test that could be taken from the records issued by the Government Astronomer is the experience of the neighborhood of Adelaide. If the time is divided which has elapsed since 1839, the year in which observations were commenced, into two periods, there is found for the first

an average rainfall of 22.8 inches, and for the second one of 21.7 inches. It will thus be seen that, on the whole, the rainfall at Adelaide is diminishing, though very slightly, and perhaps the diminution in the amount of timber may have something to do with the change. Dr. Schomburgk, in searching for illustrations of the effect of trees on climate, goes further afield, and brings forward some striking instances, in which it is evident that loss of forests means loss of rain fall, and *vice versa*. He recalls how the Russians, by burning down some of the Transcaucasian forests at the time of the struggle with the Circassians, converted the country from a fertile land into a desert, simply through the cutting off of the supply of rain. Similar instances of rain having deserted a country denuded of forests have occurred in the Mauritius, in Jamaica, the Azores, and, it may also be added, to a still more remarkable extent in several of the smaller West India islands. No sooner had the forests of these places been destroyed than the springs and rivulets ceased to flow, the rainfall became irregular, and even the deposition of dew was almost entirely checked. On the other hand, it is generally accepted as a fact that Mehemet Ali increased the fertility of Egypt enormously by planting trees. He alone planted some 20,000,000 on the Delta; his successors followed up the work, and it is a noteworthy circumstance that the rainfall rose from 6 inches, to 40 inches. Planting has also, it would seem, produced remarkable effects in France and Algiers. Extensive regions have been planted with gums and other trees, which, for the most part, grew to about 30 feet or 40 feet in height, and it is noticed that the quantities of rain and dew which now fall on the adjacent land are double what they formerly were. —*Architect*.

Operations in Rubber.

Within a short time the price of Para rubber has risen from 95 cents to \$1.25 a pound, making the price the highest ever reached in this city, and nearly double what it was two years ago—the result, it is said, of a corner by a few great operators. Most of the supply is held in Europe, though two-thirds of the rubber produced is worked up by American factories.

A meeting of seventy rubber manufacturers, representing capital to the amount of \$30,000,000, and over 60 firms employing from 15,000 to 25,000 hands, was held in this city, October 19, to devise means for defeating the corner. One of the means proposed was a general stoppage of work; another the formation of a purchasing bureau at Para. With the exception of a single company all the rubber firms of the country have entered into an agreement, by the terms of which the packing, hose, and belting makers were to reduce the production 25 per cent. after the first of this month, and the manufacturers of shoes and clothing are to shut down altogether after the 23d of December, that condition to continue until such time as the price of rubber warrants resumption.

The corner is confined to the high grade Para rubber, and has nothing to do with the common grade of Central American, Bornean, and African rubber. The cheap grades have, however, advanced fully fifty per cent in price, through sympathy. The stock of rubber in this city and Boston, it is said, is practically exhausted, and none is expected until the arrival of three ships from Para about Nov. 1. Some of the manufacturers find themselves embarrassed by the situation, while others, who have large stocks of crude rubber on hand, find it very profitable. In Para there are about 150 receivers of rubber who control the negroes who gather the gum. These receivers sell their stock to eight shippers, and several of these shippers are controlled by the corner.

* From the *American Chemical Review*.

Weeds and their Seeds.

In a recent experiment station bulletin, Dr. E. L. Sturtevant gives the following facts, as reported in the Albany Cultivator:

Weeds, however, show a most remarkable fecundity. It becomes impossible to select an average plant, as the growth varies so much in localities. We have, however, selected plants representing vigorous plants, and the average plant of our fields. The number of species of weeds upon the station farm is quite large, and the number which can start on a limited area is very surprising. June 22, a single square foot of ground in our pear orchard, that had been plowed and harrowed this season, was found to contain 356 growing plants, comprising 7 distinct species, not counting grasses or clovers. At the same date our forage plot contained 24 species of weeds, our lawn 13 species, our fields 30 species, and our garden 23 species.

On September 28, one vigorous pursley plant (*Portulaca oleracea*) contained 9 branches, the average branch 15 branchlets, the average branchlet 212 seed capsules, one average seed capsule 75 seeds, thus making for an estimate a grand total of 2,146,500 seeds.

June 21, an average plant of shepherd's purse (*Capsella bursa-pastoris*) contained about 1,000 pods, each pod at least 20 seeds, and more blooms to come. A better specimen showed 2,300 pods and still blooming; a vigorous specimen had 4,400 pods at least, and still blooming. The number of seeds to a plant may therefore be estimated at from 20,000 to 80,000. A fair sample of mallow (*Malva rotundifolia*) had 1,100 blossoms, and more to come, each bloom producing 15 seeds; the estimate for the plant, therefore, is 16,500.

A fair sample of chickweed (*Stellaria media*) showed 123 flowers and capsules, each of which produced from 7 to 10 seeds. A better plant showed 471 capsules, and many had opened and fallen. This plant flowers during a very long season, and the number of seeds upon the plant at one time may be safely estimated at from 1,000 to 4,000.

A plant of corn speedwell (*Veronica arvensis*) showed 43 pods with 90 seeds to a pod. A more vigorous plant showed 175 pods and about 101 seeds to a pod; another plant had 78 pods, and still another 123 pods. The number of seeds can therefore be estimated at from 4,000 to 15,000 to the plant. A specimen of the thyme-leaved speedwell (*Veronica serpyllifolia*) had 142 pods with about 58 seeds to the pod, or an estimated number of 8,000 seeds to the plant.

A fair, rather smallish plant of black mustard (*Sinapis nigra*) had about 120 blossoms and pods. One pod had 15 seeds; the estimate, therefore, is 1,800 seeds to the plant.

It does not require a very vigorous dandelion (*Taraxacum dens-leonis*) to throw up 10 or 20 blooms in a season, yet each head may contain 120 seeds or more, or from 1,000 to 2,000 to the plant.

A fair sample of curled dock (*Rumex crispus*) had 9 stems; one stem, selected as an average one, had 21 flower spikes, one average spike counted 369 blooms. A single stem had, therefore, about 7,750 blooms, and the nine stems about 69,000 blooms. A larger plant in the garden had ten stems. The largest stem had 41 seed spikes, the smallest 20 seed spikes, the largest spike had 630 whorls, the smallest 219 whorls. The computed number of seeds is therefore at least 93,390.

On July 1, a vigorous plant of corn cockle (*Lycchnis githago*) had 60 pods and blossoms; 2 seed pods had 49 and 62 seeds respectively; the total number of seeds may therefore be computed at 3,300.

On June 25, an average flower of the ox eye daisy (*Leucanthemum vulgare*) contained 802, and another flower 859 akenes to the flower. One plant had 72, and another plant had 120 blossoms. While often there is but one stem to a seed, yet frequently there are more, up even to 23. One stem may have 13 blossoms. The number of seeds to a plant may therefore be computed at from 8,000 to 96,000 seeds.

On July 6, a fair stool of chess or cheat (*Bromus secalinus*) had 211 heads, and an average head had 18 seeds; the estimated number of seeds is 3,798.

A fair sample of corn chamomile (*Anthemis arvensis*) had 151 seeds to the flower, and 48 flowers to a stalk. This plant has from 1 to 10 stalks. The seeds can, therefore, be computed at from 7,000 to 70,000 to a plant.

On July 12, a vigorous plantain (*Plantago major*) had 8 flower spikes, and one of these, not the largest, had 561 blossoms.

On August 29, an average sized plant of pigweed (*Chenopodium album*) had 28 branches. One branch bore 21 branchlets. One average branchlet bore 13 flower spikes. One average spike contained 108 seeds. The computation for the plant is, therefore, 825,552.

Sure Cure for Corns.

A. C., who has tried it, is authority for the following: Take one-fourth cup of strong vinegar, crumb finely into it some bread. Let stand half an hour, or until it softens into a good poultice. Then apply, on retiring at night. In the morning the soreness will be gone, and the corn can be picked out. If the corn is a very obstinate one, it may require two or more applications to effect a cure.

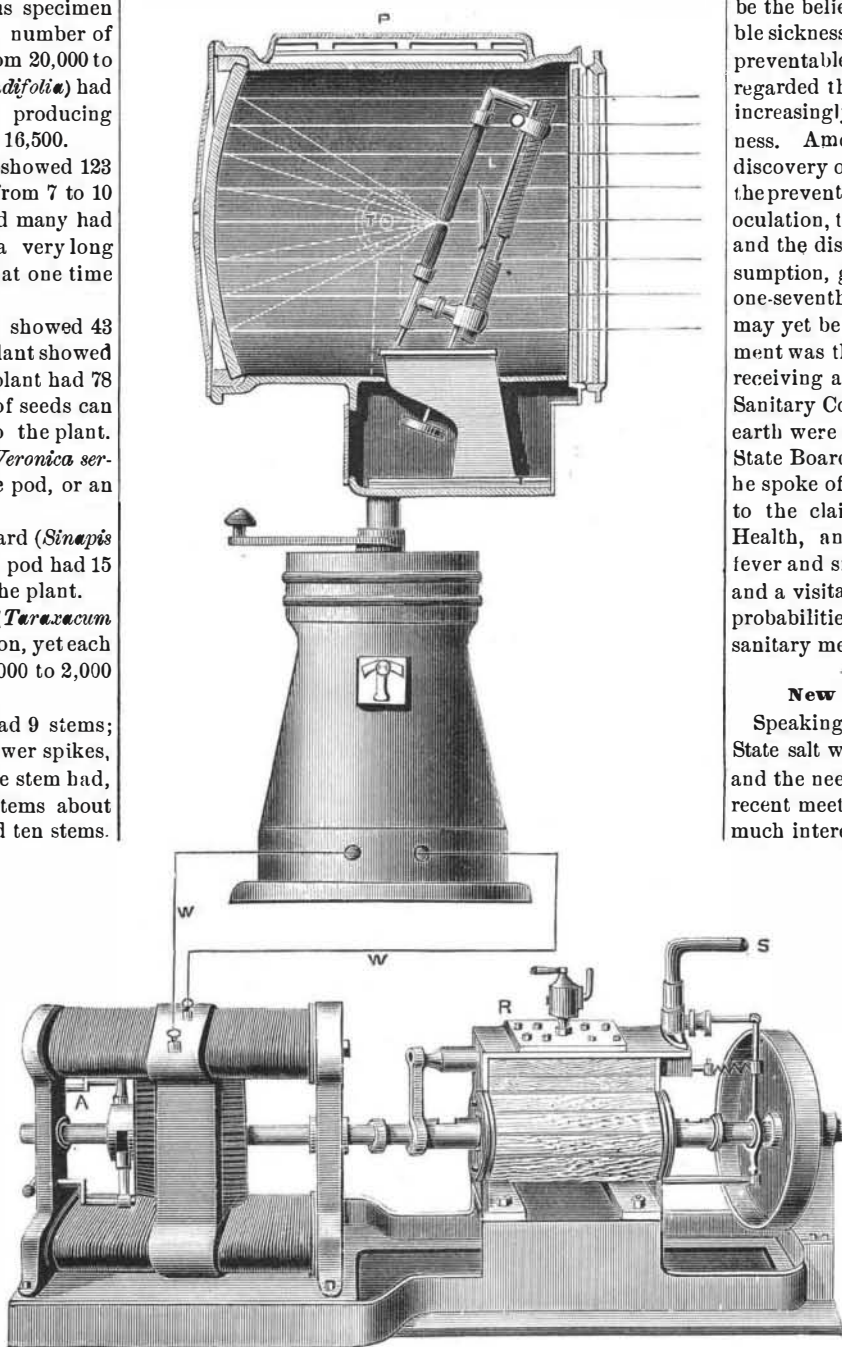
Trial of an Asbestos Fire Shield.

A test of an asbestos curtain or fire shield was made recently before members of the Washington Fire Board, and the police and fire departments. The curtain was hung between two posts. On one side of the curtain was a pile of kindling wood, and close on the other a frame of wood with a glazed window. When the kindling wood was fired the heat was so great that the spectators were driven back a distance of fifty feet. The flames curled against the curtain, but had no effect upon it or upon the window frame behind. The frame was not heated nor was the glass cracked, though both were within six inches of the fire, and separated from it only by the curtain.

The experiment was considered highly satisfactory. At the conclusion of the experiment the curtain was found to be unchanged and uninjured in the slightest degree. Even the smoke did not adhere to it. The shield is a fabric of asbestos millboard or sheathing covering fine wire, making one solid sheet, thus strengthening it to allow of its suspension from the upper part of a building, and hang down over the front to the ground, to protect it from exposure to fire.

NAVAL SEARCH ELECTRIC LIGHT.

The accompanying engraving explains itself. It illus-



NAVAL SEARCH ELECTRIC LIGHT.

trates one of eight projectors, or "search" lights, made by the British Electric Light Company, Heddon Street, W., for the Admiralty. According to the *Engineer*, no regulators are used, the carbons being kept in adjustment by hand as the beam of light is swung round the horizon. A is the Gramme dynamo machine; L is the hand lamp; R is Hodson's rotary engine; S is the steam pipe; P is the projector; W are the wires conveying current to lamp; T are the trunnions of projector.

Patent Law in Switzerland.

The proposed introduction of a patent law, which has been universally believed to be accepted, has met with a refusal by a public vote of the 30th of July. Switzerland and Holland are now the only countries in Europe which have no patent law. It must be acknowledged that the Swiss are not quite without reason in not accepting a patent law. Foreign patented, or non-patented, articles, in consequence of the low duties, meet with no difficulty in importation into Switzerland, while Swiss articles can, on account of the high protective duties, only in rare cases enter the neighboring countries. As long as these abnormal circumstances exist, Switzerland is not likely to give foreign products an additional protection by patents.—*Chem. Zeit.*

American Public Health Association.

The tenth annual session of the American Public Health Association began in Indianapolis, Ind., Oct. 17. In the annual address President R. C. Kedzie, of Lansing, Mich., reviewed some of the more striking lines of evidence to disprove the assertion that sanitary effort—though it prolongs life—does not really benefit the race. The truth is, life is not only lengthened but made more valuable and enjoyable by improvement in man's surroundings.

As the result of sanitary science he said the death rate in England has been decreased 12 per cent in urban and 8½ in rural districts. The number who survive youth by reaching the age of twenty has been increased 12½ per cent during the last years, while the number of those who pass from twenty to thirty-five years has been increased 12½ in the same period. Two hundred years ago in England, small pox, when it became prevalent, killed 96 out of every 1,000, and 66½ in Germany. Now the mortality from this cause is less than 1 in 1,000. Sanitary science has thus saved 95 deaths in every 1,000 in England, and 66½ in Germany, and such a visitation as the black death in Europe would never be known again until sanitary science became a thing unknown. The number of deaths from typhus had been reduced in England more than half, and the same was true of any other disease. Indeed it had, he said, come to be the belief of scientific and thoughtful men that preventable sickness unprevented is a crime against society, and that preventable death unprevented is a crime against God. He regarded the outlook for the progress of sanitary reform as increasingly favorable and giving much ground for hopefulness. Among the grounds of encouragement he cited the discovery of remedies for splenic fever in domestic animals, the prevention of disease by the extension of the method of inoculation, tried successfully upon animals, to the human race, and the discovery of the bacillus, which is the cause of consumption, giving hope that this dread disease, from which one-seventh of the deaths in the human family take place, may yet be found curable. Another ground of encouragement was that the question of public health was everywhere receiving attention, as was evidenced by the recent World's Sanitary Congress, where all the civilized nations of the earth were represented, and also the general organization of State Boards of Health. In alluding to discouragements, he spoke of the indifference of Congress and the Executive to the claims and importance of the National Board of Health, and argued that the present time, when yellow fever and small pox were both liable to become epidemic, and a visitation of Asiatic cholera was not among the improbabilities, was not a fit occasion for neglecting any sanitary measure that had hitherto been found beneficial.

New York State Salt Water Fish Hatchery.

Speaking of the slow progress made in establishing the State salt water fish hatchery at Cold Spring, Long Island, and the need of hurrying the work, Mr. Blackford said at a recent meeting of the State Commissioners of Fisheries, that much interest has been taken of late in the development of cod fisheries on the Long Island coast.

Already large numbers of cod were taken for the New York market in the fall and early winter months on the south coast from Coney Island to the point. Over twenty-five fishermen were engaged in taking them, besides many private boats. The commissioners could get codfish with little expense, and they would increase very rapidly. He also said that codfish were growing scarce rapidly along the New England coast. He thought the spawn of the Spanish mackerel could be obtained and the work of hatching carried on with success in the Long Island preserves. There had been expended in fixing up an old building for a hatchery at Cold Spring \$178, and a few hatching troughs had been prepared. This was all that had been done. Commissioner Sherman was in favor of continuing the work at Cold Spring, but thought that it should go on in a moderate manner. He considered it an experiment as

yet. The time was soon coming when the spawn of striped bass would be obtained in quantity, and this fish would become one of the most important in the markets, as it will live in both salt and fresh water. He thought special attention should be given to it. The spawn could be taken from the Potomac and other southern waters. In his opinion the hatchery, in time, would be of the greatest importance in raising striped bass. The fresh water ponds could be utilized for brook trout and land-locked salmon. The commissioners then decided to complete the work, and Commissioner Blackford was appointed a sub-committee to put in order the hatchery and hatch such fish spawn as the United States Commissioners and the hatchery at New Caledonia could furnish; also to build such salt water ponds as he thought advisable for the hatching of salt water fish, the expense for such purposes being limited to \$1,000 until the further ordering of the Board of Commissioners.

THE census in the French colony of Algeria for 1882 gives a total population of 3,310,565. This shows an increase since 1876 of 442,939. Of the total number given, 233,937 are French and 2,861,019 Mussulman natives. The rest are made up of naturalized Jews and foreigners.