mass of willows in which the kingfishers had been sounding their loud call during the day, and beyond them loomed up the timbers of the old mill whose wreck was to be our pier. Poor old mill, it had been starved to death by tariffs, a grim punishment for its slaughter of many a good king of the forest. We landed, and in the soft stillness made our stumbling way across field and pasture to the cosy Ingonish parlor, where, in strange contrast to rugged coast, and stern mountain, and the general simplicity of the fishermen's houses on the shore, we had found refinement, comfort, and open hospitality.

Beyond the great wall of rounded stones, raised by ice and storm, lay the beach. The rippling waves played softly upon the firm sand, making dainty lines across it. We could hear the murmur of those waves and the faint rustle of the breeze in the shrubbery. All was peace and gentleness, yet under that kindly music those who knew Ingonish Bay could hear other voices. High in the air the powers of the storm were holding council, and deep in the sea the tides were planning to hurl themselves upon the shore. It is always so by the northern ocean; and when the waves break most lovingly upon Smoky, the old mountain and his children the fishermen are most alert for the tempest which is to follow.

Frank Bolles.

HAMBURG'S NEW SANITARY IMPULSE.

THE experience of 1893 made it seem probable that the cholera could never again prevail in uncontrollable epidemic form in western Europe or America. The kindred sciences of bacteriological medicine and public sanitation have, in the last two years, grappled most brilliantly and effectively with the frightful monster. Berlin, Paris, London, and New York have learned that they can hold the cholera firmly in check. And now the cities that have suffered most in the last ten years, such as Naples and Hamburg, are prepared to meet the scourge on its appearance, and prevent it from becoming widely epidemic or from interfering seriously with business. The unspeakable fright, therefore, which has until now attended the outbreak of cholera in western Europe and America is likely to pass away with the present decade; so that a sporadic case now and then will have no paralyzing effect upon the environing community.

It is clearly fortunate, however, that Europe should have suffered these recent pangs of awful fear. The cholera is a sensational disease. Other maladies, preventable to a large extent by public hygienic measures, are far more destructive of life than the cholera. But their ravages are more insidious and more commonplace; and the warning cry of sanitary science acts tardily and feebly upon municipal purse-strings. A high average death rate, due to bad sanitary conditions, is not ordinarily seen to disturb the course of trade, or to lessen greatly the life-chances of the burghers who pay the heavy taxes and control the public funds. But a cholera epidemic ruins business, impoverishes the comfortable burghers, and threatens to invade their domiciles and rob them of their first-born. It acts as the effective tenth plague, and the municipal Pharaoh bestirs himself mightily. Naples had long intended, in a languid way, to reform its sanitary arrangements; but not until the cholera epidemic of 1885 supplied the motive force was anything of much importance undertaken. The im-

provements set on foot as a result of that epidemic have revolutionized the city, and will have resulted in the saving of many thousands of lives every year; for the principal effect of efforts to guard against cholera is to abolish, or greatly diminish, mortality from various other causes. That epidemic at Naples led, further, to the enactment of a new sanitary code for the Italian kingdom, and to many excellent improvements in other Italian cities and towns besides Naples.

Far more widespread throughout Europe, however, will have been the improved sanitary arrangements resulting from the cholera invasion of 1892–93. It is in Germany, doubtless, that the most important effects will appear. The German cities have not, until lately, been largely impelled by the sanitary motive, in their municipal activities. They have done wonderful things, and have shown a splendid capacity and business thrift. But while the public health has been the dominant motive in the development of the municipal functions of some of the British cities, good financial results have seemed to be the chief criterion of success in German municipal government. The broad generalization is too sweeping, yet it is upon the whole a safe one. While taking the lead of all nations in the scientific study of the problems of the public health, the Germans have not been the most eager people in the world to spend millions of money in the application of hygienic principles. Fortunately for them, they have the best scientific leadership that any country can afford, and at the same time they have by far the best administrative mechanism. All that had been needed, therefore, was the motive strong enough to open wide the public purse-strings. The cholera appears now to have supplied it. All over Germany the learned doctors and bacteriologists are dictating terms to the awakened municipal authorities.

The most interesting centre of this new sanitary activity is stricken Hamburg. There is very much in its conditions and in its plans and undertakings that ought to interest the intelligent people and the officials of our American cities. Let it be said in preface that Hamburg was most unjustly treated by the major part of our press during the summer and autumn of 1892, and that most Americans have an entirely erroneous impression of it. Until late years it has received comparatively few American visitors; and of course for two seasons it has been shunned. Even the travelers who patronize the fine steamers of the Hamburg-American Company hurry on to Berlin, and learn nothing of this noble old Free Hansa city and magnificent port. In America it is chiefly known as the place from which so many undesirable emigrants take shipping, and has the reputation of being indescribably filthy, overcrowded, ugly, and uninteresting, — a place, in short, to be avoided. No impression could be further from the truth. The emigrants go from Hamburg for the same reason that they land at New York: the one, like the other, is without rival as the greatest port of its continent. Ships go everywhere from Hamburg. Its dock and harbor arrangements excite the enthusiastic admiration of every visitor. There is no such sight elsewhere in the world. The boasted Liverpool arrangements are far inferior. Within a decade there has been expended by the German Empire and the city of Hamburg a sum approaching forty million dollars in the construction of this vast shipping terminal, the modern conveniences of which make everything along the New York docks seem absurdly effete and obsolete.

Hamburg is an infinitely more attractive and picturesque city than Berlin. The dull and somewhat cheap monotony of the huge new imperial capital is almost painful after a few days of Hamburg's variety and charm. The city's

architecture combines the modern with the mediæval in the most delightfully unexpected ways. Many whole streets of the high-gabled, timber-framed, quaint-windowed houses of the old sixteenth and seventeenth century Hanseatic merchants remain in good condition; and yet the city as a whole is distinctly modern in its architecture. Far from being hopelessly congested and void of breathing-spaces, there are a number of tree-lined thoroughfares, much broader than are to be found in leading American cities, and in the very heart of the city there are large water spaces and park areas, with extensive girdling promenades, and every facility for healthful outdoor recreation.

A dignified and splendid city is Hamburg, with its 600,000 inhabitants, its immense commerce with all parts of the world, its unusually intelligent merchant body, its suburbs of handsome villas, its modern growth and enterprise, and its fine traditions and history that bind it to a noble past. And its very life has been the great river Elbe. But the Elbe, which has been its commercial mainstay, has brought death as well as life. The river has always supplied the city with water for drinking and domestic uses, and its unwholesomeness has long been fully confessed. But many things have prevented, until recently, the firm attempt to solve the paramount sanitary problem of the city's drinking-water. Early in the seventies an elaborate investigation resulted in a report advising the filtration of the entire Elbe supply. But opposition arose, the discussion was protracted, and nothing was done. The inclusion of Hamburg in the new German Empire, and its accession at last to the German customs-union, led to the concentration of the municipal energy upon the development of the port facilities. The abandonment of Hamburg's status as an independent port, and its inclusion in the tariff system of Germany, took practical effect in 1888, and the influence upon the city's traffic and growth was both immediate and very important. Meanwhile, the scientific consideration of the water supply had not been altogether suspended, and the city's enhanced importance furnished a new reason for action.

In 1890, it was actually determined to proceed at once with the construction of an extensive plant for the filtration of a supply of Elbe water equal to the entire demand upon the water system for all purposes. Expert investigations, with reinvestigations and all sorts of cross-examinations, had resulted in a plan that was adopted with confidence. It was pronounced feasible by the municipal engineers to have the filtration plant ready for use in 1894. The cholera emergency led to prodigious efforts, and the new system was put into operation in May, 1893, nearly a year ahead of time.

The last seventy-five miles of the Elbe form an estuary of the North Sea, and the tidal movement up as far as Hamburg is considerable, amounting to several feet on the seaward side of the city. The Elbe flows northward; and the old waterworks were situated on the southern edge of the city, the intention being that the water should be pumped from a point in the stream that lay above the brackish and polluting influences of the flood tide. The "intake" was in the middle of the river, just opposite the large pumping station, high water tower, and adjoining reservoirs which constituted the old waterworks that served the whole city. As a matter of fact, the intake was not far enough upstream to escape serious contamination from the recession, at flood tide, of the polluted water of the harbor and lower stream. One must remember that the Elbe carries off the entire sewage of Hamburg; and that the stupendous aggregation of ships, of wharfs and warehouses, and of manufacturing establishments makes the water of the port about as filthy as possible. The sewer system of Hamburg is

by no means a bad one. The houses are all connected with well-built street mains, which empty into several large *collecteurs*, or sewage canals. These principal conduits in turn converge and join in one huge discharging sewer tunnel, which is carried well out into the channel of the river, and empties at the lower edge of the city. The discharge is dammed in and held back during the hours of inflowing tide, so that the main harbor, and the numerous branching navigable *Fleete*, or canals, that make Hamburg something like Venice, may not be fouled and gradually filled up by subsidence from the immense volume of liquid filth. The sewer gates are opened only when the ebbing of the tide joins with the ordinary flow of the river to give a sweeping current out to sea. This, at least, is a far better arrangement for sewage disposal than certain American cities lying on tidal water possess, which dispense with collecteurs entirely, and discharge their sewage at numerous points all along the river frontage.

But it is far from being a perfect system. For although the Elbe estuary is a broad stream, the cities of Hamburg and Altona have become so great that the combined volume of their refuse material is enormous; and the plan of discharging at ebb tide alone cannot wholly prevent the subsequent backflow of pollution from the sewers. Quite apart from any and all local sources of contamination at Hamburg, the Elbe water is by no means pure, for the river drains a populous valley, and has many large towns and villages on its banks. Hamburg ought long ago to have extended its intake far enough upstream to make perfectly sure that its citizens would not receive again through their water-pipes the fouled effluent of their drains. But at the time of the cholera visitation of 1892 the old intake was still in use, and was undoubtedly within the sphere, at flood tide, of harbor refuse and city sewage. An essential feature of the new water system, therefore, has been the extension of the receiving tunnel up the river to a point some miles above the now abandoned intake. This work involved very large expenditure, since the new tunnel had to be constructed under the bottom of the river.

The filtration system, however, is the interesting feature of the new Hamburg water supply. It is by far the largest and most successful "plant" for the removal of impurities from drinking-water that any city has yet instituted. It happens that Hamburg is so situated that it is practically compelled to draw its water supply from the river. There are no mountain sources accessible. Naples, like Vienna and Munich and Glasgow, has been able to secure abundant water from high and uncontaminated mountain regions. But Hamburg lies in the lowlands, at the mouth of a broad valley. We have a number of cities in the United States that seem to be under the necessity for all time of drawing their water supplies from the much-polluted rivers on the banks of which they are situated. For these cities the question of an effective method of filtration has the very highest consequence. From Minneapolis to New Orleans the cities of the Mississippi Valley are concerned. Cincinnati, Indianapolis, Louisville, Omaha, Sioux City, Kansas City, and many other cities must continue to drink river water. If the Elbe and the Rhine can be completely filtered, there will be no question about American rivers.

A general description of the Hamburg system can easily be given. The city was fortunate in owning two large islands in the Elbe, which have been connected by a narrow embankment, and which extend from a point near the old waterworks upstream for a distance of about two miles. The uppermost of these islands, the Billwärder Insel, is the larger of the two. Somewhat further up the river is the new intake, with its well screened and guarded opening. The re-

ceiving tunnel is perhaps ten feet in diameter. On this upper island have been constructed four large reservoirs, or sedimentary basins, as it might be better to call them, each of which has a capacity approximately equal to the supply of the city for one day. A new pumping plant on the island lifts the water into these basins. The four are used in rotation. It has been found by experiment that the best results are attained by allowing the water to stand undisturbed for about twenty-one hours. Sluices and valves enable the basins to be used separately and successively. Thus, while Basin I is engaged in feeding the filters that supply the city, Basin II is full and closed for a day's deposit of sediment, Basin III is being pumped full from the intake, and Basin IV, which is quite empty, is in process of being scraped and cleansed. When Basin I's supply has been drawn off, it in turn is closed for removal of sediment, Basin II is put into connection with the filters, Basin III is full and closed, and Basin IV, having been cleaned out, is again in receipt of a supply from the river. And so the rotation is complete. Each of these sedimentary basins has a superficial area of perhaps twenty-five acres.

The screens at the intake mouth of course keep out all large extraneous objects. The settling process in the great basins further disposes of fine sand, and of very much of the mud and silt that discolor the water as originally received. But from the hygienic point of view, it is obvious that nothing of very radical importance has been gained by the mere fact of a day's rest in a settling basin. It is in the filtering basins that the revolutionizing results are attained.

The lower island, the Kalte Hofe, lying just above the old waterworks on the east bank of the Elbe, at the Rothenburg suburb, presents a sight best seen from the top of the waterworks tower, and one quite worth the climb of 365 steps. One looks down upon an island perhaps three fourths of a mile long and one fourth of a mile wide, the greater part of which is covered with even rows of rectangular basins, each of which has a surface of 7500 square metres, or about two acres. There are twenty-two of these open filter basins. To describe their mechanism in detail would be to attempt an engineering article. It will be enough to tell in a general way how they are made and how they work. In principle they are not original. Sand filtration has been in use to some extent for many years. Altona, the flourishing manufacturing city of 150,000 inhabitants that lies solidly against Hamburg on the side towards the sea, and is virtually part and parcel of the larger city, has for thirty years used sand filtration to make Elbe water potable. Berlin also filters through sand-lined basins a considerable part of its drinking-water. The London water companies have made successful use of the same system, and other cities have had some experience of this mode of water purification. The Hamburg plant on the Kalte Hofe is notable, therefore, not for the introduction of a new principle, but rather for the utilization of an old principle in a far more complete and successful working plant than any other city has yet established.

The filter basins on the Kalte Hofe, like the large sedimentary basins on the Billwärder Insel, are constructed with the utmost care, being lined very solidly with clay, concrete, hard brick masonry, and cement plaster. Across the floor of each filter basin are many large pipes perforated with countless holes. The basin itself being ready and the punctured pipes being in place, the process of filling begins. First comes a layer of small, well-selected stones, covering the floor to a depth of about eight inches. Then is spread, to a like depth, a layer of gravel; that is, of stones smaller than those forming the bottom stratum, but much coarser than the layer of coarse

sand, also eight inches deep, that is next placed above it. Upon these three foundation layers is deposited the principal material of the filter, namely, a layer of fine sand, one metre (nearly forty inches) deep. When the filter is in use, the water stands exactly one metre deep on the metre of fine sand. Ingenious automatic regulators so control the inflow and outflow as to keep the water at an unvarying depth of one metre. It would be superfluous to attempt a detailed explanation of the admirable adjustment of all the parts of the water system to one another. It is enough to say that the pumping facilities are well adapted to the requirements of the sedimentary basins, that the filter basins are nicely adjusted to receive and dispose of the quantity discharged from the Billwärder Insel, and that the arrangements of the old water station on the mainland at the Rothenburgs-ort are fully equal to the reception of the purified effluent of the filters, and its distribution throughout the entire city.

It must not be supposed that this system, when once established, needs no further care or attention. The filters are all under constant inspection, and one by one they are cut off temporarily from active service in order to be emptied into the river and cleansed. Adjacent to the group of filter basins is an establishment fitted up with facilities for cleansing the sand and small stones. Ordinarily, it is found quite sufficient to remove a few inches of the fine sand for purification, leaving the rest of the filter undisturbed. It is not, indeed, desirable to take away all the deposits that the sand retains from the water as it trickles through. A certain amount of "scum" must be collected before the filter is at its best. It must be remembered that the chief purpose of the filter is the removal of microbes, whose existence can be ascertained only by bacteriological tests. These bacilli are so small that some millions of them would not feel crowded on the point of the finest needle. A yard or two of ordinary sand and gravel could therefore hardly be expected to filter out the microbes as if they were so many crawfishes. The experts tell us that it is the scum, collecting on the sand and filling the interstices between the stony particles, that somehow manages to detain the microbes, while the water passes on purified and wholesome.

Let no one suppose that this is a mere matter of conjecture, or of an occasional test with dubious results. The effect of the Hamburg filtration upon the bacteriological condition of the Elbe water is now a subject of constant examination and precise knowledge. The whole system has, during and since the summer of 1893, been operated with reference to the fact that the Elbe has been discovered to contain cholera germs, and that Hamburg proposes to give its people a water free from those germs. To this end, the director of the city's hygienic laboratory has been accorded an almost dictatorial authority. At the time of the epidemic in 1892, the distinguished authority Professor Geffke, of the University of Giessen, came to Hamburg to assume temporary charge of sanitary arrangements. He brought with him from Giessen, as his assistant, and left behind him in control of the Hygienic Institute, a young and rising bacteriologist, Professor Dunbar. Dr. Dunbar very rapidly and effectively developed the Hamburg municipal laboratory into one of the most important in the world, and gave it a practical relationship to health conditions that the authorities of Hamburg could not fail to recognize. Dr. Koch came later from Berlin, on behalf of the imperial government, to aid and advise in the struggle to subdue the epidemic, and he was surprised and delighted to discover the rare scientific quality and the comprehensive scope of the work Dr. Dunbar had already accomplished. Dr. Koch thereupon acquiesced very heartily in

the proposal that Dr. Dunbar should be given the permanent post of director of the Hamburg institute, and thus made the authoritative expert in control of the health conditions of the principal German port, and the first commercial city of the Continent.

Dr. Dunbar is a native of St. Paul, Minn.; and when he went to Germany, some years ago, at the age of twenty-one, he could speak English only. He has won his place very early in the scientific world. In order to accept the official post he now holds, he was obliged to become naturalized as a German citizen.

Dr. Dunbar commands the services of a staff of expert assistants, and his Institute is conducting experiments of extraordinary interest. A new method for the discovery of cholera germs in water has been devised by Dr. Dunbar, and accepted by Dr. Koch and the other bacteriologists as a great improvement. During the summer and autumn of 1893, the Hamburg institute tested the Elbe water from day to day, the specimens being taken from widely separated points, and found cholera germs all the way from the mouth to places far in the interior of Germany. It seems probable that Dr. Dunbar will succeed in proving effectually, what has hitherto been much doubted and denied, that cholera is propagated by means of water rather than air.

In the filthy water brought up to Hamburg by the flood tide Dr. Dunbar and his group of experts were quite regularly finding from thirty thousand to one hundred thousand cholera germs to each cubic centimetre (about one sixteenth of a cubic inch) of water. As many germs were found in the season of 1893 as in the previous year, although Hamburg was kept almost free from fresh outbreaks of cholera. The water of the river above the influence of flood tide was found to contain from four hundred to twelve hundred germs. In July, 1893, the imperial health authorities at Berlin issued a warning to the municipal governments of the country not to supply their citizens with a drinking-water containing more than one hundred germs to the cubic centimetre. It was considered that water infected to no greater extent could be used without serious danger. It is highly instructive, therefore, to note the fact that the purified water of the new Hamburg filtration works, as examined from filter to filter and from day to day, was found sometimes to contain no germs at all, and more commonly to contain from four to ten per cubic centimetre. Only by the most refined methods, never employed until the summer of 1893, could these few scattered germs be discovered, isolated, and accurately counted.

Here, then, is the great triumph of the Hamburg filter works. The citizens know absolutely that the new system has given them a safe supply, and feel that science is now equal to any emergency that may arise. The purified Elbe water is used for all city purposes, including street washing, lawn and garden sprinkling, and sewer flushing. It is of excellent quality for all industrial purposes, and as a drinking-water it is agreeable as well as safe.

An indirect evidence that the cholera epidemic was induced through the use of Elbe water was furnished by the fact that the parts of Hamburg which use wells instead of the river supply were almost or quite exempt from the disease. There are perhaps eight hundred or a thousand wells in use within the city limits. On general health principles wells are to be condemned, and their extermination by most city governments has been fully justified; but, as a choice of evils, the Hamburg wells were better than the unfiltered river water, and so they were tolerated. Some of the large breweries have very productive artesian wells. At the time of the epidemic their water was piped to many neighboring houses, and the service continues. At that time, also,

in the fall of 1892, more than a hundred new "driven" wells were made; but many of them could not be used, on account of the mineral constituents of the water. A part of the work of Dr. Dunbar's Institute, in the fall of 1893, was the thorough examination and testing of all the wells of the city. About half of them had been examined up to the middle of September, with generally satisfactory results. The health authorities were, of course, empowered to close all wells found to be yielding unwholesome water.

The Hygienic Institute has a new branch laboratory, with every needed convenience, immediately adjacent to the filtration works; and one of the large filters is used exclusively for the Institute's tests and experiments. One of Dr. Dunbar's chief assistants is stationed constantly at the waterworks. There has now been constructed for Dr. Dunbar's use, upon plans of his own, a novel steam craft, to ply on the Elbe as a floating bacteriological laboratory. The boat is not far from forty feet in length, and its remarkable equipment will make it possible to study far more fully than has yet been done the actual extent and nature of the influence of flood tide in the Elbe, and also to give frequent attention to the health conditions of the great stream in its upper courses. All these new projects and devices will have cost a good deal of money; but shrewd, commercial Hamburg has come to the conclusion that improved sanitary services are a highly profitable investment, and that it would be as unwise to spend large sums upon such services without expert scientific direction and experimentation as to erect public buildings without good architects, or invest heavily in docks and harbor facilities without the aid of civil engineers. Dr. Dunbar is evidently determined to make the largest possible use of the city government's new impulses towards the generous support of hygienic inquiry and reform.

The circumstances under which cholera again appeared in Hamburg about the middle of September, 1893, only serve to illustrate the value both of the filtration works and of the Hygienic Institute. Tests made at that time showed the alarming increase of germs in the filtered water as conveyed for consumption. It was further discovered that the water was pure as it left the filters, and that the contamination was the result of a bad leakage from the Elbe into the tunnel which conveys the supply from the Kalte Hofe to the pumping works on the mainland. The leak was at last suppressed, but, unfortunately, a number of cases of illness and death occurred, clearly traceable in origin to this infusion of unfiltered water into the purified supply. The fact that Hamburg had been exempt from cholera all summer, while the river was laden with such deadly infection, speaks volumes for the filtered water which had been in use since May; and the prompt discovery of the leakage was a new demonstration of the practical usefulness of an efficient bacteriological laboratory.

I have already commented upon Hamburg's sewers and its disposal of sewage. It remains to speak somewhat of the scavenging and cleansing of the city. As yet, the cholera outbreak seems to have led to no radical changes of system or administration, but it has resulted in a vast increase of energy in the conduct of the work. Street cleansing, under the general control of the police authorities, is managed upon a good system with admirable effect. No American city, so far as I am aware, can compare at all favorably with maligned Hamburg in the matter of clean streets. Good paving is the rule, and this of course facilitates the constant washings and sweepings to which the streets are subjected. Asphalt and smoothly laid square stone blocks are the prevailing material of the street surface. Besides the thorough night cleansings, there is a

day force of sweepers regularly at work on the principal thoroughfares to remove horse manure, etc., quite in the approved manner of Paris and Berlin.

The fright to which the cholera subjected the population has been of inestimable aid to the sanitary police in their efforts to compel the people to maintain domestic cleanliness. There remain in Hamburg many of the very narrow, badly lighted streets of the Middle Ages, with small-windowed old houses, ill arranged for subdivision into tenement apartments and for the occupancy of numerous families. Obviously, it is no easy task to keep these streets free from conditions favorable to the spread of infection. But a wonderful improvement has been made, under rigidly enforced sanitary regulations, in the average wholesomeness of domestic life among the working people. An elaborate code governing the construction and occupancy arrangements of tenement houses had been drawn up, and was expected to receive approval and go into effect early in 1894. It brings the sanitary housing of the people under the auspices of the municipal authorities to an extent never before dreamed of in old-fashioned, *laissez-faire* Hamburg.

The city has also laid energetic hands upon the question of the disposal of domestic refuse. Garbage has hitherto been carted out and dumped upon land in the vicinity of the city, some kinds of refuse, however, being carried out to sea in barges. Henceforth the garbage is to be burned, large municipal crematories having been constructed. There is no reason why Hamburg should not undertake large works, such as one finds in various European cities, for the preparation of a marketable fertilizer, and of other salable commodities, from the collected garbage, street sweepings, ashes, and waste material in general of so great a city. This will probably be done in the early future.

The epidemic of 1892 found Hamburg ill prepared with facilities for the isolation of cases, and for the disinfection of contaminated articles and houses. Ordinary hospitals had to be used for cholera patients, and extra accommodations had to be provided by means of hastily erected emergency barracks. Meanwhile, a vast new epidemic hospital on the pavilion plan was projected, and it is now completed and in working order. It is one of the largest and best appointed hospitals for infectious diseases to be found anywhere; and it will play an important part in the future suppression at the very outset of threatened epidemics.

The disinfection stations, also, are a new feature of Hamburg's sanitary administration, and they are excellent specimens of establishments of that sort. Two central ones were fitted up in existing buildings adapted for the purpose, while a much larger and more complete one has now been made ready for use. They are equipped with large ovens, for the disinfection by heat of bedding, clothing, draperies, carpets, etc., and have facilities for the detention and personal disinfection and cleansing of the unattacked members of a family whose house is undergoing disinfection after the stricken members have been removed to hospital or to cemetery. The disinfection station is headquarters for the closed vans that are sent to remove persons and infected articles, and also for the disinfection officials, whose task it is to take charge of a house and put it in good sanitary condition. Each one of these officers is supplied with a compact, portable metallic box, in which there is a curiously complete collection of scrubbing-brushes, chemicals, and implements and devices for the thorough cleansing of a condemned habitation.

Food examination lies within the scope of Dr. Dunbar's municipal laboratory, and a staff of assistants is steadily engaged in this branch of the work, which is to take on some important develop-

ments in the early future. The milk supply of Hamburg, in particular, is now to be brought under the close municipal oversight that is so desirable in all large towns, a very elaborate law to that end having been drafted. The active inspection of food in the markets is in charge of the general police authorities. It is now arranged that a special force of police inspectors shall be put at the service of the Hygienic Institute, and shall bring samples for analysis to the food department of the laboratories.

It is as yet quite too soon to attempt a presentation in conclusive statistical form of the results of Hamburg's new sanitary régime. But the evidence afforded by a comparison of the death rate month by month is highly significant, and it would have an importance even sensational in its character if the improvement it indicates should, happily, continue permanently. Thus, the average January death rate of Hamburg for the past decade has been 23.10 per thousand of population. For January, 1892, the rate was 21.61, while for January, 1893, it was only 16.59, and for January, 1894, it appears to have been somewhere between 18 and 19. Comparing succeeding months, it would seem that the death rate has declined fully twenty per cent from the average of the past decade since the extraordinary precautions of the cholera summer of 1892 were put into effect. It is quite possible that the completion of the current year may show for the twenty-four months of 1893 and 1894 an average decline in the total death ratio of not less than twenty-five per cent as compared with the statistics for the preceding ten years. It is not to be forgotten that a great epidemic almost always sweeps away so many very old, very young, and otherwise specially susceptible persons that a subsequent lowering of the death rate would result without any aid from better hygienic surroundings. But when due allowance is made for this very important factor, it would still seem reasonable to attribute a considerable part of the reduced death rate of Hamburg to the city's improved sanitary condition.

Albert Shaw.

LIMITATION.

BREATHE above me or below,
Never canst thou farther go
Than the spirit's octave-span
Harmonizing God and man.

Thus, within the iris-bound,
Light a prisoner is found;
Thus, within my soul, I see
Life in Time's captivity.

John B. Tabb.