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—THE—

HEALTH JOURNAL,

A Monthly Review and Record of

SANITARY PROGRESS

——EDITED BY——

EDWARD PLAYTER, M.D.

Public Wealth and National Strength and Wealth.

No. 1 JANUARY, 1889. Vol. XI.

CONTENTS:

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ADDRESS:

"THE HEALTH JOURNAL," OTTAWA, Can.,

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SEALED TENDERS, addressed to the undersigned, and endorsed "Tender for Lieutenant Governor's Residence, Regina, N.W.T." will be received at this office until Friday, 8th March, 1889, for the several works required in the erection of Lieut.-Governor's Residence, Regina, N.W.T.

Specifications can be seen at the Department of Public Works, Ottawa, and at the office of H. J. Peters, Clerk of Works, Regina, on and after Friday, 8th February, 1889, and tenders will not be considered unless made on form supplied and signed with actual signatures of tenderers.

An accepted bank cheque payable to the order of the order of the Minister of Public Works, equal to *five per cent of amount of tender*, must accompany each tender. This cheque will be forfeited if the party decline the contract or fail to complete the work contracted for, and will be returned in case of non-acceptance of tender.

The department does not bind itself to accept the lowest or any tender.

By order,

A. GOBEIL,
Secretary.

Department of Public Works,
Ottawa, January 19th, 1889.

THE HEALTH JOURNAL.

A Monthly Record of Sanitary Progress.

VOL. XI. JANUARY, 1889. No. 1

REPORT ON POLLUTION OF WATER SUPPLIES.

BY THE SPECIAL COMMITTEE OF THE AMERICAN PUBLIC HEALTH ASSOCIATION ON THE POLLUTION OF THE WATER SUPPLY, AS PRESENTED AT THE MILWAUKEE MEETING, NOV. 20TH, 1888, AND CERTIFIED BY THE COMMITTEE, AND PUBLISHED IN THE SANITARIAN.

IN its report at the last meeting of the association your committee explained in brief the ground of its belief in the harmfulness of sewage in waters used as potable supplies, whether these were derived from wells or larger sources; whether the water-supply of an isolated dwelling or that of a populous city. Chemical analysis was shown to be in most instances inadequate to the detection of sewage, unless the sewage was present in unusual quantity or the water unusually free from other organic matters; and the conclusion was reached that the inability of the chemical methods is of no practical importance, as the presence of sewage in the water-supply can be determined by the sanitary inspector; and further, that for protective purposes the knowledge that sewage enters the water is all that seems to be required, because where there is sewage there is danger of typhoid infection.

Your committee desires to give special emphasis to the last stated clause, because it believes that the endemicity of typhoid-fever in our cities is in great part due to the sewage in the water-supply. Many of our public water-supplies contain sewage, and its harmfulness in a general way is unquestioned even by those who have a financial interest in them. Yet there appears to be a hesitancy to acknowledge the real, the specific, danger. Typhoid-fever is present in all our cities, giving annual death-rates of from 15 to 100 and over in every 100,000 of the population; but in the enumeration of its causes its prevalence is ascribed to many unsanitary conditions before mention is made of the public water-supply. It is allowed in certain local epidemics to be propagated from wells which have become infected by an infected sewage, but the sewage in the public supply is seldom considered other than as a sentimental objection to the use of the water. It is allowed in many instances to arise from leaks in the plumbing of houses, by which exhalations from infected sewers reach the interior of the dwelling, but the water-supply into which the sewage of these very sewers is poured is used without a thought of its deadly qualities, unless, as in the case of Plymouth, Pa., the fact is forced upon the public mind that a public water-supply has as little disinfecting power over the germs of typhoid-fever as the private water-supply of an infected well. Health officers condemn the well, and generally it is closed as soon as it is found that sewage percolates through its area of drainage: they should condemn the public supply on the same grounds.

The large financial interests involved in the establishment of a public water-supply may be assumed to be at the bottom of this hesitancy to acknowledge the specific danger attaching to the presence of sewage. Millions of dollars, perhaps, have been invested in that water-supply, and many more millions would be required to replace it by water from a purer source. These large sums are alone considered, and not the vast and annually increasing totals of the loss by sickness and death that might have been prevented. A public or private well involves but a small sum, so small that it does not stand in the way of sanitary progress. It is closed, and with its

closure one more possible centre of typhoid infection is removed; but the decreasing influence exercised by this on the annual rate of prevalance is small indeed if the public supply continue to disseminate the disease. The dollars and cents represented by the existing water-works may be regarded as a barricade to sanitary progress, or an altar on which typhoid-fever sacrifices its victims.

The efforts that have been made from time to time to quiet the public mind by demonstrating the destruction of sewage and the self-purification of the water which contained it, are in part attributable to these financial interests: but only in part, for many sanitary inquiries have been deceived by partial or imperfect observations. Unfortunately, however, those analysts who have had much practical experience in following the track of sewage in its passage down-stream recognize in this so-called self-purification only the results of sedimentation and dilution. Undoubtedly the natural processes of purification—the transformation of organic matter into ammonia, and the nitrification of the latter—operate in the current of a running stream; but these account for but a small proportion of the seeming purification, and there is no ground for supposing that the infectious principle of typhoid-fever is given up to the action of these purifying agencies. We acknowledge that typhoid-fever is propagated by an infected sewage in a well-water when all organic matter in the dangerous sewage—matter which, by the absence of life, is given up to decomposition and reduction to harmless inorganic forms, and matter which by its vitality is preserved from these influences, and we acknowledge that in the well-water the former may be reduced, while the latter retains the full measure of its virulence. Analogy shows conditions of a similar character affecting our river-supplies, and the seeming apathy with which they are regarded can only be accounted for by assuming that individually we have fought against the barricade erected by the dollars and cents, and been defeated by its solidity and strength.

In this country the relation between the distribution of a water which contains sewage and the prevalence of typhoid-fever can be readily observed by any one who studies the mortality returns of our cities in connection with the *character* of their water-supply. The records in many instances are complete and trustworthy for the past twenty years. Brooklyn, New York City, Boston, Cincinnati, Philadelphia, etc., have a death-rate from typhoid fever proportioned to the quantity of sewage which enters their water-supplies. Where the water supply, as in the first-mentioned city, is free from sewage, the death-rate is low, about 15 in every 100,000 of the population, these cases being due to indirect infection and other local causes. When care is exercised in excluding sewage from the water-shed which furnishes the public supply, there is a corresponding freedom from typhoid-fever, as in New York, which has a rate of 25, and Boston, which loses about 40 annually for every 100,000 of her people. In Philadelphia and other cities, in which less attention is given to the purity of the public supply, the typhoid death-rates are correspondingly increased. Moreover, the records of some of these cities give interesting information when viewed in connection with the *history* of the water-supply. The city of Baltimore has had a steadily diminishing rate since its water-supply was first introduced, and this decrease has been more notable since 1880, when the supply was largely extended. And this same city of Baltimore shows that its improved condition is not due to the introduction of a system of sewerage, but to the use of a purer water than was formerly furnished by its infected wells. Ordinarily a sewerage system and public water-supply are contemporaneous improvements, and heretofore any benefit to the health of the community has been credited to the sewerage, although it seems as if the inflow of a wholesome water had had really more to do with the lessened death-rate, for the small typhoid rate of New Orleans, La., cannot be attributed to the sewers of that city, since it has none, but it *may* be attributed to the water-supply, for that consists of rain-water, which is free from sewage, inasmuch as the cisterns in which it is stored are not sunk in the soil, but raised considerably above the surface.

Testimony of a similar character has recently been developed by the experience

of Vienna. In that city, from 1851 to 1874, well water of an impure character was used to a large extent in addition to a systematized supply from the Danube. During this period the deaths from typhoid-fever ranged from 100 to 340 annually in every 100,000 of the population. In the last mentioned year a spring water was introduced, and the death-rate from typhoid-fever fell immediately to 50. Since then, by the disuse of impure wells and the extension of the new supply, the rate for the past three years has fallen to 11; and, inasmuch as the sewerage system was in existence during the period of high rates, the fall since 1874 is necessarily referred to the use of a water which is free from sewage. The fall in the typhoid rate experienced an interruption in 1877, when, owing to the freezing of some of the sources of the spring-supply, the water of the Danube had be pumped into certain of the mains; and it is of importance to observe that the sections of the city which were chiefly affected by this epidemic were those in which the Danube water was distributed. According to Professor Nothnagel, typhoid-fever has become such a rarity since the introduction of the spring supply that when a case occasionally comes to hospital from outside the city he shows it to the students as one of unusual interest.

In the face of such testimony to the influence of a pure water on the typhoid rate, we cannot shut our eyes to the relation that exists between sewage in our streams and typhoid-fever in the cities that are supplied by them, no matter how great may be the financial interests that are involved or sunk in the contaminated supplies. Now comes the inquiry, What are the measures that have been or should be adopted to lessen the evil?

As a rule, the only effort made by our municipal authorities and water companies to purify our public supplies is by sedimentation. They select a pond which forms a natural sedimenting reservoir, or they throw a dam across a stream to form an artificial one, or, in the case of large water-courses, they pump directly from the stream into specially prepared basins. Primarily these basins or reservoirs were intended to facilitate distribution and guard against a temporarily inadequate flow in the stream which furnishes the supply; but they were found to answer the purpose of clearing, and to that extent of purifying, a turbid water, provided they were large enough to permit the water to remain undisturbed for the needful length of time. When it is proposed to have additions made to the water-supply of a city, the construction of new basins is usually implied. As an instance, there are now at the city of St. Louis, Mo., four settling basins, holding eighteen million gallons each. The floors are paved with brick on edge, and slope toward the centre and the river side. The sediment is floated off from the floor of each basin once in about four months, the quantity removed annually amounting nearly to 200,000 cubic yards. The wants of the city permit the water to settle only from eight to eighteen hours, while a period of thirty hours is required for a satisfactory subsidence. On this account an extension of the work is at present in contemplation. Surveys have been made, and land purchased, for larger settling-basins and conduits to carry the water to the present high-service or clear-water pumping-plant. The estimated cost of these improvements is three and a half million dollars.

The storage of a turbid water in such basins undoubtedly tends to improve its quality. No argument is required to show that the St. Louis water is better with its suspended matters at the bottom of the reservoirs than choking the distributing pipes, collecting in every containing vessel in the city, or settling in the alimentary tract of the water consumers. The subsidence of the inorganic matters which constitute the mass of the turbidity carries down a considerable proportion of the associated organic materials, and the clear water gives markedly better results as well on chemical analysis as on bacteriological examination.

Chemically considered, the tendency of the cleared water is to further purification. Organic matter steadily diminishes in quantity, and is replaced by ammonia and nitrates; but as this is effected by bacterial agencies, biologically the stored

water progressively deteriorates after it has become clear by sedimentation. The bacteria increase at the expense of the organic matters which they destroy. A water which every chemist and every bacteriologist would pronounce a fair sample of potable water will be found, after a week of storage, to be swarming with bacteria. Daily experience forbids the condemnation of a good water merely because it has been stored for a week; yet the bacterial colonies that may be developed from it are infinitely more numerous than those that are found in a water which is impure even to the senses. Indeed, the bacteria in an ordinarily pure water, after storage, may be vastly more numerous than in another portion of the same water intentionally contaminated with sewage or other impurity and similarly stored for the same length of time. This it is which deprives the bacterial cultivations of that value which but a short time ago they were expected to develop as indices of the wholesomeness or unwholesomeness of a water. A chemical evidence demonstrating a tendency to purification by the conversion of organic matter into nitrates, through the instrumentality of bacterial organisms, is more consistent with everyday observation than the bacteriological evidence which suggests unwholesomeness by demonstrating the numbers of the bacteria.

But although the general tendency is to the reduction of organic matter in stored waters, it often happens, particularly if the water is rich in ammonia or easily decomposed albuminoids, that vegetable growths other than bacteria will be developed, giving a bad taste or odor to the water, and perhaps causing diarrhœa in the consumers. These, which may be considered the accidents of storage, have been studied by many health boards and water companies; and the influence of heat, aeration, exposure to sunlight, etc., on their development, has been determined with practical benefit in many cases.

Sedimentation is sometimes an exceedingly slow process, particularly when the mineral particles consist of finely divided clay. A week or more is required in some instances to give a clear water, and this involves a large expenditure for storage-basins. Hence, many have turned their thoughts to filtration as a prompt and efficient means of purification. Filtering-beds are in general use in England, but in this country they have been constructed only by a few cities, and in an experimental way. The results do not appear to have been satisfactory. The expenses attending them are large, and the coldness of our winters begets difficulties which have not to be encountered in the milder climate of England.

But the failure of filtration on the large scale, and the imperfect results of sedimentation as carried on in the reservoirs, have given an impetus to the construction of filters for domestic use; and the success which has attended attempts to supply a clear water to manufactories and other large establishments has gradually led to more ambitious efforts. Of late some municipalities have investigated the means by which this filtration is effected; and the ability of the filters to supply a clear water on the large scale appears to have been demonstrated. As the method is patented, a certain hesitancy has been manifested by members of the Association in referring to it; but, patented, or not patented, if it have a value above others in supplying a pure water, we should have full accounts from such of our members as have a practical knowledge of its operations in all their aspects. A member of the American Water-Works Association did not hesitate, at its last meeting, to invite attention to the success achieved at Atlanta, Ga. He expressed himself as knowing but little of the chemical improvement that took place in the quality of the water, but so far as the mechanical results of the filtration were concerned he was perfectly satisfied. The surface of the water in the impounding reservoir is nineteen feet above the layer of coke and sand which constitutes the filter-bed, through which it is carried by gravity into the clear-water basin. The reservoir water is generally so muddy from red clay and other suspended impurities that it is rarely fit for bathing or laundry uses; yet in the clear-water basin small objects may be plainly seen, through it at a distance

of twenty feet. The capacty is three million gallons daily, although the quantity actually filtered for distribution at the time of the report was only two million gallons. The cost of the filters and clear-water basin was $55,000, and the daily expenses eight dollars for alum and two dollars and fifty cents for labor.

So much experience has been gained in the construction of these filters that filtration can no doubt be effected more rapidly and economically under the supervision of the patentees, than on new plans which must be at first regarded as merely experimental. But if the attention of boards of health, water companies, and sanitary engineers were directed to the development of the best filtering plant, other and better methods might be suggested and carried into practice; or, if the patent process were proved to be superior to all others, the ability to express a prompt approval would be substituted for our present hesitancy. The passage of water through a filter-bed, the regular cleaning of the filtering material, and the addition of alum iron, lime, or other precipitant to the water are essentials of the process; but the patents necessarily cover only the specific mechanism by which these are brought into operation in that particular process. The natural laws of filtration, and of mechanical and chemical action, are open to the ingenuity of the world.

Recently Mr. L. H. Gardner, of New Orleans, has been experimenting on the large scale with solutions of iron, not as an adjuvant to filtration, but to hasten sedimentation in the settling basins. Iron as a precipitating or filtering agent has been used in various forms and to a considerable extent, on the large scale, as a water-purifier since Medlock, in 1857, patented a process in which water was treated by contact with metallic iron. Spongy iron attained even a popular repute as a filtering material, but at the present time in Europe it has been displaced by the Anderson process, which is said to be in successful operation at Antwerp, Ostend, Paris, and Vienna. The water in this process is first partially sedimented and then forced through a revolving purifier consisting essentially of a wrought-iron cylinder mounted on hollow trunnions, which serve for inlet and outlet pipes. Curved ledges, running lengthwise of the cylinder on its inner surface, scoop up and shower down fine borings of cast iron through the current of the water. By the combined action of the cylinder and the water-current every portion of the latter is brought into contact with the iron, the particles of which are kept constantly bright by friction against each other and the sides of the cylinder. After this the water is passed through sand filter-beds to remove excess of iron. The results claimed are that the organic matter is altered in its chemical nature, and the albuminoid ammonia lessened from one fourth to one half of its original amount; that the water is softened, the scale in boilers becoming greatly reduced, open, friable, and loosely adherent to the plates; and that the microscopic life of the water is, to a large extent destroyed or removed. At Antwerp the quantity of water thus treated is two million gallons daily, and the engineer in charge of the works and the municipal authorities have expressed their satisfaction with the results attained.

The various methods of purification by iron that have been tried in Europe involve the contact of the water with natural or prepared ore or cast-iron borings or turnings, with a subsequent filtration through sand to eliminate any excess of iron; but Mr. Gardner has suggested the introduction of a solution of iron in the precise quantity needful for the desired purpose. He tried a solution of red hæmatite ore in hydrochloric acid on Mississippi water at the New Orleans water-works, and the clarified water gave satisfactory results to Professor Chandler, of New York, and other chemists. Later, he treated a body of thirteen million gallons in the St. Louis settling basins. The solution used, the water in various stages of precipitation, and the clear resultant water, all met with favorable reports from the analysts. The action is chemical, not mechanical. The combinations of lime and magnesia in the Mississippi water become converted into chlorides by the chlorine of the iron solution, and the precipitated oxide of iron settles promptly, carrying the suspended

matters with it, and leaving the water clear. A solution of the specific gravity 1.6 in the proportion of one part to 20,000, clarifies the muddiest of river waters without hardening them or leaving in them any excess of the precipitant. The Mississippi water at New Orleans can be thus clarified by a rest of eight hours in the reservoir at an expense of one cent for every thousand gallons. Mr. Gardner's object at the present time is to procure a cheaper solution.

In the efforts to attain to a prompt and efficient method of purifying water by sedimentation or filtration, with or without the use of precipitants, it is of the utmost importance that the object of the purification be kept steadily in view lest we fall into the error of supposing that the end has been accomplished when a clear water has been obtained. The agents of a patent filter place in the show windows of some prominent store two companion glass jars, one filled with an opaque and discolored turbidity overlying a stratum of heavy sediment, and labelled "Water taken this morning from the public mains;" the other sparkling like a consolidation of dew-drops, and labelled "The public water after passing through so-and-so's filter." A glance at these gratifies the passer-by, by seeming to instil into his mind so much sanitary knowledge. They sow seeds of reflection which develop and multiply with bacterial fecundity, so that in a few minutes they have done the work of an octavo pamphlet on "Potable water: its impurities and the methods by which they are removed." But the sparkle of the filtered water, although honest in itself, hides a fallacy which undermines the whole of the suggested argument. It must be remembered that clear waters are not necessarily wholesome waters. Their sparkle is no proof of their purity. From the laundresses' point of view, or the paper-makers', the result is satisfactory; but the object of the filtration of a water-supply for domestic or public service is its wholsomeness when used for drinking, and its transparency gives no testimony on this subject.

During sedimentation the heavier and grosser particles of mineral matter readily subside, and carry down with them much of the flocculent organic matter which would otherwise continue in suspension for many days. The effect of sedimentation at St. Louis, Mo., has been mentioned but it will perhaps be better appreciated when stated in other words. The lake supply of Cleveland, Ohio, which is usually of excellent quality, is occasionally turbid, particularly during the spring months. When in this condition of turbidity the twenty million gallons, which are distributed daily contain ten and half tons of suspended matters, and the odd half ton consists of decomposing organic substances. Who will say that the city of Cleveland would not be benefited if it did not have that daily distribution of half a ton of semi-putrefaction? But sedimentation does more than free the water from suspended matters. During the so many hours or days of its continuance the processes of nature are at work transforming the semi-putrefied matters into ammonia and nitric acid, both of which are harmless in the quantities present. The purifying influences of sedimentation may be easily determined by chemical analysis, and in many cases it is so marked as to render the process of infinite value in the absence of a better method.

Most surface waters, which are turbid from particles of mineral matter, contain the germs of nitrification, and the process of purification takes place in them during storage; but if these germs be absent, months may pass with but little improvement in the character of the stored water. Hence, cisterns which do not contain these bacteria have usually a less pure water, as judged by the ammonia and albuminoid ammonia which it yields, than those which do contain them. Where wooden tanks, as at New Orleans and other Southern towns are used for storage, it is a common occurence for the analyst to find water of poor quality in new or recently cleaned cisterns, while water of a much better quality is discovered in those that have not been cleaned for a year or two, and have a fermenting sediment a foot or more in depth covering their floor. The nitrifying agencies accum-

late with the sediment, and notwithstanding the sediment, they succeed in reducing the organic matter of the water to the inorganic condition. The sediment is thus an advantage, but the end is better accomplished by keeping it out of the cistern and introducing the bacterial workers through the medium of a layer of clean gravel or sand.

But withal, it must be remembered that it is only organic matter in a state of decay that is thus reduced to the inorganic condition, and only organic matter in a tangible form that is thus carried down by the heavier particles of the mineral sediment. Organic matters that are endowed with vitality remain uninfluenced by the destructive and reconstructive bacterial agencies that are operating in the water ; and these, as has been seen, are the matters from which most is to be feared if sewage has unfortunately had access to the supply. The infected water which prostrated 1200 of the 8000 inhabitants of Plymouth, Pa., and killed 130 of those whom it prostrated, passed through three storage reservoirs on its way to accomplish its deadly mission.

Nor is filtration more efficient as a purifier when viewed from the standpoint which sees typhoid-fever disseminated by an infected sewage in the water supply. A satisfactory filtration removes the haze or cloudiness which may pervade a sedimented water for days after the grosser particles have subsided, and in so far its results are better than those generally effected by sedimentation. The finer particles of clay, some no larger than barley distinguishable molecules under the ordinary working powers of the microscope, are removed, and with them organic shreds of similarly minute size, and even many of the bacterial germs which were present. A water thus freed from foreign matter in suspension seems to offer the lustre of its transparency as a voucher or visible symbol of its purity, and chemical analysis may show in it only the merest trace of organic matter in solution, for the processes decomposition and recomposition of the organic elements take place with much greater rapidity when the water percolates through the pores of the soil, as in the natural process of filtration, than when it is merely stagnant in a reservoir or flowing in the current of a stream. It is now well known that the bacterial agencies which effect these changes have their habitat in the three or four feet of soil which constitutes the surface of the earth and that in soaking through this layer the organic matters of a water are transformed into matters which the roots of living plants can absorb and assimilate. Chemical analysis may therefore show in such a water merely the small quantities of ammonia or nitric acid which are the results of this bacterial action, and the water may be claimed to be pure on much stronger evidence than can be advanced on behalf of any water which is massed on the surface in a lake, pond, river-bed, or settling-basin, these surface waters having at work in them only those struggling bacteria that have been washed from their habitat in the soil into the current of the stream. In fact, so far as can be demonstrated by chemical tests, the naturally-filtered water may be free from everything of an organic nature.

In view of our knowledge of the conditions needful to a perfect natural filtration, it is impossible to allow that artificial means, operating after nature's methods, will ever produce as pure a supply as can be procured in suitable localities by digging a hole in the ground. Comparatively speaking, only a small quantity of rain falls on a stated area—a depth of so many inches during the course of a year—and of this a large proportion is turned aside for the general police of the surface, and, having fulfilled its mission, is carried off by surface channels to the ocean, while another part of the fall cools the overheated surface of the soil by its evaporation, and gives the air that proportion of moisture which is needful to the continuance of life under present conditions. Only a few inches of the annual rainfall penetrates the soil, and, escaping the roots of the living vegetation, collects on the surface of some impervious stratum as the surplus water poured into a flower-pot drains into the saucer below. Artificial filtration has neither the time nor the surface to effect percolation after nature's method. Filtering-beds of gravel are prepared which permit more water to pass

through them in a day than nature percolates through the same area in a year, or or special filters are constructed which transmit, under pressure, as much water in half an hour as nature purifies on the same area annually. The bacteria of nitrification cannot be harnassed to the work of artificial filtration, and hence the results of such methods, although manifesting a satisfactory freedom suspended matters, can in no instance compare with the organic purity which characterizes the spring and well-waters that are found in the laboratory of nature. Since the bacteria of the artificial filtering-beds are unable to deal with the organic matters dissolved in the percolating water, it is needless to expect them to to reduce the the masses of organic matter which in progress of time clog the filter with their accumulated foulness, and lessen its efficiency as a filtering medium. The artificial filter cannot, therefore, furnish a water which will be as pure as a naturally pure water. In fact, artificial filtration amounts to little more than the mechanical separation of a water from its suspended particles while the essencial of natural filtration is the thorough nitrification of the albuminoids of the water, the removal of sus. pended matters being incidental and merely secondary.

The decay of once-living organisms, animal or vegetable, gives more or less taint of a putrefactive nature to the surface-waters of the earth, and this taint, when of sufficient strength, is known to induce diarrhœal tendencies in the human system. Moreover, among the fermentations which take place during the destruction of organic matter, is one which gives origin to an influence—the malarial —which is always disabling, and often deadly, to human life, pervading the surface-waters to a dangerous extent, particularly in warm climates and seasons. By the process of filtration nature removes both the putrescent and malarial taints from the water, yielding a supply which is held to be pure and wholesome by the ever-increasing testimony of the generations of the world. The malarial influence is attributed to a micro-organism. If this view be correct—and the tendency of medical science is to accept it as the only theory which gives a satisfactory explanation of the malarial phenomena—the vitality of the germ should preserve it from the putrefactive and nitrifying agencies, for these operate only on dead matter. It is therefore probable that only the mechanical part of the process of natural filtration is concerned in the removal of the malarial influence from a water, and that an artificial filtration which gives satisfactory mechanical results will be of value in the prevention of malarial disease.

Although the bacteria of the soil do their work so thoroughly that no chemical trace of existing organic matter can be found in the percolated water, it sometimes happens that this water is unwholesome. When collected at a distance from the haunts of man, it is as pure as it looks, for nature's methods always suffice for her necessities ; but where the activities of human life create artificial conditions, such as result from the aggregation of individuals in cities and towns, her methods fail because they cannot be carried out. The soil becomes more and more contaminated by animal excreta, and the wells reservoirs in which are collected the leachings or washings of this impurity. If the impure soil be colonized by the infection of typhoid-fever, it is immediately converted into a breeding ground for the germs of that disease. The vitality of these germs preserves them from putrefactive agencies, and their size seems to offer no obstacle to their passage through the soil. They therefore drain into the well, and confer upon its clear waters powers of a most deadly character. In the records of sanitary science are to be found many epidemics of typhoid-fever chargeable to wells that have become contaminated by sewage. Indeed, the more the transmission of typhoid-fever is studied, the more evident it is that the water-supply is the main agency concerned in its propagation. Hence, sanitary officers have not only closed up wells into which sewage has entered, but those which, from their situation, are merely exposed to this danger.

Since natural filtration is powerless against the infection of typhoid, it is evident that artificial methods can give no guarantee of protection.

The purifying influence of precipitation by means of such chemicals as alum, iron, or lime can readily be demonstrated by chemical analysis. The hydrated alumina, ferric oxide, and lime carbonate, as they materialize into particulate existence from their solution in the water, entangle and carry down with them organic particles that would otherwise be less easily removed; and biological research shows that bacterial germs are swept from the water in like manner. That this operation is imperfect is demonstrated by the number of colonies which can be developed from the cleared water; that it is purely mechanical and not germicidal is indicated by our experimental knowledge of the action of such substances on various bacterial organisms, and by the fact that their presence does not exercise even an antiseptic influence on the bacteria of the water, as the number of these bacteria subsequently increases in the cleared water as rapidly as in a stored water which has had no such chemical treatment. The commercial interests concerned in artificial filtration invest these substances with the title of coagulants, as if the albuminoid constituents of inorganic life curdled into a bacterial *rigor mortis* as soon as the water became pervaded with the presence of the precipitant; but there is no warrant for a belief in any protective virtue other than that connected with a mechanical entanglement and precipitation.

The processes of purification that have just been reviewed remove suspended matters and more or less of the dissolved saline and organic substances that are present in the water, but none of them can lay claim to the removal or destruction of the causative agencies of the acute infectious diseases that are known to be propagated by an infected water-supply. These processes have been closely studied by the English sanitary authorities, who long ago came to the conclusion that sewage in a water is harmful because it may contain the germ of cholera or typhoid-fever, against which the most efficient method of artificial filtration constitutes no effective safeguard. Hence, the object of sanitary legislation in England is not to preserve the rivers as a drinking-supply, but to prevent them from becoming a nuisance in their character of open sewers. The solids of sewage consist of a highly nitrogenized organic matter, the proper disposition of which in the economy of nature is as materials for the growth of the vegetable kingdom; and if these be separated, the water may be purified by percolation and filtration and returned to the rivers. Sewage has accordingly been treated in various ways for the separation of the solids and the reclamation of its water. In country houses and small communities a cesspool can be provided for the deposition of solids, the liquid overflow being conveyed by drain-pipes into the soil. The effluent water in such cases may be as pure to chemical tests as that of the stream into which it is discharged. But as communities grow, the difficulties attending the disposition of their sewage are proportionately augmented.

Various methods of precipitation have been tried with the view of paying expenses by the sale of the solids as a fertilizing material, while the separated liquids are turned into the water-courses, with or without an intermediate filtration through the soil. Sewage irrigation has also been tried on the large scale, and in many instances with satisfactory results. The advocates of irrigation point with considerable enthusiasm to the purity of the effluent water, and consider that this system will ultimately settle the vexed question of the disposition of sewage; and, indeed, such is the purifying influence of the soil, that the clear water of the outflow gives relatively good results on analysis. But, as we have seen in speaking of sewage-polluted wells, the purity which is evidenced by chemical tests fails to give an assurance of protection from typhoid-fever, and it is this protection, not chemical purity, which is the object in view. These advocates claim that typhoid-fever does not prevail in the fields which receive the sewage of an infected city, but it is the propagation by drinking-water, not by exhalation, in which we are interested, and typhoid-fever is known to have prevailed on fields where the effluent water was used for drinking. Indeed, how could we expect otherwise when we know that typhoid-

fever is propagated by an infected sewage in a well-water which has undergone a more efficient filtration through the soil than that to which the sewage is subjected in the irrigating fields, or when we remember that the spring-waters which occasioned the epidemic at Lauzen were derived from a sewage-polluted stream spread over the fields of an adjoining valley for purposes of irrigation?

In view of the considerations which we have thus briefly reviewed, we cite the opinion of the English commissioners, to give it greater empasis as re-affirmed after the passage of years which have added much to our knowledge of the propagation of infectious diseases by means of the water-supply: "Of all the processes which have been proposed for the purification of water or of water polluted by excrementitious matters, there is not one which is sufficiently effective to warrant the use, for dietetic purposes, of water which has been so contaminated. In our own opinion, therefore, rivers which have received sewage, even if that sewage has been purified before its discharge, are not safe sources of potable water." A water to which sewage has access should from that fact alone be excluded from all further consideration at a possible water-supply for drinking purposes.

The introduction of a water-supply into a growing city is ordinarily only a question of money. Engineering difficulties fade into insignificance when surveyed from a satisfactory financial standpoint. It is often said to be beyond the power of money to purchase health, but the sanitary student can readily demonstrate that in many cases this is not so. Money expended in the distribution of a wholesome water-supply will purchase health for the thousands who otherwise fall victims to the fever which is endemic in our cities and towns. Typhoid-fever is a disease to which every one is exposed. The susceptibility to it is inherent in our constitutions, and, so far as we know, immunity can be purchased only by submitting to attack. Ordinarily the human constitution succumbs to its influence before maturity is reached, but if up to that period we fortunately escape, we have no assurance of future immunity. Uncertainty overhangs us like a cloud. Danger is at present with us in the daily routine of our peaceful lives as on the battle-field, only that the embodiment of evil is an invisible and intangible germ instead of a fast-flying bullet. Danger flows beside us in our streams, in our mains, from the taps in our houses. The germ of the disease may not be in this pitcherful or in that, in this tumblerful or that, but it will find us some day if we continue to use the water which contains it. In a town of 50,000 inhabitants one victim is taken daily, and as the average duration of this disease is about a month, there are always in that city thirty persons whose lives are unnecessarily trembling in the balance.

What is the local suffering from yellow-fever in Jacksonville, Pensacola, or New Orleans, once in so many years, compared with the totality of the destruction caused by the steady progress of this general and ever-present scourge? Thirty thousand people die of typhoid-fever annually in the United States of America, and Vienna lowered her losses by this fever from 340 to 11 annually in every 100,000 of her population by introducing a spring-water supply instead of the sewage-tainted waters of the Danube. Calculate the loss by sickness associated with these 30,000 deaths—the loss of work, the unprofitable work of nursing, and the actual outlay necessitated by each visitation of the disease—and you will find that saving money by drinking sewage in the water-supply is a penny-wise policy that in the long run will fail to pay even for the funerals and the mourning goods.

In many instances it is, on this continent, an easy matter to obtain a suitable supply for a community. Some neighboring lake offers itself as a natural reservoir, requiring only the construction of conduits for the transmission of its waters: or an artificial reservoir may be formed by damming certain of the radicles of a neighboring stream. The drainage area of this supply must be kept under the closest supervision by the sanitary authorities of the community, for it is not enough to obtain a supply which is free from sewage; it must be kept so. Constant viligance

is the price of safety. The sanitary inspector should be ever on guard and familiar with every square yard of the surface, and the health authorities should be empowered to protect the many against the carelessness or wanton encroachments of the few. The question of water-supply is here reduced to its simplest terms: the raising of sufficient money to bring in the wholesome water, and the investment of the health officer with power to preserve the wholesome quality of the public supply and to prevent the use of water from sources which are known to be unwholesome.

In other instances, it is difficult to obtain a suitable water-supply. The whole face of the country has been more or less settled, and the natural drainage of every valley brings sewage and manufacturing waste into its outflowing stream. Nevertheless, now is the time to act, for these unfavorable conditions will increase and multiply in the future, so that what may be done now cannot be done then without a tenfold expenditure of time and money. Fortunately, when difficulties occur from the density of the settlement, there is also more wealth to meet the increased expenditure, but it is beyond the power of that wealth to give life to those who have in the mean time fallen victims, or consolation to the hearts that are in mourning. What is to be done should in all cases be done at once. It is *we* who are intrested in this matter—now, in our own time and generation ; for what does it avail us that the city is supplied with pure water ten years hence, if at that time it be remarked of us, Oh, yes, I remember him well ; he died of typhoid-fever eight or nine years ago. And it is an easy matter to so arrange the financial burden that part of it shall fall on those who will hereafter participate in the benefits.

In well-settled sections of the country it may be impossible for the towns and villages to obtain a water free from sewage in their main streams or their neighboring tributaries, and equally impossible for any one of them to go to the nearest sources of pure water for a supply, but those favorably situated for combined action may easily perfect their arrangements for bringing in the water from long distances. Nor should it be forgotten that if water free from sewage is not to be obtained on the neighboring surface, it may sometimes be found beneath the surface, as at Brooklyn, L. I. or, more notably, at Memphis, Tenn., where, after a thorough investigation of the developed that they had a source of the purest water within a hundred yards of their domestic hearths.

Many communities have a water-supply which was pure enough when originally introduced, but which has become dangerous by the subsequent growth and development of which it formed the nucleus. A water-bed or basin cannot be used for concurrent purposes of water-supply and sewage discharge. If the drainage area be given up to settlement and commercial enterprise, with their consequent sewage and manufacturing waste, the city must be prepared to find another source of supply for its daily wants, or pay the penalty of an increased death-rate from preventable disease. In the race for material prosperity this penalty is too often forgotten, and the endemic fever is regarded as one of those visitations of Providence that are inevitably consequent upon conditions of aggregation. Yet every intelligent medical man knows the fallacy of this reasoning, and that the progress of malady can be checked by suitable measures as surely as exotic disease can be kept out of the country by properly enforced restrictions on commerce. To permit the citizen to enjoy life which according to the Constitution of the United States, is his right, the most stringent laws should be enforced to preserve the purity of the drinking-water . or, if the settlements on the area are too valuable to be destroyed, a new source of supply should be obtained and guarded.

The protection of the citizen requires that every advantage be taken of our knowledge of the natural history of the typhoid infection, that it may be destroyed before reaching any of our water-courses. It is well to insist upon the purification of sewage by processes of precipitation, filtration, or irrigation before its water is delivered into the natural courses, for thereby the latter will be prevented from

falling into the streams in well-peopled districts; but these processes cannot be depended upon to remove the typhoid infection. This infection passes from the patient to our surface-waters directly by the sewers, or it drains through the soil with the subsoil water, and reaches the surface on some lower level. Of course in either case it may be lost in the mass of water in which it is diffused, but it was not so lost at Plymouth nor at Lauzen. To protect the citizen and stamp out this fever, it should be made the duty of every medical man who attends a case of fever to see that the excreta are disinfected before being consigned to the sink, cesspool or sewers, and the utmost care in this regard should be taken in cases occurring on a water-shed which is utilized for a public supply. So far as our knowledge goes, sewage would be deprived of that which under ordinary conditions, constitutes its only dangerous element, were this system of bedroom disinfection efficiently practised.

Local authorities such as water companies and boards, citizens' committees, health boards and commissioners, should exercise a jealous guard over the water-supply, but in many instances these would be powerless without the intervention and co-operation of the authorities of the State. Massachusetts, Illinois, and Minnesota have already taken steps in this direction. In the first-mentioned State the Board of Health is invested with the general supervision of the water-supplies. No sewage, drainage, excrement, or other refuse or polluting matter of such kind or amount as—either by itself or in connection with other matter—will corrupt or impair the purity of a water used for domestic purposes, is permitted to be delivered into a water-course or any of its feeders within twenty miles above the point where a water-supply is taken. Upon the application of a city or town to the Supreme Court, alleging the pollution of its water-supply in violation of law, an injunction may be issued, or the polluting substances required to be so cleaned or purified that they shall be no longer deleterious. The limit of twenty miles in this law is a defect, but sanitary legislation is a thing of slow progress, and our friends in Massachusetts undoubtedly secured as much as was possible for them to obtain at the time.

The board is required to examine the waters from time to time, for the purpose of ascertaining whether they are adapted for use as domestic water supplies, or are likely to impair the interests or imperil the health of of the public. It is required to conduct experiments to determine the best practicable methods of purification, of drainage, and of the disposal of refuse, and to recommend measures for the preservation of the purity of the waters. Moreover, it is the legally constituted adviser of cities, towns, corporations, firms, or individuals, in matters pertaining to the introduction of water supplies or sewerage systems, making use of its knowledge and facilities on their behalf in regard to source and quality of water and methods of sewage disposal, having regard to the present and prospective needs and interests of other communities or individuals that might be affected thereby. The approval of the board is a legal requirement to the consideration by the Legislature of any application for authority to introduce any system of water supply or sewerage.

The board is also empowered to consult with and advise those engaged, or intending to engage, in any manufacturing or other business as to the best practicable method of intercepting, purifying, or disposing of any drainage or refuse that might result from the business to the detriment of the waters of the State. It is required to bring to the notice of the attorney-general all instances which may come to its knowledge of omission to comply with existing laws respecting the pollution of water supplies and inland waters, and to report to the Legislature any specific cases not covered by the provisions of existing laws which, in its opinion, call for further legislation. Finally, and very materially, the board is provided with funds to sustain the corps of engineers, chemists, and inspectors, whose labors are needful to the proper performance of its duties.

The report of the board's proceedings under these heads, submitted to the Legislature in January of this year, shows the excellent work that may be accomplished

in this way. Eleven applications from cities and towns for advice concerning water supplies were received; eleven for advice concerning sewerage; two soliciting action to prevent the contamination of particular water supplies; and one from a manufacturer for advice concerning the disposal of drainage from certain works which he purposed establishing. The important question of a water supply for the cities of Boston, Chelsea, and Somerville, and the town of Everett, was one of those that came before the board. There are 123 sources of public water supply in the State; but over 200 samples are investigated chemically and biologically every month, the samples being from rivers, ponds, and other sources that may be utilized in the future. Experiments are also in progress on methods of sewage disposal, which will add considerably to our knowledge of the results which may be obtained in that direction.

With the aid of the State, the local authorities in their efforts to obtain and preserve a wholesome water supply would experience no difficulty that could not be overcome by the expenditure of the necessary funds. The twenty-mile limit will in progress of time be blotted out, and the waters of the State be sharply divided into those which may be used as sources of domestic supply and those which carry off the waste water. The water-supply and sewerage systems of the State—of the country—should be as distinct as those of every household, and the sooner this is accomplished the sooner will the rates of sickness and death be decreased among our people.

Your committee, therefore, urge a livelier interest in this important matter on the part of State boards of health, an interest which is not satisfied with discussing and subscribing to sanitary views on the subject, but which will leave nothing undone that will tend to invest them with power to act for the preservation of the public health. With all our boards operating, each with its domain, there would be no need of a committee of this Association to investigate the subject of water pollution. In concluding, we submit the following resolution:

Resolved, That it is the well-considered belief of this Association that it is an imperative necessity, especially in the more populous States, that State Legislatures should give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water supplies, investing them at the same time with the supervision of the said supplies, and with power to preserve these waters from contamination by sewerage or other injurious matters.

Signed:—

Dr. CHARLES SMART,
Major, and Surg., U. S. Army,
Washington, D.C.

Dr. S. W. ABBOTT,
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" G. C. ASHMUN,
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" W. W. DANIELLS,
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" EDWARD PLAYTER,
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WHAT IS NEEDED FOR PROMOTING THE PUBLIC HEALTH.

IT is universally conceded that a statement of all births and deaths which take place, as well as of marriages, in a country is an essential of nationality. Almost every civilized country has provision for the collection of statistics of this kind. In a new and constantly developing country like Canada, with many outlying juttings of scattered settlements, it would be next to impossible to obtain them sufficiently approximating accuracy to be of much practical use.

Recently we have given this subject a great deal of thought and have arrived at the conclusion that, for the most useful and practical purposes of public health promotion throughout the Dominion, it would be sufficient if accurate, comprehensive mortuary statistics could be obtained, monthly or weekly, from a large number of defined centres of population—say 100, or better, 150 centres—along with a reliable report from each relating to any prevailing epidemic or endemic infectious disease, either of man or animals, and a statement at least once a year of the population of each centre. It would also be desirable, but not particularly essential, to get for comparison an accurate statement, say quarterly or yearly, of the number of births in these centres.

The reports relating to prevailing diseases should embrace or relate to intervening sections of country as well as to the special centres. Any health officer of a centre, as a city or town, would usually

soon learn of any epidemic that might be prevailing almost anywhere in his section of country. Reports of such usually soon get circulated, or at least reach the nearest town, whence enquiries could be made by the nearest official.

Now while such information regarding the condition of the public health in and around so many centres, distributed freely in a bulletin, say once every month, would promote the confidence of the public generally, and be of interest to all who were interested in the country's welfare, it would be most valuable information for the Government to possess and would be all that would be essential, I contend, as a foundation for practical public health work.

More good than all, would follow the free distribution of the bulletins, showing all over the Dominion where the mortality was high, or in what city or town it was highest, and also in which there were epidemics prevailing. It would shame and stimulate into strong efforts to reduce their mortality, those municipalities giving so bad a sanitary record; better, perhaps, than any stringent coercive legislation; for obvious reasons. The reports would, in short, be the best possible educators of the people.

Then, should any municipal authorities require an investigation into the cause or causes of their high death-rate, the Federal Department should be prepared to cause such investigation to be made; and which could then be done in an independent and satisfactory manner. In this case, a Hygienic Laboratory would be most desirable; indeed, an essential.

It has already been shown that the mortality in our Canadian cities and towns is far in excess of that in the overcrowded cities in England—that even in the "Queen City," Toronto, it is in excess of that of great and densely populated London, while it should be much lower than in the latter; that,—and what most indicates a want of proper sanitary administration, the zymotic death-rate in the Canadian cities and towns is about double that of the largest cities in England; and in short that many thousands of lives, many of them of the best lives in the country, are sacrificed in Canada every year, by reason of want of proper attention to ordinary sanitary requirements. Of the 17,100 deaths recorded in twenty of the largest cities and tows of the Dominion last year, probably the entire medical profession will concede, one-fourth might have been prevented had proper sanitary regulations been enforced a few years previous; and of the 120,000 deaths which probably take place in the Dominion every year, 25,000 to 30,000 might be eventually saved to help to fill up the vacant west.

Who will say that this is not a subject for the Federal Government to take hold of—a most worthy subject? The present state of things must now tell against the country's welfare, as we have shown, and will it not do so much more in the future?

The necessary machinery for such an organization as would be required for work of the kind above indicated need only be inexpensive. The present Federal regulations for obtaining mortuary returns could be extended to the necessary number of towns, and the health or statistical officers of all these towns be supplied with blanks and information for their proper use, relating to reports of prevailing disease.

A fixed number of inspectors of local offices would be required—from five to eight—in all the different provinces, to visit all the officers two or three times a year, at indefinite periods and times, in order to see that the latter were doing their work properly. These inspectors might be specially appointed by the Government from among the officers of the different centres or others having nothing to do with the collection of statistics might be appointed as inspectors, as deemed best.

In connection with the Government, in Ottawa, there would be required a chief officer He might be a Deputy Minister or a Commissioner of Public Health, and connected with one of the departments, such as that of Agriculture or of the Secretary of State. In case of the latter, any statistics for filing or preserving could be passed on to the Department of Agriculture. The chief officer would necessarily have to be a physician, and one of experience. We would not recommend a central board, but instead, an Advisory Council. This might consist of only five or six persons—three or four physicians, of high standing and experience in sanitary proceedings, and a veterinary surgeon and an engineer; or better, of a much larger number, as from one to three or four from each of the provinces, specially appointed (either by the Federal Government or the provincial authorities, as thought best), and of a Committee of the House, similar to the present standing committees. This Council need meet in full but once a year, during the session of the House, consider all health questions and appoint a special Advisory Council of four or five members as a kind of Executive, which could meet as occasion required, or at specified times, as thought best.

A permanent secretary would be required for preparing and arranging the work of and for the Council. He, too, should be an experienced physician, and also an ex-officio member of the Executive of the Advisory Council. Upon him would devolve the greater part of the work of the department.

In case a Hygienic Laboratory were established, as it should soon be, and might be best perhaps in connection with the department of the Chief Dominion Analyst, other

officers would of course be required. And in this connection it may be observed that better accommodation will surely soon have to be provided for the department of the chief analyst, and so but little extra would be needed for a Hygienic branch.

The total cost of an such organization would not exceed, and probably not reach, $50,000 a year. The extention of the mortuary statistics, as at present collected, to one hundred places instead of less than thirty, as at present, would not exceed $20,000. One hundred monthly reports, relating to epidemics, twelve times a year, at $2 a report (a fair remuneration) would cost $2,400. The cost of three inspections a year by each of the eight inspectors would not exceed $5,000; with a per diem allowance and costs of travel to each inspector. The expenses of the Advisory Council, one meeting a year, and executive thereof, say four meetings, need not exceed $5,000, if even $3,000. A large number of monthly bulletins could be published for $2,000. And salaries and all office expenses would not exceed $10,000, if more than even $7,000. So that an appropriation $50,000 would give several thousands for any investigations as to causes of disease, which might be deemed advisable. And in what better way or to what better cause could Canada set apart $50,000 a year of her revenue? We believe that 150 centres of information could be "worked" for the $50,000 a year.

LATEST FACTS RELATING TO THE CAUSES, SOURCES AND PREVENTION OF TYPHOID FEVER.

EXTRACTS FROM A PAPER IN THE N. Y. MEDICAL JOURNAL, JAN. 19TH, 1889, BY AUGUSTUS CAILLE, M.D., VISITING PHYSICIAN TO THE GERMAN HOSPITAL AND CHILDREN'S DISPENSARY, RECENTLY READ BEFORE THE MEDICO-CHIRURGICAL SOCIETY, NEW YORK.

WE may state that the evidence as to the parasitic origin of typhoid fever is conclusive.

Next in importance to the recognition of a poison, its source is of practical value, for if we know from what direction danger threatens we have a rational defence in prophylaxis.

If we at any time admit the existence of a specific parasite we must also admit its continual propagation, and it is not at all probable that the typhoid-fever poison originates spontaneously in putrescible matter, but that it finds therein a suitable vehicle for its growth and multiplication. In other words, drinking water contaminated by drainage from a cess-pool will not cause typhoid fever unless the specific germ is contained therein.

Experience has taught us that the disease under consideration is not directly contagious, and we know, on the other hand, that the specific poison is contained in the dejections of the sick; therefore we may state, without fear of contradiction, that the *carriers of the contagion are chiefly air, water, food and clothing.* It is hardly necessary to cite instances of infection by means of contaminated air (sewer-gas), the latter being simply a vehicle for the typhoid-fever germ.

Murchison has reported how a number of children were taken sick from breathing the air of a school-room contaminated by means of an open cess-pool. Nearly all the children were attacked, and those sitting nearest the closet were taken sick first. A positive proof of infection by means of sewer-gas has lately been reported. Some time ago several convicts were stricken with typhoid fever in one of the wards of the Michigan State Prison at Jackson. The Board of Health was called upon to investigate the matter under the supervision of Professor Vaughan, director of the Michigan Laboratory of Hygiene. The milk and the water supply were found pure. A defective sewer was found which had not been in use, but which communicated with a newly constructed sewer under the hospital ward. The air of the old soil-pipe was analyzed and the typhoid-fever germ found, and distinguished by the potato cultivation.

When air or sewer-gas is the medium of infection, absorption of the poison need not necessarily take place through the lungs. In all likelihood the germs are

caught in the secretions from the naso-pharyngeal space and are swallowed.

Infection by means of drinking-water is a well-established fact and need not be dwelt upon. Occasional immunity is noticeable, but sooner or later finds its explanation. Dr. Underwood, customs medical officer at Kinkiang, China, noticed marked immunity from the disease among the natives in his district, notwithstanding the frequency of typhoid fever among the Europeans located there. He explains this by the fact that the Chinese drink no water while tea is at hand.

According to Billings and Prudden, impure ice may be the means of infection. Dr. Prudden states that there are a considerable number of cases of typhoid fever in which the most painstaking examination of the sanitary surroundings of the victims and their personal contacts fails entirely to account for the occurrence of the disease. Some of these isolated cases of typhoid fever, whose origin is otherwise unaccountable, may well be due to the ingestion of bacilli from sewage contaminated ice.

The Berlin correspondent of the "Medical Press," March 28, 1880, reports a persistent epidemic that played havoc in a garrison artillery barracks from 1873 to 1885. A case of typhoid fever was imported in 1873, and from that date to the close of the epidemic 116 cases occurred. Every possible source of disease was looked into and everything kept in the best possible condition, but the disease baffled all enquiry. The closing of the barracks finally came up for consideration, but previously suspicion fell upon the bed-linen and clothing, because the vast majority of cases were furnished by the men of one battery alone. On close investigation, it was found that the linings of the trousers were, almost without exception, soiled by dry faecal matter. The clothing was submitted to renewed careful treatment by means of chlorine and dry heat, from which time (November 18, 1885) no more cases of disease occurred.

Infection by means of the clinical thermometer in hospital wards, and through nurses who attend a typhoid-fever patient at one moment and presently prepare ice-water without previous disinfection of their hands, is a sure thing, in my opinion, and the possibility of its occurrence should be borne in mind and avoided by all means.

We have all read, or attempted to read and digest, the somewhat lengthy treatises on ground-water, the height of which is calculated according to the depth of well-water. As a matter of fact, ground-water stands in a certain relation to health, and Pettenkofer has found that typhoid fever is prevalent with low ground-water. The investigations of B. Latham, C.E., extend over a period of eleven years, and show for England the prevalence of typhoid fever *after* low ground-water. On general principles, I should be inclined to hold that contaminated well-water would contain proportionately more germs if the well were nearly dry than if it were quite full.

Concerning individual disposition little is known. Persons between fifteen and thirty years of age are most liable to be taken sick; the disease attacks more men than women, more robust than weakly individuals. It is the exception that one person is attacked more than once. I can, however, recall several such cases. Occasionally entire families are stricken with typhoid fever. In 1878, of a family of eight persons living at 113 Eldridge Street, all were attacked within four months.

In conclusion, I would add a few words on the prophylaxis of typhoid fever. Dr. Vilchur, of St. Petersburg, has found by experiment that boiling water kills the "typhoid" bacillus, and recommends that the stools of patients be treated with boiling water. Such a method is impossible in private practice for obvious reasons; nevertheless, the physician should insist that the stools be treated by some cheap disinfectant, also the soiled wash.

No sleeping apartment should have a wash-basin which communicates with drain-pipes and sewers. The occasional use of germicide solutions in waste-pipes is no safeguard against infection; it is far more advisable to place a large piece of crude potash into the sinks every week or two: the fatty and sticky coating on the interior of waste-pipes is thus dissolved and loosened up and is carried away by a flush of water. Such a procedure would work good results, especially in tenement-houses.

According to our present experience, infection through drinking-water can be avoided by boiling the water before use.

In the tenement-house districts of New York city typhoid fever would have fewer victims if the physician who attends a case would make it his business to ascertain that printed directions distributed by the Board of Health to prevent the spreading of contagious disease were actually read, understood and obeyed.

Many people are willing to carry out sanitary instuctions if they are shown how; others neglect to do so because they do not quite understand written instruction, and no one has a better opportunity to make such matters clear than a conscientious attending physician.

CURE FOR COUGH.—A Baltimore physician, connected with an institution containing many children, says: There is nothing more irritating to a cough than to cough. For some time I had been so fully assured of this that I recently determined, if possible, for one minute at least, to lessen the number of coughs heard in a certain ward in the hospital of the institution. By the promise of rewards and punishments I succeeded in inducing them simply to hold their breath when tempted to cough, and in a little while I was myself surprised to see how some of the children recovered entirely from their disease.

THE evil consequences of eating to repletion, or of luxurious living, far exceed belief, or even the calculation of the physician; for they metamorphose themselves so artfully, and mask themselves so successfully behind unsuspicious forms and phenomena, that they are constantly undermining the constitution, deceiving patients and misleading practitioners.

IRREGULARITIES OF THE TEETH, denominated constitutional, prevail to a greater extent among the idiotic, deaf and dumb, and blind, than among an equal number of strong and healthy persons. Not only is the brain matter deficient in the feeble-minded, but many cases are seen which demonstrate that the osseous system is also generally defective.

BAD DIET AND NOT OVERWORK.—Mrs. Mary Blake, in *The Golden Rule*, writes as follows respecting the diet of school children: It is a very common and mischievous notion that unless an article of food doubles up a child with colic, or throws him into a fever, within twenty-four hours, it does him no harm. We often see whole families of children who are thin, sallow and nervous. They lose many days of school because they cannot "keep up," and the parents complain bitterly of "our high pressure system." They are bilious, or have headache, or "summer complaint," or they cannot sleep, or they have no appetite. In short, they are sick half the time, or half sick all the time. But suggest to the mother of this family that perhaps her food is not suitable, and she will indignantly answer, "Oh, no! they never eat anything that hurts them." The blame is laid on malaria, or on overstudy, or nervousness, or delicate constitution, or anything but the real reason. The trouble actually is that the stomach is doing its hard work on *brain*. Brain and body call for strong, rich blood to build up their rapidly growing tissues, and to replace what exercise and study burn up. But what does the stomach get to make it of? —Greasy meats, with all the life-giving qualities cooked out of them; hot bread, and compounds like it; all kinds of fried abominations, whose original excellence is destroyed by being steeped in boiling lard; rich cake and pies, sweets and candy. All these tax digestion to its utmost, and give little nutriment in return. Poor Jennie starts off to school after a restless night in a room with every window closed for fear of "the night air," with nothing for breakfast but a cup of strong coffee "to keep up her strength," and a hot roll. "She never has any appetite mornings." She comes home to dinner faint and hungry, to find roast pork and mince pie, or fried ham and heavy apple dumplings, which her poor, eager stomach takes and tumbles over and over all the afternoon, while her brain labors heavily with the afternoon lessons. A supper with something which tempts, but does not nourish, the tired stomach, finishes the day.

DISEASE CONTRACTED BY KISSING.—Miss Mary Hooper, an experienced professional nurse, of Toledo, Ohio, writes to Annals of Hygiene as follows: I see that Dr. Corwin asks to be informed of any case of disease being "contracted or transmitted by kissing." I can speak of two positively, which came under my notice. One was in England, in this wise: In my home there was an old lady staying with us: my aunt who was her companion and god-child, was very fond of her. Mrs. Arewater (the old lady) was taken with inflammation of the lungs and bronchitis, which proved fatal; one day before her death, my aunt stooped over her and kissed her on the lips: I remember my mother saying at the time, C. you should not do that, and aunt laughed, Mrs. A. died the next day. Aunt was taken with severe bronchitis two days after. She felt the attack coming on the day after, and although she had never suffered from bronchitis before, from that time to her death, eight years afterwards, she had frequent attacks of it. The second was in the Hobart Hospital, where I was superintendent. There was a young man brought in with diphtheria; his mother, who lived two hundred and fifty miles away, was telegraphed for. I had told the nurses not

to let the mother in until I saw her, but they disobeyed orders, and when I went to her I found she had thrown herself down by the bed and was kissing her son. I told her the danger, and insisted that she was running unnecessary risk. The boy recovered: five days after the mother was brought in with diphtheria and died.

VALUE OF SANITATION.—Dr. John C. M'Vail says, (in Glasgow Sanitary Journal): If the question be asked: Where is the proof that our proventive measures—our sanitation—have had the results we speak of? the answer is at hand. It is given by the Registrar-General in the language of figures. He points out that, according to the newest English life-table, the children born in England in any one year have now divided among them "nearly two million years of life"—more than would have been the case thirty-five years ago. In England and Wales the annual mortality per million of population per annum has been as follows: 1861-65, 22,595; 1866-70, 22,436; 1871-75, 21,975; 1876-80, 20,817; 1881-85, 19,310. Comparing the first period and the last, the difference is 3,285 per million, and taking the population at 30,000,000, the total annual saving is about 100,000. And if for every death there are twenty cases of sickness, then we have two millions less cases of sickness in the first period. * * * You can count the cost of each case of sickness, of lost work, of doctors' Bills and so on, and also the monetary value of each of the 100,000 lives.

ARSENIC IN THE HOME.—Mr. A. Stokes, F.C.S., F.I.C., public analyst, Paddington, Eng., says:—Of wall-papers submitted to me, 10 per cent. are found to contain arsenic. This is a high proportion, but then only suspected samples are sent for analysis. One of my rooms I found thus papered. Omitting articles in which its occurrence has been purly accidental, arsenic has been found of late years to be present in some samples of muslins, cretonnes, wall-papers, playing-cards, the glaze of some enamelled stew-pans, the paper of fancy boxes, and in some furs. These last are usually the furs prepared by amateurs. So that we may picture an infant placed by an unfortunate concurrence of circumstances in a room covered with arsenical paper, having its cot draped with muslin or cretonne, fed on food prepared in a glazed saucepan, itself covered by a rug, and playing with some fancy box of sweets or toys, all of these containing a minute but unnecessary amount of arsenic. One has no wish to be an alarmist, and it must be acknowledged that cases of any ill results being traced to the use of these articles are rare. None the less, seeing how unnecessary they are, and how each year arsenic seems to be finding its way into new quarters, it seems advisable to stop its further progress. This can only be done by prohibiting by law, as in some other countries, the use of arsenic for producing colours.

CAUSES OF LAMP ACCIDENTS.—A Mr. Marvin is urging in the Sanitary Record for legislation for dangerous lamps. He says that in "the United Kingdom 300 people are roasted alive every year" through the manufacture of dangerous lamps. In pursuing his investigations into the causes of the accidents, he discovered that more than half were occasioned by the breaking of the reservoir consequent on the lamp being upset, and at least 20 per cent. more by explosions arising from the ignition of the gas in the reservoir in endeavoring to extinguish the light by blowing down the chimney. The rest of the fatalities proceeded from the wick being wound down into the reservoir, the overheating of the burner, the filling of the lamp when alight, the impinging of a draught on the flame, and so forth...Even a simple clause in the Petroleum Bill, rendering obligatory two things—metal reservoirs, and burners that would bear being blown upon—would be better than no law at all, for it would reduce the mortality by at least two-thirds, and save the lives of 200 people a year.

A CUP OF TEA is generally made the wrong way. In the first place the tea is made too strong, thus losing the full tea flavor. In the second the tea is boiled, extracting the bitter tannic acid from the leaf, while the tea aroma is lost by evaporation. In China the tea is made weak in cups from which it is drank, the water being poured boiling hot on the leaves, covered for a few minutes, and then drank without either milk or sugar: the Chinese consider our use of them in tea as by no means the least proof of our barbarism.

But that is a matter of taste. The water, with which tea is made, should be fresh, not drawn from the boiler, nor taken from the kettle in which it has been kept standing on the stove, but freshly boiled for the purpose and *boiling*, and the kettle in which it is boiled should only be used for water. First wash and scald the teapot, and have it hot.

"NERVOUSNESS."—The victim of nervous disquietude should learn that a cure must be sought among agencies which strengthen the nerves: those which merely render them dull and inactive will, after prolonged use, bring inevitable destruction of vital force. Good food and plenty of it: exercise in the open air and plenty of it, and freedom from unnecessary worry are the best remedies.

HYGIENE OF OLD AGE.—In a paper before a Sanitary convention, Dr. H. C. Wood said: A very notable percentage of the deaths of persons who have been successful in life, and have attained beyond the seventieth year, could be, by proper care, long postponed. . . . (and he might have added, in comfort—Editor Health Journal.) In order to protract an advanced life, it is well to understand not only the dangers that beset such life, but the reason why old age has been attained. . . . The larger proportion of mankind die early on account of some local weakness. It ought to be generally recognized that human age is not to be counted by years, and that in some constitutions the general tissues are older at fifty than they are in other individuals at one hundred. Many of the cases of men and women suddenly or gradually breaking down at forty or fifty, ostensibly from overwork, are really cases of premature old age, and are to be nursed and treated precisely as other individuals would be who had reached fourscore years. Moreover, a large proportion of early deaths are the result of some vital organ's being originally endowed with a longevity less than that of the rest of the organism. The principle involved in such case is that which is most vital in the treatment of the old,—protection, and especially protection from straining any one vital part. And old man exposes himself to inclement weather, and especially to a high wind, which suddenly drives the blood from the surface in upon the internal organs, and at the same time, by its very force, checks the enfeebled movements of respiration, which in aid forcing the blood out from those organs. As a result, the man perishes at once, because he has thrown too great a strain upon a week heart, or, if able momentarily to resist the strain, dies in a few days of pneumonia, due to congestion of the lungs. I have known the sudden shock of good news to strike the old man down, as fatally as the poleax fells the bullock, by causing the blood to rush with renewed force through the brain, and tear its way through the weakned walls of the blood vessels. Again, the violent emotion of sudden bad news may overwhelm a heart which, with care, would have suffered for its duties for many years.

INFECTIOUSNESS OF CONSUMPTION.—At the last annual meeting of the American Climatological Association, Dr. Wilson, of Philadelphia, said that dilation was the true means of rendering the air of our houses aseptic. There is more apathy than there should be about the ravages of pulmonary comsumption, which are more formidable than even the epidemics of the middle ages, and we should take proper precautions against the spead of consumption. Dr. A. H. Smith, of New York, remarked that he believed the time would come when the physician who neglected to take proper precautions to prevent the infection of healthy persons by consumptives would be considered as guilty as one who exposed his patient to the small-pox without vaccination.

MUNICIPAL CONTROL OF DIPHTHERIA.—At the eighty-third Annual Meeting just held at Albany, the New York State Medical Society, Dr. Storer, read a paper with this title It had been shown that by proper isolation and disinfection the number of cases of diphtheria in a community could be reduced to one fifth of the ordinary number. There were the same reasons for placing the disease under official supervision as applied in the case of yellow fever, cholera, or small-pox. Twenty-three times as many patients died by diphtheria as by variola. He recommended that in every community there should be an officer whose duty it should be to post notices of danger on all houses in which diphtheria had made its appearence. All physicians should be supplied with blanks on which to notify this officer as soon as a diagnosis of the disease was made in a case to which they

were called. Tracts containing practical information as to isolation, sanitation, and general treatment were to be distributed to families one of whose members had contracted the disease, and notices should be sent to school-teachers, that they might at once exclude children coming from such families. In the country the schools were the leading means of spreading the contagion. In cities and towns it might also spread by contamination of the drinking-water, by sewers and cess-pools, and by aerial infection by means of ground-air ro sewer-gas.

To Remove Freckles.—Shirley Dare recommends a lotion of chloride of lime made very weak and dried on the face in the sun for five minutes, and washed off with lemon juice, followed by glycerine. "If they don't go at the first application, they will with sufficient repetition. Or you may touch the freckles with javelle water, taking great care it does not touch the eyes, lips or inside of the nose; after a few minutes wash off with lemon juice or vinegar as before."

For Black-heads, flesh-worms, which are found in the skin of the face and especially of the nose, may usually be removed by the following safe prescription of Dr. Unna: China clay, 4 parts; glycerine, 3 parts; acetic acid, 2 parts. Add to this a sufficient quantity of any perfume desired. On going to bed apply the ointment to the parts affected, and leave it on all night. Repeat four or five times and wash with fine pumice-stone soap.

THE PUBLIC HEALTH.

Canadian Cities.—The total number of deaths recorded for December in the twenty-eight principal cities and towns which make monthly returns to the Department of Agriculture, in Ottawa, was 1,356; 66 more than in the previous month. For the corresponding month of last year the record was 1,441 with two cities less making returns, which with the increase of population, gives again for December (as for the previous month, as reported in our December issue) a decidedly lower rate for last month than in 1887. No deaths from smallpox were reported for December. From measles there were 37 deaths, 14 of which were in Halifax, and 17 in Montreal. In the previous month there were only 22 deaths from measles. From scarlet fever there were 24 deaths in December, 14 of which were in St. John, N. B.; 4 less than in the previous month. From diphtheria there were 85 deaths, 26 more than in November. Of the 85 deaths, 38 were in Montreal, 12 in Toronto, 11 in Ottawa and 7 in Winnipeg. With a further decrease in the mortality from zymotics, there was an increase in that from local causes, such as inflammations.

The Mortality in 1888.—The total mortality in the 20 principal cities in Canada in 1888 was 17,100. The total mortality in the same cities during 1887 was 15,636: although in 1886 it was 16,018.

In London, Eng., according to the British Medical Journal of January 12, 1889, notwithstanding the unseasonable weather which prevailed during a great part of the year, the death-rate was considerably below that recorded in any year since civil registration was first established in 1837—18.5 per 1,000 of population. The mortality from the principal zymotic diseases was also below the average, although epidemics both of measles and of whooping-cough prevailed during the year.

The marked improvement in the health of London has thus been more than maintained; the death-rate from all causes, which had averaged 24·4 per 1,000 persons estimated to be living therein in the ten years 1861-70; 22·5 in 1871-80; and 20·4 in the first seven years of the current decade, further declined to 18·5 during 1888, the lowest rate on record.

In Michigan in November, small-pox was reported in seven places. The disease, it is reported, is prevalent in many centres in different parts of the United States. Three places are mentioned in New York in which there are isolated cases; and five centres are reported (Jan. 19) in Ohio.

PLAY AND PHYSICAL TRAINING.

Schiller once said: "Deep meaning often lies in childish play." We have before us two valuable articles: one on "Play as a Means of Development," an editorial in the New York Medical Journal; and the other on "The Physical Training of Young Children," by M. Fernan Lagrange, in the Popular Science Monthly, translated from the Revue Scientifique, in which the author advocates natural play as superior to gymnastics for children under fifteen years of age.

Play, says the Journal, "may be defined as a voluntary exercise prompted by natural inclination and producing pleasure. . . . The great variety and apparent aimlessness of motion in play is explained by the requirements of the muscles and faculties, and the necessities of the future. It "is an instinct with the child, and has developement for its object. This instinct is an inherent impelling force that causes all the muscles of the body and various faculties of the mind to be exercised in sufficient measure, but never in excess. It gives a large share of education and training, and prepares the young for future work. Nature never leaves what is necessary for continued existence to be supplied by the unaided wisdom of man."

M. Lagrange writes as follows: The fact that intense muscular effort interferes with the development of the growing infant in height is perhaps less well known to hygienists and physicians than to veterinary surgeons and trainers. It has long been observed that young horses which are put to work too early never become as large as their fellow-colts which are allowed to reachtheir full growth in the pasture. Gymnastic apparatus, with the efforts which they necessitate, would have on the child the same dwarfing influence as harnessing to the waggon or the plow upon the colt. The infant prodigies of the circus sufficiently exemplify this fact. With all the skill they display, they are usually in some way distorted; and persons who have begun hard work on farms or as laborers too early in life are generally stunted. These facts should be strongly impressed upon parents.

In children muscular effort should be generalized, so as to make as great a number of muscles as possible participate in it, or at least to distribute it judiciously among the stronger muscles. Exercises in which the work is localized, however much they may contribute to the development of the active part in the adult, do not have that effect in children, the volume of whose muscles is never increased by them. They are consequently useless, while they promote fatigue. They are liable to the further objection that they tend to produce deformities in young children subjected to them, whose plastic frames at their tender age yield very readily to any stress which is put upon them, and acquire a permanent set if it is repeated too often.

These objections do not lie against light gymnastics, which are not performed with fixed apparatus. In these, the child bends, stretches, and shifts his arms, legs, head, and body in various directions, at the command of the teacher, in measured rhythm. But even when performed in concert they are not recreations, and this is an extremely important matter with pupils whose brains are working to excess They become exceedingly monotonous, and the child begins to perform them reluctantly, or learns to partly evade them. He finds in them, not a recreation, but a lesseon additional to the others—a new burden. Now, recreation is not only a moral want of the child, but it is an important physical need, in so far as it furnishes a remedy for the nervous weakness and irritability that are induced by constant constraint, and helps to prevent disturbance of the equilibrium of the vital functions.

The prime fault of both these kinds of gymnastic exercise is that they are artificial. They were introduced for the praiseworthy purpose of suppyling the want of natural exercise where that could not be obtained; but they have gone beyond this, and the notion has arisen that a child can not take proper exercise without going through an apprenticeship and being subjected to a method. Instinctive exercise would amply suffice for the development of the body if the instinct were listened to every time it speaks, but social and scholar conditions do not permit this. The instinctive desire, repressed too often, becomes weakened, and finally disappears. The body accommodates itself to a sedentary life, and the insufficiency of exercise finally induces muscular indolence and an inert habit. The teacher of gymnastics would not be needed if the pupil had the privilege every day, for a sufficient time, of a large space, and liberty to

amuse himself in it. Why, then, erect halls and apparatus if we can have the privilege of a spacious sward or a garden with broad walks? While gymnastic apparatus may be useful where there is not room to provide other means, what is to be said of heads of families having ample spaces in the country, with all desired conditions for natural gymnastics, who go to the trouble of constructing gymnasiums for their children? The tendency to look for the best, misses its mark nowhere more sadly than in the physical education of the child, when it prefers complicated, to natural methods, and neglects the best hygienic means as too simple, or insufficient.

Instinctive gymnastics is, from the hygienic point of view, the best adapted to the regular development of the child. It is not liable to any of the objections we have brought against gymnastics with apparatus. It can not deform the body, for it is made up of spontaneous movements, and conformed to the natural office of each limb. It does not localize the work in a particular region of the body, for all the limbs are instinctively invited to take their quota of exercise; and it does not seduce the child into efforts touching upon the limits of his strength. Instinct also invites him to the kind of work which is best adapted to his particular aptitudes for resisting fatigue. Finally, natural exercise, being the satisfaction of a want, is by that very fact a pleasure; and joy shines in the face of the child who is playing freely.

The physical education of the child, up to his fifteenth year, should have for its sole object to favor the growth of the body in all directions, particularly in height and weight; the perfecting of the structure of the organs, and the training of them by methodical exercise to a more complete performance, should come later on. The fourteenth year will be early enough to begin more energetic motions for hardening the flesh and developing the muscles. Till that age, physical education should especially aim to remove from the child all influences that may be in the way of free expansion and growth of the body.

This important distinction between developing and perfecting hygiene is well understood and observed by horse-trainers. They give colts nourishing food, free air, and room to gambol; and do not begin training them for work till they have acquired bodily growth and substance. If natural gymnastics is enough for the animal, we may conclude from analogy that it would be amply sufficient for the child, if he had the conditions of space and time that are indispensable to the satisfaction of the instinct that impels him to exercise.

The form of exercise that comes nearest to natural exercise is playing. It is nothing else than a more or less methodical regulation of the instinctive motions, such as every living being is prone to execute spontaneously when he feels the stress of the want of exercise. It may be called a natural exercise, for we see the young of every species of animals playing with one another, and may even observe their parents inciting them to play. Play, in the progress of civilization, has taken various forms, and has been subjected to methods that tend more and more to introduce into it an artificial element. Hence, sport has been developed from plays; which permit a greater display of muscular force, exacting more complicated motions and a longer apprenticeship. It is sometimes hard to draw a clear line between sport and play. In the hygienic view, sports are half-way between gymnastics and play, and are therefore more suitable to youth than to children.

Play was the only children's gymnastics at the beginning of this century, and even now some nations have no other settled method of physical exercise. The English have never taken to gymnastics with apparatus; and the Belgians, after having tried it, are abandoning it and returning to play.

Will parents then encourage free romping in their children,—in girls and boys alike? And further, as the N. Y. Medical Journal puts it, will parents "dare to be children again with children," for the sake of both parents and children.

FOR DANDRUFF, A writer in the Medical Summary recommends the following: Chloral hydrate 1 ounce, water 1 pint, apply freely to the scalp, with friction, either with hands or hair brush. Repeat this operation night and morning until the scalp is clean. Gradually lengthen the intervals of application, but keep up a bi-weekly use of it for a time. It is said to leave a cooling and invigorating sensation.

WHEN HOARSE speak as little as possible until the hoarseness is recovered from. Speaking irritates the parts and tends to prevent recovery.

STERNE, in one of his brilliant essays said: "O thou blessed health, thou art above all gold and treasure; 'tis thou who enlargest the soul, and openest all its powers to receive instruction and

relish virtue. He that hath thee hath little more to wish for, and he that is so wretched as to want thee, wants everything with thee." Someone has written that the body was given to us by which to express the soul. The ancient Greeks, over two thousand years ago, who had then reached a higher degree of physical culture than any other people who have ever existed, regarded the human form as a gift of the gods and believed that it was their duty to preserve and perfect it. Moreover, they believed that health, strength and beauty of form were indissolubly united ;—and so they are. And is it not worth the trouble for every one to carefully guard the health and to use every available means to avoid and prevent disease, and for parents to look most closely and diligently to the health and proper development of their children?

On the other hand ; it is possible to go too far —to go to extremes, in the worship of Hygeia. Dr. Norman, at the last annual meeting of the British Medical Association, said, " As there was no rose without a thorn, and as suffering and death were the appenages of humanity, we could not expect that attention to health and sanitation would be absolutely free from risk. As to health, there was risk in the very attention to it. He had patients who had killed themselves by attempting too earnestly to live on scientific principles. Such worried themselves and sometimes their wives into an untimely grave." All means for the prevention of sickness and preservation of health must, like the food, be served with "brain sauce"—with common sense. It has been said that in this age of crowding into cities, eternal vigilance is the price of health ; but one need not be over anxiously vigilant and worried. Besides providing wholesome nutri-

food, partaken of in moderation, with other essentials of health, there are many direct causes of disease which it is desirable to use means to avoid, such as infections and causes of certain fevers, inflammations, &c. While people should not allow themselves to be misled by unreliable advice, there are new facts being constantly brought to light regarding the causes and sources of disease of which everyone should become informed. And while there are many who will not put useful knowledge of this kind into practice, there are many who will.

New ways, or those hitherto unknown, by which infections—the germs or seeds of disease, are spread and received into the body are frequently being found out, and which should be known by every-body. It is not long since it was first suspected that the increased prevalency of kidney diseases are due, as it now appears that they are, to the habitual use, in the diet, of too great a proportion of nitrogenuous food, thereby overtaxing those organs. Again, it is but now being brought to general notice that many physical exercises which were supposed to expand the lungs do not do so, but actually lessen in some cases the inner capacity of the chest, although increasing its outer circumference, simply by enlarging the large muscles on the front of the chest. Gymnastics, for increasing the strength, are often very unwisely and unscientifically indulged in. Great strength in one part is a source of danger to another. The athlete perishes, as Dr. H. C. Wood says, because his over-developed muscular system perpetually strains, and finally wears, out a heart or a lung that was originally constructed for a muscular apparatus of half the power of that which he has artificially built up. As an example, of about 1,200 students of Cornell University who were recently vaccinated, a number of the athletes fainted under the operation. The science of health is progressive and there is a great deal yet to be learned regarding it.

The "New Gospel" of health must be spread. In a special sermon preached in Ottawa some time ago by the Rev. Mr. Carson, in the Dominion Methodist Church, the Rev. gentleman said : "I call it the new gospel because it is a part of the revelation contained in the Testaments of God ; and because, as a practical science it is yet scarcely half a century old." "My object in bringing the subject into the pulpit and making it a part of my teaching is to show that it is a part of the gospel which I preach, and is included in the scheme of Divine government as given to us in the Holy Book." "We must teach that sanitary science is as much a law of God as the ten commandments : and that obedience will bring reward and disobedience punishment." Why cannot there be much more of this sort of preaching? why not a sermon on the subject once a month by every minister of the gospel? They would promote better living, temperance and greater ability in communities for good.

Neighbors, it need hardly be written, are often very unneighborly. There are some people indeed who live near to others but who are not fit to be called neighbors ; who should live at least ten miles from any others, who keep a howling, barking or biting dog, badly trained,

saucy children or foul premises. There are a few of the opposite sort who can with a good deal of trouble, make fair neighbors of such people, but many of them no one can do anything with, except it be to let them severely alone; and even then a great deal of very unpleasant trouble is the reward. A sort of semi-prison or penal colony should be set apart for those who cannot live in a community without making themselves a nuisance, and a commission of neighbors be appointed to decide upon their doom. All such should be in one place.

ON BEING NEIGHBORLY, on the other hand, again, Dr. Alison has related a story of an Irish widow, whose husband had died of typhus in a lane in Edinburgh, who had wandered about the town with her three children, seeking help, but finding none. This gave rise to an epidemic which ended in the death of seventeen other persons. Carlyle says of this: "Very curious. The forlorn widow applies to her fellow-creatures, as if saying, 'Behold I am sinking, bare of help! I am your sister; ye must help me.' They answer 'No impossible; thou art no sister of ours.' But she proves her sisterhood; her typhus fever *kills* them." Dr. Russell, the able Medical officer of Glasgow, says; The ultimate cause of the existence of communicability in disease is, I believe, to enforce the golden rule upon us in reference to the physical well-being of mankind. The practical question is,—"What am I to do with my dirty neighbor?" We must bring to the solution of it a little common sense and ordinary business principles as well as philosophy. There must be power to prosecute and punish dirty neighbors for over-crowding and other nuisances which affect the well-being of neigbborhoods. The principle must be not to do anything for them, but make them do it for themselves, and bear the expense, as they reap the benefits In this way a process of education would be carried on.

CANNED FOODS, as everybody who reads the "papers" knows, frequently give rise to poisonous, sometimes fatal, symptoms in those who have eaten them. An "expert" in the Grocers Chronicle gives the following advice: Canned foods should be turned out and eaten as soon as possible. If kept at all, the food should be covered up and put in a cool place—always, however, turned out of the original tin. The liquor around lobsters, salmon, and all vegetables, excepting tomatoes, it is desirable to strain off and throw away. Never on any account add vinegar, sauces, or any kind of condiment to tin foods while they are in the tins. All tinned goods are put up fresh, but, unless corned or salted, will not keep if turned out, as freshly cooked goods will, and certainly not longer, as many thoughtlessly suppose they will. Sardines, if preserved in good oil, and if of good quality, are an exception; as long as the oil is good, the fish can be kept in tins for many days. If the nose and eyes are properly used, it is as impossible to partake of an unsound tin of canned food of any kind as to partake of bad meat, fish, or vegetables from a shop.

IN PROOF of the contagiousness of consumption, Dr. von Duhring relates a case (British Medical Journal) of a girl, E. Z., aged 14, of a family uncontaminated with tuberculosis, who was intimate with a young girl who had died of consumption. E. Z. removed the earrings from the friend's ears, which had frequently had blood and matter on them, and wore them in her own. Shortly after, the holes in her ears began to show a discharge. Sometime after, when Dr. Duhring saw her, he found her pale and thinner, but well developed. At the hole in the left ear there was an ulcer, matter from which showed the presence of tubercle bacilli; and on this side of the neck was a large ulcerated gland. The progress of the case was rapid, and at the time of writing the report, the patient was rapidly sinking from phthisis.

MENTAL OVERWORK is a form of disregarded illness. In a recent number of the London Lancet we find the following:— Some interesting observations on the symptons of mental fatigue were discussed at a recent meeting of the Anthropological society. The result goes to prove that weariness of mind, the result of work, like other forms of exhaustion, is recognizable under the two different though related aspects of irritability and incapacity. The observations were culled from a series of reports by school teachers, and include details of their own sensations as well as of the children under their care. The signs of mental irritability were apparent in sleeplessness and nervous laughter; of fatigue, in sleepiness and incapacity for task work. Lolling, yawning and a languid manner told that the will was flagging. Headache suggested overstrain in study combined with defective ventilation, and perhaps a too sparing diet; while some curious facts bearing on the causation of color-blindness and somnambulism were also noted. Over-

work, both mental and bodily, is at once the most general and the least regarded form of illness. Do what we may, it is next to impossible to escape from it ; but there is a certain satisfaction in being able to recognize its features It is too a preventable evil. Its treatment requires chiefly that due attention be paid to the two great essentials, timely rest and wholesome diet. Work, however irksome, may it is generally allowed, be undertaken on a liberal scale, if only it is not too continuous, but is broken by timely and adequate intervals of rest. The value of a plain and liberal dietary is hardly less, and we may take it as a maxim for the times that, so long as appetite and sleep are unimpaired, there is no dangerous degree of overwork, and conversely, that a failure in either of these respects should be regarded as a warning signal, to which attention should be paid by at once relieving the strain of exertion.

ATHLETES are not required in this age, but fine active controlable muscular systems and brains. We are full in accord with the following, from a lecture given by Dr. G. W. Anderson, Jan. 8th, 1889, at Cooper Union, before the New York Academy of Anthropology (reported in the Doctor) : Of what use to day would the strength of Milo be to a man? Scanderberg would have found a position in a dime museum as a curiosity. Morris, the Count of Saxony, would have done the work that is now done by animals. John L. Sullivan does little for the advancement of physical education. What we long for most in the muscular system is quality not quantity. We want men whose well developed muscles are controlled by better developed minds. We wish to prove that gymnastics will cure and remedy certain physical defects. Above all we wish to elevate the science of physical education by proving that we can develop the brain through the muscles. Huxley in his description of a man who has had a liberal education says ; "he is one who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work it is capable of." Rousseau in his treatise on education says ; The feebler the body, the more it commands ; the stronger, the more it obeys." Dr. Anderson, had found in his practice that systematic gymnastic training would produce symmetry of the muscles ; that a clumsy, awkward boy was changed by exercise to a graceful well-proportioned youth. Not only was the muscular system developed, but through the muscles the nerves, and through the nerves the brain. There were cases where boys with sluggish minds had been greatly benefitted by muscle and nerve training, and in several instances they had ultimately excelled in mental work. Du-Bois-Reymond has shown the necessary connection between brain and muscle and that by far the most marked influence of physical exercise is upon the nerve centres.

OF THE VALUE OF HYGIENE, one of the best illustrations is furnished by Mosny, in the *Revue d'Hygiene* for January, 1888 (Albany Med. Annals) in describing the water supply of Vienna. Before 1874, Vienna received nearly all its water from the Danube. Since that date, large reservoirs built in the mountains near the city have been in use to collect spring water, so that in 1886, about 88 per cent. of all the city houses were provided with pure water. Dysentery has now become quite unknown. In 1869, 1870 and 1871, there were about 100 fatal cases of this disease : in 1872, 38; in 1873, 53; in 1874 and 1875, 32 ; in 1877 and 1878, 17 ; in 1880, 11. Since that time none have occurred. Typhoid fever has also well-nigh disappeared. In the decade of 1850 to 1860, the mortality from this disease was about two for every 1,000 inhabitants. In 1871 an epidemic appeared in which mortality rose to 4.5. After 1874 it began to fall until it has now reached the low figure of .11, or less than one in 9,000. In the winter of 1877 the reservoir of spring water had become frozen, and to supply the demand, four districts of the city were provided with water from the Danube until February 10th. An epidemic of typhoid thereupon appeared in March, in which twenty-nine out of every 100,000 inhabitants succumbed ; of every 100 sick, twenty-five died. In those districts in which no Danube water had been distributed, the mortality rose but slightly above the usual rate.

THE New York Times of the 27 inst, under the head of "Tuberculous beef and milk," gives an Editorial commenting on the half a million dollars appropriated by Congress for protecting the cattle industry, but complains that "the people themselves suffer great loss, both of health, and of life, by a disease (tuberculosis) that is in many cases communicated to them from cattle," and adds, "they too should be protected." "The Bureau of Industry inspected 305,280 animals last year and killed only 8,139. About one-third of these had pleuro-pneumonia. The percentage of those having tuberculosis is much larger."

THE annual mortality, the Times continues, in conclusion, caused in this country by that form of tuberculosis called consumption, is estimated to be 130,000. "The concurrent testimony of prominent physicians, veterinarians, and bacteriologists is to the effect that this terrible mortality can be largely decreased by preventing the sale of the beef of tuberculous cattle and the milk of tuberculous cows. The careful sanitary inspection of all herds for the purpose of eradicating this disease is required for the protection of the people."

A DOCTOR recommends, in the British Medical Journal, his fellow practitioners to have small pads of cotton batting, with light tapes attached, tied over the mouth and nose, to prevent the entrance of infections on visiting infected patients ; to be burned when taken off. A

good practice, which ANY ONE forced to go near a case of infectious disease might wisely and easily adopt.

ANOTHER illustration of the value of Hygiene: typhoid fever is never absent from New Orleans, says Dr. Kaine, and with no other change in conditions except the enforcement of sanitary regulations, the death rate from that disease has been reduced from 68 per 100,000 of population to 16, in less than twenty years In Philadelphia (Ann. of Hyg.) where the water is contaminated with sewage, the death rate from the same disease has increased from 56 to 66 per 100,000 in the same period.

WHERE CONSUMPTION LURKS—Carnet experimented with the dust obtained from the walls and floors of various dwellings in which tuberculous patients had been; and inoculating guinea pigs with it, carefully excluding all possibility of infection from other sources, he obtained positive results. Twenty one rooms of seven Berlin hospitals were examined, and bacilli found to have been present in the dust from most of them. Positive results were also obtained with the dust from insane asylums and penitentiaries. The dwellings of fifty-three tubercular patients were investigated in the same way, and the dust in the neighborhood of twenty patients found to be virulent. It was the case with absolute regularity that the dust was always virulent when the patient had been in the habit of spitting on the floor or in a handkerchief, while it was not so when a spit cup had been employed.

ANOTHER SOURCE OF CONSUMPTION—Dr. E. di Mattei reports (*Arch. prio le Sci. Med.*) a number of experiments made to determine the possibility of transmitting tuberculosis through the medium of the sweat. In the first series, in which the sweat was taken from the skin without any precautions, numbers of tubercle bacilli were found. In the second series the author cleaned carefully a portion of the integument, covering it subsequently with a glass to prevent possible contamination from the air, and then examined the sweat excreted on this part. Here no bacilli were found, showing that the microorganisms found in the first instance were deposited upon the skin from the surrounding atmosphere, and that none passed through the sweat glands.

RELATING to the percentage of tannin in different teas, the following note of the result of some experiments on three samples, unblended, sent to the British Medical Journal, (Jan. 12th, 1889,) by Dr. Hale White, of Guy's Hospital, is of much interest. A was the finest Assam; B the finest China; C common Congou; no green tea being used. The percentage of tannin by weight extracted by infusion for three minutes was in sample A, 11.30; in B, 7.77; and in C, 9.37. The percentage of tannin by weight extracted by infusion for fifteen minutes was 17.73, 7.97 and 11.15, respectively. The result, Dr. White adds, is what might have been expected, as tannin is very soluble in hot water. It is of course true that any tea which has been infused for some time has a more marked effect than tea which has been infused a shorter time; but this difference is due not so much to the tannin as to strength. The moral, therefore, is to select the best China tea and not to drink it strong; to be satisfied with flavour and not desire intoxication.

CONSUMPTION in New Hampshire, according to Dr. Watson, Secretary of the State Board of Health and also of the American Public Health Association, causes about one-eighth of the total mortality in that State. The greatest number of deaths occur in May. The prevalence of the disease is greater at low elevations with a maximum soil-moisture than in the higher elevations with a less moist soil; and the death-rate is relatively much larger among the foreign-born residents.

THERE are three general grades of flour usually in the market (N.Y. Med. Times): "Patent," "Clear" and "Straight," as known to the trade. "Patent" contains most of the gluten of the wheat, its strongest and most nourishing part, and has all the good qualities of bran flour without its objectionable sawdust property. "Clear" is flour made at the same time as the patent; it is mostly starch, very white, but has little strength. "Straight" is the two combined in one flour. The "Patent" is the highest priced, "Straight" next, and "Clear" the cheapest.

THE celebrated old New England divine, Cotton Mather, of Salem witchcraft notoriety, when asked to define malaria said it was the devil, a definition which, as the N.Y. Medical Times says, has in it more of truth than poetry. The poison not only produces nervous prostration, a lack of appetite, aches and pains with sleeplessness and weariness of life, but localizes itself in distinct organs, and holds on with the tenacity of death.

THE Queen of Sweden is undergoing peculiar treatment to "restore her nerves." Her doctors have ordered her to rise early, make her own bed, do up her room, and take a walk in the garden before breakfast; to work among the flowers afterwards, and lead an active outdoor existence all day. Already she has been benefitted by this "chamber-maid" treatment.

IF a man adulterates money by mixing base metal with it he goes to the penitentiary, an exchange says, but if a man adulterates food he gets a high seat in the synagogue, and when he is quoted in Mammon as having made a million of money by poisoning his fellow creatures his surviving customers burn incense in his face, and implore him to "run for something" that public honors may crown successful private enterprise.

IF Life Insurance Medical Examiners, instead of hammering at a man's chest to learn if he has a tendency to any disease, an exchange aptly says, would enquire if he has a cess-pool leaking into his well, or an un-trapped pipe beneath his closet, they might save some losses to their companies and benefit the public as educators.

ASTHMATICS, from necessity, become spare feeders, and are often very thin. In so many cases a heavy meat meal is followed by an attack that a restricted dietary is inevitable. To certain asthmatics certain articles are specially injurious. All articles of food which are indigestible, such as pastry, pickles, uncooked vegetable, salads, cheese and richly dressed or highly flavored dishes, are to be strictly avoided. Digestion should be completed before bed time.

WHOOPING-COUGH has been very successfully treated in four cases by Dr. Britton, Toronto, (reported in Can. Lancet) by the so-called "sulphur treatment." One case was that of a six-year-old child of his own. He burned a handful of common sulphur in the bed-room, from which all hangings, carpets, etc., were removed, confined the fumes for two hours, and aired the room for an hour just before the children retired. A cure was completed in three or four nights.

THE Croton Water, New York, will be the next point of attack for the Ladies Health Protective Society. They have appointed a committee of six to confer with Dr. Peters and visit the Croton watershed They are deeply impressed with the idea that the water is spreading typhoid and scarlet fever, diphtheria and measles at the present extraordinary rate in the city.

WATER, Dr. Coan, of New York, says, is the most dangerous drink known to man. It brings typhoid fever, cholera and other deadly diseases. Croton is reasonably safe from contagion on the principle that dirt is healthy.

ICE, too, is "a purveyor of death, because the little microbe garnered from the filtering inland streams don't mind being frozen up for months. He blossoms out at the proper time just the same."

ON drains. Dr. Honeyman (in Sanit. Jour.) says: Besides plenty of air and periodical flushing, one thing more is essential, that is, that they should be regularly CLEANED. I see no difficulty whatever in having this cleaning done periodically at less expense, and with very much less trouble than the sweeping of chimneys. There is, indeed, no reason why we should not have drain sweeps as well as chimney sweeps.

SOME modern "dishes" Dr. Hunter describes thus: One, will soon bring a man to his crutches; another, contains a considerable quantity of gout and scurvy; and a third, is diabolical and only fit for the Sunday dinner of a rustic who is to work the six following days in a ditch.

A NEW deodorant is recommended in the N. Y. Medical Journal; that is, Cromine, a cheap by-product in the manufacture of salt. It completely deodorizes decomposing organic matter, and is particularly recommended for stables, privy vaults, urinals, etc. One part by weight to 800 gives a practical strength for ordinary use.

MANY broken bones follow falls, and are caused by sudden stoppage at the ground; because one usually in falling tries to stiffen the joints in order to "catch ones self." Fall limp. like a drunken man or an acrobat in the circus —go down as limp as a rag, with all joints loose, and you will usually be able to get up alone.

A LEAN, misanthropic physician, in a small hamlet, had as his only opponent a handsome robust man. One day a lady asked the first why he was continually in bad health, whereas the other was so well all the time? "You see, madame," he replied, "I am the only man who can treat him; the only physician whom I can get is he."

THE SEPARATE SYSTEM for the disposal of sewage (*i.e.* separating the storm water from the sewage), which the medical officer of Victoria, B C., Dr. Milne, is urging upon that city, is one worthy of deep consideration by the authorities of many towns and cities, as regards both economy and efficiency. There are parts of the capital of the Dominion in which it appears it might be applied with benefit.

"SPRING medicines" for "purifying the blood" will now soon be in abundance in the drug market. Dont touch them. They do vastly more harm than good. If your blood be impure. from living in close rooms or over eating, or both, be a little "abstinent"—fast liberally for a few days—don't go near anything tempting—eat only the plainest of food, and go out in the open air and sunshine freely and let both freely into your rooms.

TO succeed well in life a man wants, not the athletic strength of the Ancient Greek, but a vigorous body, good digestion, pure blood, and a clear brain. Abundance of out in the sunshine exercise and strict temperance in both eating and drinking will give this.

THE ravages of cholera or smallpox give terror to many persons yet where cholera destoys one life typhoid fever destroys ten. In Canada alone, every year there are not less than about 3,000 deaths from typhoid, looked on calmly by everybody, yet every death of which might be prevented.

IT is a mistake to suppose that because a remedy, such as some patent medicine, makes one feel better for a time, that it is a good thing; the after effect on some organ or part may be very injurious.

THE HOG AHEAD.—It is stated that the United States Government has paid more money in the investigation of the disease of hogs than it has for all the diseases affecting mankind.

IT is not simply what one eats that gives strength, but what one digests, assimilates and forms into blood. Usually much of what is eaten is never digested.

AS to so called "temperance?" we believe that if ardent spirits were strictly "prohibited" and the use of light wines and good beer allowed it would best promote a true temperance, and and every encouragement should be given to the growth of the grape and the manufacture of pure light wines.

THAT strong temperance Journal, "Good Health," says: "we do not hesitate to venture the assertion that the health would suffer less from the use of half a pint of light wine daily than from the use of tea and coffee as ordinarily used. A cup of strong tea contains more poison and does more mischief to the vital economy than an equal quantity of beer."

FOR light wines, which we believe to be pure, we know of none of Canadian manufacture, or indeed made on this continent, superior to those of the Ontario Grape Growing and Wine Manufacturing Company, of St. Catherines, Ontario; and we have used and carefully observed and examined the wines of many other vineyards.

AN old New Yorker, brought up in hotels, said to a reporter of The Sun "There are two big mistakes that almost all persons make, one is that they don't eat the right things, and the other, that what they do eat they don't eat right. Dyspepsia and indigestion kill more people than rum ten times over. If the stomach is right the head will be clear." Truly, when the stomach is disturbed both the head and the heart soon go awry.

FIGHT all against tobacco, badly cooked and badly selected food, over feeding and foul unventilated rooms, and a true and lasting temperance will soon develope and a "third party" will not be needed.

THE "Doctor" states that a firm in Atlanta tells a representative of the Journal, that they ship ginger, which contains about ninety p.c. of alcohol. The old topers think it is the best substitute for whiskey, and once they get accustomed to it they prefer it to whiskey.

A BOSTON man sued his landlord for damages, and recovered them, on the ground that defective drainage had produced diphtheria in the plaintiff's family; an example which if more generally followed would soon lead to improved tenement houses.

DR. GOODMAN believes (Phila. Med. Times) that blood poisoning may result from foul teeth. He relates a case in which a patient suffered with a persistent headache, irregular chills, fetid breath, and fever which resisted treatment The man's teeth were bad and the doctor sent him to a dentist. He returned cured, showing a set of natural teeth.

THE CAUSE OF ILL-TEMPER has been discovered, it is said, by a dress-reform lecturer. She says that oftener than not it is owing to bodily discomfort proceeding from improper dressing, and that wives would all be sweet-tempered if they were properly attired and took sufficient exercise.

NOTES ON CURRENT LITERATURE.

IN THE JANUARY ST. NICHOLAS, just received, is published the first of a series of illustrated ballads announced in the Prospectus "The Pygmy Fleet" is an amusing fanciful story in verse, excellently told and charmingly and lavishly illustrated, or rather interpreted into pictures. There are more than twenty pages of these beautiful drawings besides the frontispiece. The serial, "The Belle of Ste. Anne," by Mrs. Catherwood, grows rapidly in interest; and Mrs. Burnett finishes "Little Saint Elizabeth." A continued story for little folk on a novel plan is called "The Bunny Stories," and is written by Mr. John H. Jewett, and excellently illustrated by Culmer Barnes.

IN THE CENTURY for January, the long announced articles by Mr. Charles De Kay, on Ireland, begin, the first being entitled "Pagan Ireland" with illustrations of the mediæval castle at Clonmicnois, the Cross Monasterboice, the round tower at Ardmore, etc., etc. Mr. Wilson, the photographer, continues his series on the Holy Land in connection with the international Sunday-School Lessons. The present installment, profusely illustrated, is entitled "Round About Galilee."

THE ILLUSTRATED LONDON NEWS for the month has been quite up to the usual high standard of this admirable weekly, and has given some most excellent illustrations. In the number for the 19th inst., Rider Haggard's great story, "Cleopatra"—the fall and vengeance of Harmachis, the Royal Egyptian, is commenced, with two full page striking illustrations.

THE POPULAR SCIENCE MONTHLY for January gives, besides much other valuable matter, an admirable paper on the "Physical Training of young children," copious extracts from which we have given on another page, and another entitled the "Story of a School" every parent and teacher should read these articles.