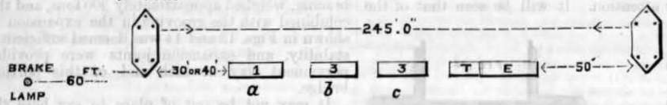
To the upper set of columns wrought iron cross girders of great strength are attached, and on these hydraulic rams are fixed, with which the combined span of girders is slowly raised up, much in the same manner, and with the same precaution of lifting and holding pins as adopted in lowering the caissons. In this way the span, weighing about 200 tons, is lifted up as the piers are built—the final lift being given from extra columns that overtop the whole structure of the pier. After the girders are at their greatest elevation the cutwater columns are erected and braced to the other, and the whole pier is consolidated and completed, the girders being, at the same time, settled in their final position. The apparatus of lifting girders, hydraulic rams, &c., is then removed to another pier."

Mr. Gilkes gives the area exposed to the wind for each span and its pier as 1600ft., which, multiplied by 60 lb. for the wind pressure per square foot, gives 43 tons as the overthrowing effort of the wind on any span. He wrote thus on the subject in November, 1876:—"A consideration of the action of the wind on this bridge will dissipate the often-advanced theory that at some period it will be blown over. The exposed surface of one large pier is about 800 square feet, and of the superstructure which depends upon it, about 800 more, and, so giving 800ft. for a train above, we have 2400ft. 21 lb. per square foot is the force of a very strong gale, but it would take no less than 96 lb. per square foot on the surface given to overturn the pier. Even the most severe hurricane on record would equal only one-half this resistant power."

Now, 96 lb. on the square foot acting on 2400ft. of surface represents an overturning effort of not quite 103 tons, and would give about four times as much for the tensile strain put on the lower flange bolts of the piers, from which must be deducted the insistant weight of, say, half the pier and one-fourth of the girder. This would leave about 100 tons for each of the three upright windward legs to sustain. The eight bolts would represent, say, 8 square inches of section, which, multiplied by 20, would give 160 tons. Thus the bolts *ought* not to be the first to go. Again, the three legs would have a sectional area of, let us say, 50 square inches each. The strain would therefore be not more than two tons per square inch—not too much for good cast iron. We are at a loss to know on what data Mr. Gilkes statement was based. Whatever were his grounds, the suggestive fact remains that, whereas it is known that wind pressures of at least 50 lb. to the square foot have been recorded in this country, the Board of Trade consented to the opening for traffic of a structure which, according to the public statement of one who ought to know best, had a factor of safety of much less than two to one. In other words, it was known that the bridge might be exposed to gales which would strain it to more than half its breaking strength, and yet it was deemed fit for traffic. But the officers of the Board would not for a moment sanction the running of trains across a girder, the calculated breaking strength of which was 96 tons, if the strain due to the rolling load and dead load reached 50 tons. The anomaly requires some explanation. If Mr. Gilkes is right, and the breaking or overturning point, due to the wind, was 96 lb. on the square inch, then the Board of Trade to be consistent ought not to have permitted the use of the Tay Bridge by the public.

It is not easy to ascertain the precise position of the wrecked train or of so much of it as exists in a recognisable form. The evidence of the divers contains all the available information, and this is at best scanty and imperfect. We believe, however, that the annexed diagram shows pretty accurately the extent of information acquired on this part of the case. The diver Simpson has testified to the position of the engine, tender, the third-class carriage *c*, and the first-class carriage *a*. The



THE TAY BRIDGE ACCIDENT—POSITION OF THE WRECKED TRAIN.

engine, he says, lies about 50ft. south of the fifth broken pier, counting from the south. The tender is attached to it, and the carriage *c* is close to. Then he speaks of carriage *a* as being a little to the north of the fourth pier. Fox, another diver, says it was about 40ft. to the north, and Thomas says about 30. The last-named diver found to the north of the first-class carriage *a*, and "close to it," a third-class carriage. From the desciiption he gives of this carriage it is clearly not the same carriage as *c*, discovered by Simpson. It is therefore the second third-class *b*.

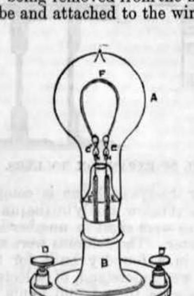
So far the evidence seems consistent and probable. The length of the engine, tender, and three carriages would be, according to Mr. Drummond's figures, 158ft. or thereabouts; adding to this 50ft. and, say, 35ft., the spaces spoken to by the divers as existing between the respective piers and the vehicles nearest to them, we have 243ft. lying in the span between the piers of 245ft. Then Simpson found one of the van side lamps at a spot between 50ft. and 60ft. south of the fourth pier, fairly showing that the rest of the train fell on that side of the pier. Norly, another diver, however, is reported as giving a circumstantial account of the discovery by him of a first-class carriage between piers three and four. Now there was only one first-class carriage in the train, and we have a concurrence of testimony as to the position of its ruins to the *north* of the fourth pier; we are therefore compelled to assume either that Norly has been incorrectly reported, or that he is mistaken in his statements. In addition to the van lamp, roof lamps to the number of eight at least have been found by the divers on the south side of the fourth pier. They, no doubt, represent the two carriages which fell on that side.

It is singular that throughout the evidence of the divers, as reported in the *Times*, nothing is said which can be used as a satisfactory guide in fixing the position of the wreckage either of train or girders to the east or west of the axial line of the bridge. Probably, having regard to all the circumstances, the position of the train in this respect is pretty much as we have shown it upon our plan.

MR. EDISON'S LATEST ELECTRIC LIGHT.

A CELEBRATED character once used the memorable words, "I don't believe there is no sich a person." The incredulity had for its object Mrs. Harris. We are disposed to echo the sentence, and "say we don't believe there is no sich a person as Mr. Edison;" no such person at least as Mr. Edison of the *New York Herald*. Mr. Edison, of Menlo Park, has hitherto been regarded as a man of great native talent, comparatively uneducated, and feeling his way by making experiment after experiment where the trained electrician walked in the broad light of science. But Mr. Edison has done much for telegraphy, and he has given us the telephone in a commercial shape. He was looked on as a man who could and would learn, and one possessed, moreover, of strong common sense. The American newspaper press is no doubt responsible for much attributed to Mr. Edison which has never been uttered by him; yet we begin to fear at times that Mr. Edison himself is not quite so discreet as could be wished. The *New York Herald* of Sunday, the 21st of December, 1879, contains a long illustrated article, and it is difficult to understand on the one hand how any respectable newspaper could have the effrontery to invent the statements contained in this journal; while on the other hand it is almost incredible that a man of scientific standing could permit the assertions it contains to go to the world under the sanction of his name. The only way out of the difficulty is to believe that the Edison of the *New York Herald* is the Edison of Menlo Park in a grossly exaggerated form; we refuse to think that the latter gentleman can hold himself responsible for the sayings and doings of his prototype.

Our contemporary gives a long historical sketch of Mr. Edison's labours, and states that the lamp which not many months ago was to revolutionise electrical lighting is of no value, and has been abandoned, almost for the very reason we predicted on the 14th of March, 1879, and he has also abandoned as useless the tuning-fork generator, which we pronounced at the same time "the very worst dynamo-electric machine ever invented." Subsequently the platinum wire lamp was ushered into the world; once more the problem had been solved. This also has been relegated to the past as an utter failure. But at last the secret has been discovered, and Mr. Edison has produced *the* lamp of the future. We have already described this lamp; we illustrate it in the accompanying engraving. The *New York Herald* thus writes concerning it:—"With a suitable punch there is cut from a piece of Bristol cardboard a strip of the same in the form of a miniature horseshoe, about 2in. in length and ⅛in. in width. A number of these strips are laid flatwise in a wrought iron mould about the size of the hand, and separated from each other by tissue paper. The mould is then covered and placed in an oven, where it is gradually raised to a temperature of about 600 deg. Fah. This allows the volatile portions of the paper to pass away. The mould is then placed in a furnace and heated almost to a white heat, and then removed and allowed to cool gradually. On opening the mould the charred remains of the little cardboard horseshoe are found. It must be taken out with the greatest care, else it will fall to pieces. After being removed from the mould it is placed in a little globe and attached to the wires leading to the



THE EDISON PERFECT LAMP.

generating machine. The globe is then connected with an air pump, and the latter is at once set to work extracting the air. After the air has been extracted the globe is sealed, and the lamp is ready for use. The annexed figure shows the lamp complete. A is a glass globe, from which the air has been abstracted, resting on a stand B. F is the little carbon filament connected by fine platinum wires, G G', to the wires, E E', leading to the screw posts, D D', and thence to the generating machine. The current, entering at D, passes up the wire E to the platinum clamp G, thence through the carbon filament F to G', down the wire E' to the screw post D'; thence to the generating machine. It will be noticed, by reference to the complete lamp, that it has no complex regulating apparatus, such as characterised the inventor's earlier labours. All the work he did in regulators was practically wasted, for he has lately realised that they were not at all necessary—no more so than a fifth wheel is to a coach."

In all this we fail to find anything new. Du Moncel, one of the greatest living authorities on the electric light, has shown within the last three days that the arrangement is old, has been tried, and has failed. Mr. J. W. Swan states in *Nature* for Jan. 1st, that fifteen years ago he "used charred paper and card in the construction of an electric lamp on the incandescent principle. I used it, too, of the shape of a horseshoe, precisely as, you say, Mr. Edison is now using it. I did not then succeed in obtaining the durability which I was in search of, but I have since made many experiments on the subject, and within the last six months I have, I believe, completely conquered the difficulty which led to previous failure, and I am now able to produce a perfectly durable electric lamp by means of incandescent carbon."

The Edison lamp can, it seems, hardly be said to have been invented; it was discovered. Here is the *New York Herald's* account of the discovery:—"There occurred, however, at this juncture a discovery that materially changed the system and gave a rapid stride towards the perfect electric lamp. Sitting one night in his laboratory, reflecting on some of the unfinished details—of the platinum wire lamp—Edison began abstractedly rolling between his fingers a piece of compressed lampblack, mixed with tar, for use in his telephone. For several minutes his thoughts continued far away, his fingers in the meantime mechanically rolling out the little piece of tarred lampblack until it had become a slender filament. Happening to glance at it the idea occurred to him that it might give good result as a burner if made incandescent. A few minutes later the experiment was tried, and, to the inventor's gratification, satisfactory, although not surprising results were obtained. Further experiments were made, with altered forms and composition of the substance, each experiment demonstrating that at last the inventor was upon the right track. A spool of cotton thread lay on the table in the laboratory. The inventor cut off a small piece, put it in a groove between two clamps of iron and placed the latter in the furnace. The satisfactory light obtained from the tarred lampblack had convinced him that filaments of carbon of a texture not previously used in electric lighting were the hidden agents to make a thorough success of incandescent lighting, and it was with this view that he sought to test the carbon remains of a cotton thread. At the expiration of an hour he removed the iron mould containing the thread from the furnace, and took out the delicate carbon framework of the thread—all that was left of it after its fiery ordeal. This slender filament he placed in a globe, and connected it with the wires leading to the machine generating the electric current. Then he extracted the air from the globe and turned on the electricity. Presto! a beautiful light greeted his eyes. He turns on more current, expecting the fragile filament instantly to fuse; but no, the only change is a more brilliant light. He turns on more current, and still more, but the delicate thread remains entire. Then, with characteristic impetuosity, and wondering and marvelling at the strength of the little filament, he turns on the full power of his machine and eagerly watches the consequence. For a minute or more the tender thread seems to struggle with the intense heat passing through it—heat that would melt the diamond itself—then at last it succumbs, and all is darkness."

Let us consider for a moment what are the peculiarities of the new lamp which are to render it more successful than its predecessors. It is neither more nor less than an incandescent carbon lamp. Such lamps have been invented and made already by the hundred, and they have failed. The nature of their failure is well understood. The carbon disintegrates in the current and is at last reduced to dust. Why should carbon from paper give a better result than any other carbon? Why should it not fail now as it has failed before when tried? As a matter of fact the Edison horseshoe must be made of comparatively impure carbon contaminated with silex and alumina; but it is well known that the purer the carbon the better the result obtained. Not a shadow of an argument is put forward to prove that carbon from paper is better than any other carbon. The *New York Herald* attributes to it properties which have never yet been found to belong to any form of carbon by others. Not a single scientific man of any eminence in the United States or in this country supports the statement, and yet the world is expected to believe it; and this with the fact before us that this is the third or fourth announcement of Mr. Edison's success which has been published with just as much certainty and precision. It is not necessary that we should suspend our judgment in this case; the lamp put forward by the *New York Herald* as a success, cannot be a success. We do not say that it will not burn, we do not state that it may not be able to give out a good light for some hours; but this is nothing. To justify the encomiums which have been passed on it, or the panic which has overtaken the holders of gas shares now recklessly throwing away their property, such a lamp should last at least through a winter. It should be capable of burning continuously night after night for at least four or five hours each night for a half a year, and this the so called Edison "perfected lamp" will not do. It is a pretty toy and nothing more.

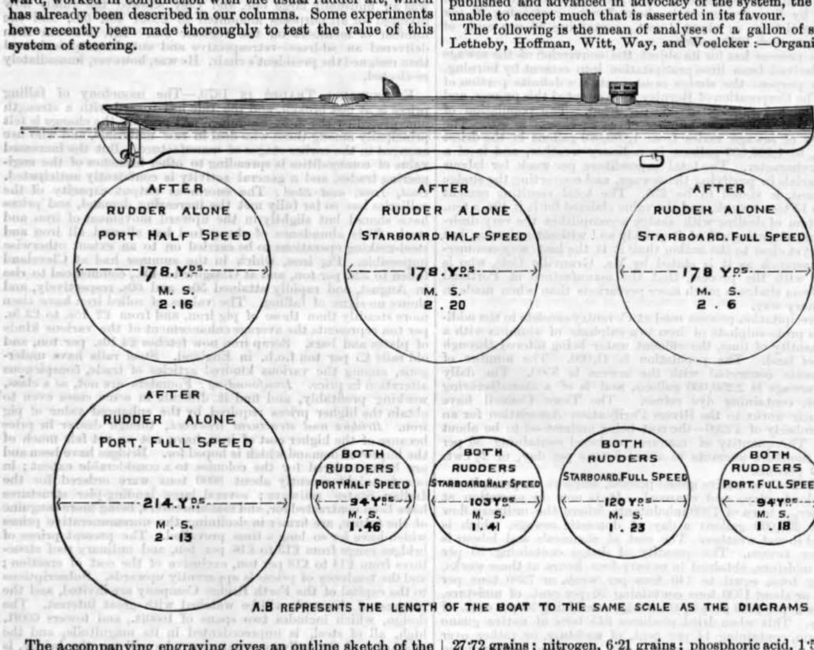
The statements connected with it are, in many respects, glaringly absurd. For example, we are told that the new lamp can be made for 25 cents., that is 1s. Is it credible that glass globes can be exhausted of air to the millionth of an atmosphere at a cost of 1s. each? Two small platinum wires and clamps are used to connect the horseshoes with the main wires, and it is very obvious that nothing but platinum, or some equally refractory metal, can be used for the intended purpose. How much platinum wire do the readers of the *New York Herald* imagine can be got for 1s.? How, let us ask, is the charcoal horseshoe, an eminently fragile article, connected with the platinum? and what kind of skilled labour will be required to manipulate it and make the lamp? The notion that such a refined mathematical instrument can be made for 1s. is simply preposterous.

Mr. Edison may well say, save me from my friends, and, above all, from the *New York Herald*.

"The very, very latest enterprise of the indefatigable scientist is a scheme for obtaining gold out of 'tailings,' or the sand thrown away by miners as having been worked out. Rumour has it that Edison has succeeded in obtaining a chemical preparation which will take from 200 dols. to 300 dols. per ton out of 'tailings,' from which the present processes can obtain nothing. The matter, however, is as yet a profound laboratory secret." If Mr. Edison can get £60 worth of gold out of every ton of sand thrown away by skilled miners, he must have discovered a "chemical preparation" capable of converting quartz into the precious metal. Someone has hit on a more certain method of obtaining gold, for statements such as those we have reproduced have sufficed to send up shares in the Edison light from 100 dols. to 2000 dols. each. We venture to think that it is about time that Mr. Edison put some restraint on the use made of his name.

THE STEERING CAPABILITIES OF TORPEDO BOATS.

OUR readers will recollect that in the early part of last year Messrs. Yarrow and Co., of Poplar, introduced a method of steering their torpedo boats by fitting a drop rudder forward, worked in conjunction with the usual rudder aft, which has already been described in our columns. Some experiments heve recently been made thoroughly to test the value of this system of steering.



A.B REPRESENTS THE LENGTH OF THE BOAT TO THE SAME SCALE AS THE DIAGRAMS

The accompanying engraving gives an outline sketch of the boat, and we may observe that Messrs. Yarrow and Co. now place the drop rudder considerably nearer the bow than shown, which has been found greatly to increase its efficiency. The respective areas of the two rudders were as 3 to 1, the stern rudder having an area of 1500 square inches, and the bow rudder 500 square inches. The latter, although below the bottom of the boat, does not extend so low as the screw propeller, and it is arranged that it can be speedily raised and lowered, and even dropped clear of the vessel altogether in the event of its getting foul.

The circles annexed represent the circles described by the boat, and, being drawn to scale, give clearly the results obtained, full particulars of every experiment being appended.

SOCIETY OF ENGINEERS.

AT the monthly meeting of this society, held at 7, Westminster-chambers, December 1st, 1879, Mr. Robert Paulson Spice in the chair, the following paper by Mr. Henry Robinson, M. Inst. C.E., F.G.S., F.R.G.S., was read:—

ON SEWAGE DISPOSAL.

The question of how the sewage and refuse of our towns can best be disposed of is one which yearly increases in interest as the evil consequences that attend the neglect of the subject are more and more realised, and the necessity for proceeding on sound principles, both from economic and sanitary considerations, is better appreciated. The importance that this branch of our profession has of late years acquired in public estimation involves a duty on the part of those who are called upon to advise on it to study impartially the accumulating mass of information which is now available, and to form opinions based on experience and accurate practical observation. The removal of fœcal matter from towns is, broadly speaking, accomplished in one or two ways. First, by the water carriage system; secondly, without a system of sewers, such as by the pail, and dry earth methods. The retention of the fœcal matter for even a short time in pails or tubs in the dwellings, however carefully the system may be administered, involves a risk of nuisance, and a further objection in the visible removal of it. Perhaps this is partly sentimental, but the removal from a house in pails or tubs of the fœcal matter produced in it appears to be hardly in accordance with the civilisation of the period; and considering that a system of sewers is necessary, even where the pail method is employed, the adoption of it means duplicate systems for getting rid of the refuse from the houses, the economy of which is open to grave doubt except in cases where an ordinary system of sewerage is inapplicable.

The water carriage system is a necessity in order to effect the removal of the slop water and fluid refuse, which cannot be got rid of by receptacles for fœcal matter. After a system of sewers has been carried out in a town, it appears natural that it should be utilised to enable the excrementitious matter from houses also to be conveyed away by it. Although a sanitary authority may discourage the water-closet system and the connection of closets with the sewers, it cannot, the author thinks, legally prevent the connection being made. In the course of time, even where the pail system existed, it is probable that, as the inhabitants experience the convenience of the water carriage system, they may insist on exercising their right of resorting to the sewer to get rid of their water-closet refuse. The exclusion of the fœcal matter does not deprive the water-carried portion of sewage of its polluting properties, so as to enable it to be discharged into streams and watercourses without contravening the Rivers' Pollution Prevention Act. It has been ascertained that 12 tons of average sewage from a midden and privy town will, in round numbers, equal 10 tons of sewage from a water-closetted town in manurial value, so that the exclusion of water-closet refuse only reduces the manurial strength, and consequently the polluting capacity of the sewage by one-third.

Rochdale, Salford, and several other towns have resorted to the pail system, but it is not possible to regard the subject *per se*, as it is necessary to include with it the general scavenging of the town, as well as other supplementary arrangements for removing refuse, all of which are factors in considering the financial question. Manchester has partially adopted the system by converting as much as possible of the town refuse into concentrated manure, at a cost of about £80,000 for works to deal with the refuse of one-half the city. The greater part of the material brought to the works is made into manure, mortar, or fuel, to accomplish which about 1500 men are required, with 300 horses, 400 vehicles, including 120 railway wagons. At these works about 11,000 tons of concentrated manure it is estimated will be produced annually.

The systematic removal of refuse and its disposal in this way is preferable from a sanitary point of view to its being allowed to accumulate in cesspits, and this has been proved to be the case by the improved health returns from the districts operated upon at Manchester. The financial results must, however, be considered in conjunction with what has to be arranged in order to dispose of the rest of the refuse; and although much has been published and advanced in advocacy of the system, the author is unable to accept much that is asserted in its favour.

The following is the mean of analyses of a gallon of sewage by Letheby, Hoffman, Witt, Way, and Voelcker:—Organic matter, 27·72 grains; nitrogen, 6·21 grains; phosphoric acid, 1·57 grains; potash, 2·02 grains. Dr. Letheby arrived at the conclusion that 1000 persons of a town population contributed 3750 gallons of sewage a day, containing about 167 lb. of organic matter, 33·3 lb. of nitrogen, 9·4 lb. of phosphoric acid, and 6·9 lb. of potash. The necessity for promptly removing the excreta and refuse from the neighbourhood producing it will be readily conceded, but it too frequently happens that from one cause or another, such as insufficient velocity, want of flushing, "dead ends," and defects in sewers, some of the refuse intended to be conveyed away is able to accumulate and putrify. The emanations given off from foul sewers produce intestinal derangements, fevers, and other maladies. The late Dr. Herbert Parker observed that even when the gas was not perceptible to smell it was capable of producing diarrhœa and severe constitutional disturbances. The more acute diseases, such as typhus, typhoid, and scarlet fevers are specially liable to be introduced into the system through the organs of respiration, and the germs of these diseases being passed into the sewers from infected houses may be conveyed to great distances and distributed over wide areas. The late Dr. Murchison stated that he had met with few examples of enteric fever which on investigation were not traceable to defective drainage. It follows, then, that where a sewerage system is not skilfully devised and carefully carried out it furnishes a ready means of creating and propagating diseases instead of preventing the possibility of their occurrence as was expected. The evils arising from defective drainage have been often urged, but too frequently they are either forgotten or disregarded. The sanitary authorities throughout the country are not sufficiently alive to the necessity that exists for enforcing the provisions of the Public Health Acts, and for seeing that the houses in their districts are in a proper sanitary condition; that they have no untrapped connection with the sewers, and that the house drains are so laid that the refuse from it is carried to the sewerage system promptly, and before decomposition arises. Also that the ventilation of both house drains and sewers is effectual. As the most carefully devised plans are liable to be frustrated by carelessness or scamping on the part of those executing the works, the author makes a rule in his practice not to allow any sewers, drains, or similar work to be covered up until a written certificate has been obtained to the effect that the work has been inspected and passed.

Although a great advance has been made of late years in the degree of attention which is given to house sanitation, it is nevertheless a fact that owing to the permissive nature of sanitary legislation, and to the ignorance or apathy of the sanitary authorities, there is a great deal more preventible disease in the country than there ought to be. London does not escape from this implied censure on sanitary authorities. The vestries—which are the sanitary authorities for London, but are free from the control of the Local Government Board—seldom exercise the powers vested in them to overhaul the house connections, and to enforce a compliance with the rules which govern proper house drainage in connection with a system of town sewerage. Even where care is taken in regard to the removal of the refuse there is neglect in preserving the water supply from contamination. When it is supplied in a pure state by the water companies, it frequently becomes polluted before consumption by storage in cisterns which are not periodically and properly cleaned.

Public attention has of late been directed to the question of the water supply of London, and although the supply should be constant instead of intermittent, the chief causes of mischief appear to be overlooked. It is not the quality of the water supplied to the metropolis that is a factor in the death rate from filth diseases, but it is the indifference which is shown by the owners and occupiers of houses as to cleansing the cisterns and the neglect on the part of the vestries, whose duty it is to enforce the observance of all the well-known rules as to house sanitation. Clauses 82, 83, and 84 of the Metropolis Local Management Act of 1855 give power to the vestry to inspect the internal arrangements of houses, to require the occupier to rectify defects which are injurious to health, or in the event of his neglecting to do so the necessary work can be done and charged against him. There would appear to be no hope of progress being made in sanitary matters commensurate with the gravity of the subject until there is a more vigorous enforcement of existing sanitary legislation. It is the author's opinion that all matters relating to the health of the community would be better administered by a special department of health with a well-organised staff. The cost would be abundantly repaid in the saving of lives which are now annually sacrificed to filth diseases, and by preserving in good health the still larger number whose physical strength is impaired from the same cause.

Where provision can be made for excluding the bulk of the rainwater the expense and difficulties attending sewage disposal are reduced. The sewers then have to convey a more uniform volume consisting of the fluid refuse from the houses without the addition of any but a small proportion of the rainfall. It must not, however, be forgotten that the washings from roads after a long drought are very foul, notwithstanding the most complete system of scavenging. The filth removed by rain from gutters and bye-streets is very great, and is practically sewage. Analyses of the water flowing in the London gullies after a heavy rain succeeding a dry period have proved it to be as foul as ordinary sewage, in regard to the amount of putrescible organic matter which it contains.

A second sewer is sometimes employed to carry off the rainfall independently of the refuse. Where there are two sewers special care has to be taked to prevent confusion arising between them, as workmen in connecting a house drain with the sewerage system might resort to whichever sewer happened to be the nearest. Where the separate system is adopted the second or clean sewer might advantageously be employed to lower the level of the subsoil water. Experience has proved the advantage to health that results from the subsoil being drained to a sufficient depth to preserve in a dry state the basements and surroundings of houses. Sometimes the foul sewers even are laid open jointed in order that they may serve as drains for the subsoil as well as sewage carriers. This endeavour to combine two essentially distinct operations is, the author thinks, wrong in principle. The sewer itself should be made absolutely water-tight, so as to prevent the escape of sewerage from it into the subsoil. The separate drain pipe should be the open jointed pipe, and it could be laid in the same trench with the sewer.

Having collected the sewage into its main outfall, the next point to consider is how the sewage is to be disposed of. The Rivers Pollution Prevention Act of 1876, amongst other provisions, imposes on towns the duty of employing "the best practical and available means to render the sewage harmless" before it can be permitted to flow into any stream or watercourse. This Act has not been productive yet of the anticipated amount of good in regard to its application to town refuse and sewage. Towns which are carrying out, or are about to carry out a system of sewerage, have in most cases to provide some means of purifying the sewage, but they are confronted with the difficulty of ascertaining what will be recognised as a compliance with the Act. It was contemplated that certificates should be given to towns to the effect that they were dealing with their sewage efficiently. A strict, technical compliance with the Act appears to be construed into its being necessary to convey the sewage for purification on land, so that those towns which are so situated as to be unable to dispose of their sewage on land could not obtain the certificate if it were essential as a protection against litigation.

The advisers of sanitary authorities on sewage disposal feel that owing to the want of discretionary power on the part of the Local Government Board, the best practical means of purifying sewage can only be defined as filtration through land. Although this is admitted to be so where land can be obtained suitable for the purpose, yet there are numbers of towns where land cannot be obtained either of suitable quality or of sufficient quantity, or where a sewage farm is objectionable, and then the question arises as to what is to be allowed. It is a choice of evils, and the least evil in some cases is to employ chemical treatment as an alternative to land filtration, or as an adjunct to it.

Probably before long the Rivers Pollution Prevention Act will be amended so as to give greater latitude in regard to what will suffice to prevent towns from incurring the penalties recoverable for a non-compliance with the Act, or from incurring the expense of a system for attaining a degree of purity in the sewage effluent higher than need be. The standard of purity ought to be allowed to vary with the circumstances of each place. That fixed by the Rivers Pollution Commissioners, namely, 0·3 parts per weight of organic nitrogen in solution in 100,000 parts by weight is needlessly high where the sewage effluent is passing into a large stream.

The difference of opinion as to the required standard of purity of effluents, and the efforts sometimes made to compel authorities to incur the expense of obtaining land where it does not exist at a reasonable distance, causes many town authorities to do nothing. They are somewhat encouraged in this attitude by the singular exemption which was made in the Rivers Pollution Prevention Act in regard to the Metropolitan sewage and the river Thames.

The Metropolitan Board of Works was created in 1855, for the purpose of sewering London and purifying the Thames. This duty was imposed on the Board at its formation, and it has fulfilled it to the extent of executing an admirable system of sewerage with outfalls at Barking and Crossness. These are supposed to remove the sewage to where it no longer pollutes the river or the metropolis, but it is generally considered that a large portion of the sewage returns to pollute the river within the metropolitan area, and that the Board of Works has only partially accomplished the work for which it was specially created. In clause 3 of the Metropolis Local Management Act Amendment of 1858, it expressly states that the powers conferred by the original Act of 1855 shall "extend and be applicable as well to works for deodorising sewage." This clearly indicates that at that time it was contemplated to apply some treatment to the sewage at the outfalls before its discharge into the river.

The Conservators of the river Thames are supposed to have the power of preventing the Metropolitan Board from continuing this alleged pollution, but the powers of the Conservators as regards pollution appear, from their Act of 1867, to be confined to the preservation of the purity of the river to the western boundary of the metropolis. The Conservators have somewhat