GOVERNMENT NOTIFICATION.—No. 533.

The following Report on the Sewerage and Drainage of Hongkong was laid before the Legislative Council at a meeting held on the 3rd September, 1902, and is published.

By Command,

F. H. MAY,
Colonial Secretary.

Colonial Secretary's Office, Hongkong, 4th September, 1902.

SEWERAGE AND DRAINAGE OF HONGKONG.

PUBLIC WORKS OFFICE,
HONGKONG, 13*th May*, 1902.

SIR,

As to the scope of this Report.

1. Since the publication of a report dated 10th April, 1902, I have made further enquiries concerning the Sewerage and Drainage of the City of Victoria, which, on the whole, tend to confirm the remarks and observations which I have made in the aforesaid report. In this report I accepted full responsibility for the general system of sewerage. In criticising it I am, therefore, sitting in judgment on my own project. I shall endeavour to be impartial and I hope I shall succeed in being so, for I trust I am not yet so senile as to believe that I attained finality of knowledge, twelve years ago, or that my views have not undergone modification, in accordance with increasing experience.

Sewerage.

The prevailing drought renders it difficult to judge of the working of the sewers.

2. The scarcity of water, which has prevailed during my visit, renders it most difficult to judge as to the normal condition of the sewers. No sewers could be expected to work well with a consumption of water not exceeding 7 gallons per head per day for all purposes, and in many parts of the town, doubtless, less. This remark applies with even greater force to the House Sewers, which, I am sorry to say, are not so well constructed as they should be.

The present drought is an argumetn in favour of the Separate System.

3. The prevailing drought is an argument in favour of the Separate System. The only arguments of any weight which have ever been brought forward against the Separate System are:—

(*a.*) That the sewers are not flushed by the rain-water.

(*b.*) That covered storm-water drains being required to carry off rain-water, they may as well carry sewage also.

(*c.*) That the Separate System is not in use in London and many towns in England.

As regards (*a.*), I beg to point out that no rain of importance has fallen since August last. Since that month had the sewers or drains been dependent on rain for flushing, their condition would now have been deplorable. Sewers, large enough to carry off rain-water would have only received during all these months the paltry quantity of sewage which now flows, an amount wholly inadequate to flush such large pipes or conduits.

As regards (*b.*), I would point out that covered storm-water drains should be avoided to the greatest extent possible. They are sure to be at least as great a nuisance as properly constructed sewers. Some must indeed be covered, but covered lengths should be reduced to a minimum. Certainly the condition of the drains whether as they exist or even when re-modelled would not be improved by allowing a mere dribble of sewage to flow through them during the prolonged dry season or even during the intervals between rain-storms. They would merely be vast magazines of sewage tainted air.

As regards (*c.*), I merely say that the climate of Hongkong is dissimilar to that of England; that most English sewers were made long ago, and that many towns have adopted the Separate System, at least so far as ancient custom and law permit them to do so.

4. All observations made, during my visit, tend to a belief that nuisances are as often, even more often, traceable to drain gulleys and openings as to sewer gulleys or manholes. The drain and sewer gulleys are normally close to each other and the one gets blamed for what is due to the other. Drains as often sources of nuisance as sewers.

5. The gradients of the low-level sewers—those below Queen's Road—are indeed somewhat flat, but not so flat that they could not keep themselves free from deposit if there were a copious flow through them, and if road-detritus and other improper substances were excluded from them. Indeed they do actually keep free from sewage-deposit, properly so called. As to the low-level and outfall sewers—their gradients.

The levels of the outfalls are lower than I intended them to be. I proposed that the centre line of the sewer, at its outlet on the Praya, should be at mean sea level, so that each sewer would be only filled to one-half its diameter for one-half of the year and during the remaining half there would be a free and unchecked flow of sewage through it, sufficient to remove any deposit which might precipitate, during the times at which the flow was checked by the rise of the tide.

The following are the levels of the inverts of the sewers at the several outfalls:—

Outfall No.	Locality.	Invert Level at Outfall (or near it) above Ordnance Datum.	Diameter of Pipes in Inches.	Centre Line below Mean Sea Level in Feet.
1	Belchers Point, ...	2.10	15	0.98
2	French Street,.....	1.66	9	1.67
3	Eastern Street, ...	0.67	15	2.41
4	Wing Lok Street, ...	0.98	21	1.85
5	Hillier Street,.....	1.71	21	1.12
6	Queen Victoria Street, ...	2.43	18	0.52

The annexed plans Nos. 1 to 6 show the extent to which the various low-level sewers are tide-locked at mean high-water and mean sea level, lines being drawn to show respectively the distance to which the pipes are entirely filled and half filled by tidal water.

It is but right to say that the outfall sewers laid on the Praya Reclamation are temporary only, pending consolidation of the ground. In one or more cases, a 9″ pipe receives the flow of one or more 18″ or 21″. This cannot fail to check the flow of sewage, and thus promote deposit. Under these circumstances the low-level sewers cannot be said to have had fair play up to the present, and will not until the Praya Reclamation is finally completed and consolidated.

6. I will freely admit that, were I to design the sewerage system over again, I should make the outfalls more numerous, place them at a higher level and give, if possible, steeper gradients to the low-level sewers. I do not, however, consider that it is necessary to make any alteration at present, certainly not until the Praya Reclamation is completed and consolidated. The sewers on the New Praya Reclamation will for the most part surely require re-laying, and when the time comes for so doing, the question may be re-opened. By that time, the effect of copious flushing at low-water will have been settled by experiment. The levels of outfalls too low, and sewer gradients too flat.

7. As soon as pipes of the full diameter have been laid, temporarily or otherwise, across the Reclamation, the effect of vigorous flushing should be tried. This experiment should be made on the sewers along Des Vœux and Connaught Roads running from the eastward to the outfall at Queen Victoria Street. Flushing the low-level sewers. Point of commencing work.

A flushing tank containing say 3,000 gallons should be constructed beneath the Parade Ground near to the urinal now under construction. This should be filled, daily during the dry season, from a well, or from the sea by pumping. In the case of a well, a centrifugal pump driven by an electric motor would probably be the most economical means of pumping. Possibly the electric motor

would, in all cases, be the most economical source of power. This flushing tank might indeed be filled with the sewage from the Peak. I am not, however, in favour of flushing sewers with sewage. The tank is apt to be a nuisance, as it requires occasional cleaning, but the system is often resorted to and might, if considered advisable, be tried.

The contents of this tank should be discharged, alternately, down the two low-level sewers, a 12″ pipe, leading to each head, being provided. The flush should be discharged at or about low-water. The lowest of the two low-waters during the day should be selected, for one is often much lower than the other.

Flushing cannot be effective until the outfall sewers across the New Praya Reclamation are of full diameter and free from obstruction. It may also be necessary to provide a sluice in the diaphragm which is in the outfall manhole, to allow the flush to escape more freely than the actual submerged pipe will permit. When not flushing, this sluice should be closed.

Rules as to the volume of water required for flushing.

8. To thoroughly flush a sewer, a quantity of water should be provided sufficient to fill it half-full, or to the depth producing a self-cleansing velocity, for about one-third of its length.

The quantity required for flushing depends not merely on the diameter and length of the pipe, but on its inclination. If a pipe has a good self-cleansing gradient, but deposit occurs owing to insufficiency of the normal sewage flow, then it will suffice to fill it to one-half or such depth as will give up a self-cleansing velocity for say one-fourth of its length. If, however, the pipe has a somewhat paltry gradient then the flush should be equal to its full contents for half its length. The bottom of the flush tank should be as high as possible above the head of the pipe and the outlet should be large enough to make the mean rate of discharge equal to the rate of discharge of the pipe to be flushed.

Extension of flushing system.

9. If the experimental flushing already described proves successful, and if the necessity for flushing be not obviated by improvement in scavenging and in the construction of sewer gullies, then let it be extended to other outfall areas. In some, namely Nos. 3 and 4 outfall areas, (*vide* plans 3 and 4), the sewers are so low that flushing may always be necessary or at least desirable. These should be the first to be taken in hand. In all cases, it would be easy to flush with sewage from above. It must, however, be remembered that automatic flushing tanks cannot be used for the low-level system. A flush discharged when the tide is above the level of the invert of the sewer is useless. Flushing, in the case of tide-locked sewers, must always take place at or about low-water.

Necessity for dragging sewers. Want of supervision.

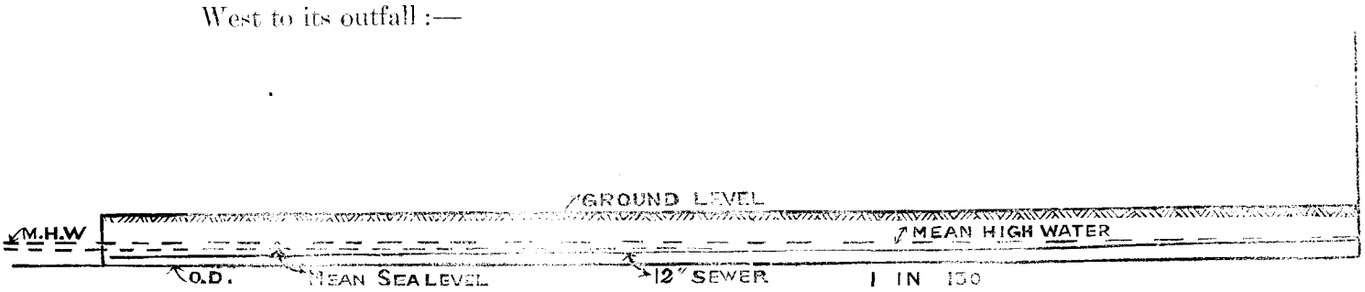
10. I have reason to believe that chains and scrapers are dragged through sewers, probably to their detriment, more often than is necessary. The operation has become a matter of routine perpetuated owing to inadequate supervisory staff. A single European Overseer cannot be expected to inspect all the sewers in the City, and also look after construction work. He cannot possibly supervise all the gangs of coolies, nor can he satisfy himself, by personal inspection, that the sewers of any one district or street are in such condition as to require dragging. Consequently gangs of coolies are told off to drag in a certain district, and they do so, whether this operation is required or not. I have suggested a means, whereby the inside of a sewer may be inspected by the aid of a lamp and mirrors, without going down the manhole. Whether this arrangement will materially mend matters or not the true remedy is *more skilled supervision*.

Objections to tide-locked sewers.

11. A sewer, partially or wholly tide-locked, is, according to modern experience, objectionable. Such a sewer, of necessity, violates one of the fundamental principles of sewer-design, namely, continuous onward flow, from the gully or inlet at the house, to the outfall, or place of final disposal, without stoppage or stagnation.

Though the gradient of a sewer may be sufficient, when its outlet is free, to establish a self-cleansing velocity, whenever the outlet becomes tide-locked, this condition is disturbed, the hydraulic gradient being reduced by the rise of the tide.

The sub-joined sketch shows a section of the 12″ main sewer in Queen's Road West to its outfall :—



The pipe, 12″ in diameter, has a gradient of $\frac{1}{130}$. Running half full, with a free outlet, it would discharge 101½ cubic feet per minute with a velocity of 246 feet per minute, or more than is necessary to prevent deposit.

When, however, the same volume of water fills the whole pipe the velocity will be reduced to 123 feet per minute, or barely sufficient to prevent deposit. A flow of only 3.6 cubic feet per minute filling the pipe to a depth of about 1¼ inch would give a velocity of 120 feet per minute. But the velocity of this stream would, when in consequence of the outlet being tide-locked it filled the whole pipe, be reduced to 10 feet per minute, which is wholly non-self-cleansing. Hence this sewer which receives a large quantity of sewage, would be self-cleansing, all the day through, if it discharged above high-water mark, but as it is, it is a sewer of deposit for the greater part of the day though, doubtless, it cleanses itself when the tide is below the level of the outfall.

Methods of preventing tide-locking.

12. The level of the Praya is so low that it is impracticable to place all outlets above high-water mark. The sewers would have to be so near to the surface that they would be liable to damage by traffic, and they would be too high to receive the sewage discharged from the house-sewers of tenements on the Praya.

The sewers on the Praya must be, for a great part of their length, below even mean sea level. The only way to prevent tide-locking is to exclude the sea water altogether, and to do so and at the same time prevent stagnation, will involve pumping. In many towns tanks are constructed to collect the sewage which is then discharged at or near the hour of low-water. This plan, always objectionable as it involves stagnation, cannot be adopted here on account of the great variation in the range of the tide at neaps and springs, and of the diurnal variation in range. At certain periods one tide in the day almost disappears. The sudden discharge of the sewage stored during say 18 hours out of the 24 could not fail to produce an insufferable nuisance. Pumping must therefore be resorted to. If there is to be pumping then it will be well to pump to some distant outfall, and to intercept all sewage from the harbour frontage.

It would be most expensive and almost impracticable to conduct all sewage to one pumping station. There must, therefore, be two intercepting sewers, with their respective heads near to Murray Road, one flowing eastward and one flowing westward to two pumping stations. The ultimate outfall at which the sewage from the Eastern District should be discharged should be at North Point and that from the Western District in Sulphur Channel facing Green Island. I have already suggested in a Report of 1890 such an arrangement for the Eastern District. The syphon arrangement therein described would be most economical, but an ordinary sewer, flowing partly full, would be most satisfactory though probably considerably more expensive. I am leaving on record a plan and section of the Western intercepting sewer in order to show how interception might be effected, if at any time it is considered desirable to carry it out.

The intercepting sewer when below mean sea level should be of cast iron. This is really the most economical material, for the difficulty of making a water-tight sewer of brick or stone-ware in wet ground is very great.

I find that the maximum depth of the Western intercepting sewer at the pumping station just behind Kennedy Town would be about 10 feet below O.D. or 22 feet below ground. This is by no means an extravagant depth.

The construction of intercepting sewers not recommended as an immediate work.

13. I have brought forward the question of complete interception mainly because I contemplated the possibility of its having to be adopted in Reports made in 1890, and arranged the design of sewers in a manner that would permit of its adoption. I look upon the construction of intercepting sewers as a counsel of perfection. I do not recommend even the consideration of this project at the present moment. There are many other costly works, notably those for the augmentation of the water-supply, that must take precedence of any radical alteration of the sewerage system. I maintain that if matters remain in *statu quo*, no danger to the public health is involved.

There may be occasional nuisance, and, undoubtedly, the necessity for periodical cleansing by means of chains and drags is a source of expense. But this is the worst that can result from the defects that I have noted. The said nuisance will not give rise to epidemics of disease and is of little moment, compared with the water famines which occur almost annually necessitating the introduction of the intermittent system.

The works required in connection with the low-level sewers.

14. The only works that need be contemplated for some years to come, in connection with the low-level sewers, are the re-laying of the sewers on the New Praya Reclamation in all cases in which settlement has caused detrimental distortion and alteration of the originally projected level. This work should, however, be deferred until the New Reclamation has thoroughly settled, so that no further movement need be anticipated. Some sewers on even the Old Reclamation will require re-laying, notably those leading to the No. 1 outfall at Belcher's Point. Notwithstanding the fact that the Praya Wall in this locality was constructed many years ago, there is evidence to shew that settlement has taken place relatively recently, and that it may be going on even at present.

Summary of recommendations with regard to street sewers.

15. The recommendations which I have made, with regard to street sewers, in this and a previous report, may be summed up as follows:—

(*a.*) Complete the outfall sewers across the New Reclamation.

(*b.*) Prevent by means of additional care in scavenging the introduction of improper solids into the street sewer.

(*c.*) Trap all street sewer gulleys with improved traps and gratings.

(*d.*) Make an experiment as to the effect of vigorous flushing at low tides with well or sea water, on one section of the low-level sewers. If this experiment is successful, and leads to saving in working expenses, extend the same system to other sections.

(*e.*) Close the ventilating openings in the sewer manholes.

(*f.*) If, contrary to expectation, ventilating openings or rather vents prove necessary let them be provided, either by means of the house sewer ventilating pipes, removing the intercepting traps, or by providing separate elevated vent-pipes carried up above the neighbouring buildings as suggested in a previous report.

(*g.*) Whenever the roots of trees cause obstructions, cut down the trees; or substitute cast iron pipes, with lead and yarn joints for stoneware pipes.

HOUSE SEWERS.

It has come to my knowledge that considerable inconvenience has been experienced in the case of European houses in the upper levels of the City. These tenements are provided with a drain, as defined in my former report, as well as a house sewer, and it frequently happens that the grating over the inlet to the house sewer becomes obstructed and, in consequence, the sewage, properly so called, flows into the nullahs, causing a nuisance. It is difficult to suggest a complete remedy for this, for the arrangement must vary in each individual case. After all, the

matter is one that the Sanitary Board and the occupier should decide. The Board has doubtless powers to compel owners to abate nuisances. Matters would be simplified if, as recommended, the Sanitary Board has charge of the scavenging of nullahs. In the case of new houses, this difficulty will practically disappear if the rules set forth in the Standard Instructions which I propose to send out are observed.

DRAINAGE.

I have little to add to what I have said in my previous Report concerning the Drainage of the City. Before anything can be finally suggested a complete plan must be prepared of the drains and nullahs as they exist.

The following suggestions may, however, be of use in the future consideration of this subject.

Classification of drains.

16. Drains may be classified as follows:—

(*a.*) Main drains or nullahs running direct down to the sea and carrying water from the hills above.

(*b.*) Branch drains which run usually more or less in an East and West direction and convey water into the main drains or nullahs above defined.

The aforesaid main drains or nullahs may be further sub-divided into two portions, namely, the flat or tidal portion which extends perhaps to Des Vœux Road or further inland and the hill portion which has an abundant gradient.

Tidal section of nullahs. Levels of inverts.

17. The following statement gives the levels of the several nullahs at their outfalls as determined by Mr. XAVIER, Assistant Engineer, and the attached plan No. 7 shows the distances to which the sea-water backs up along the inverts at mean high-water and mean sea level respectively. It will be seen that the nullah-outlets have their inverts well below mean sea level and those of many are below ordinary low-water mark. Consequently these nullahs contain at their lower end, where they cross the Praya Reclamation, stagnant water contaminated by filth brought down from above as well as matter washed in by the tide.

City of Victoria, Hongkong.—Out-falls of Nullahs.

Locality.	Size.	Invert of Out-falls referred to Ordnance Datum.	Remarks.
Belcher's Point,	2′ 6″ × 2′ 6″	1.37	
Whitty Street,	1′ 9″ × 1′ 6″	0.35	Near outfall still incomplete.
West of Marine Lot 205,	1′ 6″ × 2′ 6″	0.41	
French Street,	2′ 0″ × 1′ 6″	0.45	
Western Street,	4′ 6″ × 4′ 0″	1.70	
Centre Street,	4′ 6″ × 4′ 0″	1.28	
Eastern Street,	2′ 0″ × 3′ 7″	0.39	
Wilmer Street,	2′ 0″ × 3′ 7″	0.35	
Sutherland Street,	2′ 0″ × 3′ 6″	1.21	
Queen Street,	6′ 6″ × 4′ 6″	0.27	
Wing Lok Street,	dia: 18″	0.16	
West of Marine Lot 225,	dia: 15″	0.98	
Cleverly Street,	7′ 6″ × 5′ 4″	0.07	
Hillier Street,	dia: 15″	0.65	
Toong Kai,	dia: 18″	0.57	
Wing Wo Street,	3′ 5″ × 2′ 3″	1.14	
Gilman Street,	7′ 6″ × 4′ 3″	1.56	
Jubilee Street,	7′ 6″ × 4′ 3″	1.11	
Pottinger Street,	3′ 6″ × 1′ 6″	1.00	
Douglas Street,	2′ 6″ × 1′ 6″	2.63	
Pedder Street,	5′ 0″ × 3′ 6″	0.62	
Ice House Street,	5′ 3″ × 4′ 0″	0.09	

Invert-level of nullahs should have been fixed higher.

18. There can be no doubt that it would have been better to have fixed the inverts of the nullah outlets at or about mean sea level, so that they could be dry-scavenged daily. Why this was not done cannot now be ascertained. I fear that it is now fully late to effect any radical cure of the undoubted evils of the tide-locked nullahs. Some abatement might be effected by diverting the ordinary dry-

weather flow, at or above high-water mark spring tides, and conveying it into the sewers. If this were done the nuisance would be mainly that due to filth washed in by the tide and the wind.

Record plan of drains.

19. Without having a complete record plan of drains and nullahs it is impossible to make any definite and finite recommendations as to the amelioration of the drainage system. When the scavenging of both sewerage and drainage systems is under one and the same Authority, a material improvement will probably result.

Recapitulation of recommendations.

20. I will now briefly recapitulate the recommendations which have been made with regard to drainage in this and previous reports.

(*a.*) Let covered drains or nullahs be avoided to the utmost extent possible.

(*b.*) Let the inverts of drains, at their outlets to the sea, be at mean sea level or higher if possible.

(*c.*) In the case of flat areas near to the sea, whenever covered drains are necessary, as in the case of the Praya Reclamation and other Reclamations, let them run by the shortest possible route to special outlets to the sea, and do not attempt to connect them to main drains or nullahs which are tide-locked.

(*d.*) In laying out new districts let the alignment and levels of streets be so planned as to minimise the length and size of underground drains.

(*e.*) Let it be remembered that the main object of sewers is to keep sewage out of the drains. It is more important to exclude sewage from the drain than rain-water from the sewer. With the gradients which obtain in Hongkong it is almost always possible to provide storm overflows should any sewer become gorged with rain-water.

(*f.*) Let a complete Record Plan be prepared of the drains of Hongkong, covered or otherwise; this being in existence a definite scheme may be prepared.

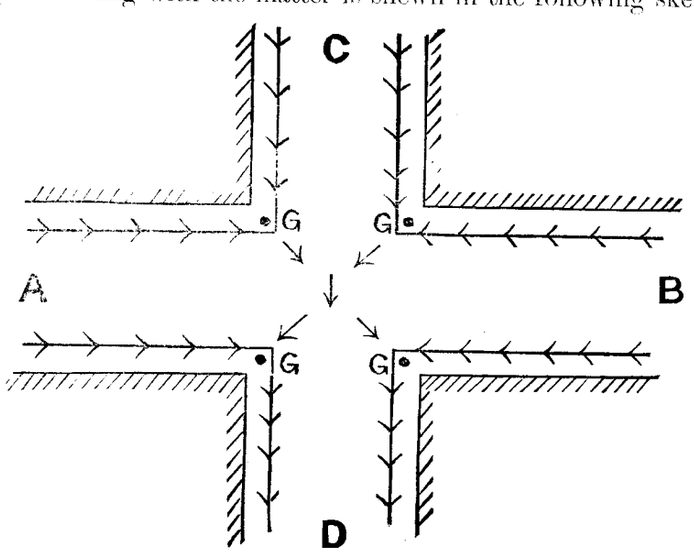
Sewerage at Kowloon.

21. I have not in this and other reports concerning the sewerage referred to Kowloon. I have altogether refrained from so doing because I look upon the sewerage system of Kowloon as provisional or temporary only. It may not be necessary to carry out a complete scheme of sewerage for some years to come. Nevertheless, I am of opinion that a definite scheme should be prepared and adopted so that all work done may ultimately fall in with the sanctioned scheme and so that nothing done, or to be done in future, will require to be undone.

Arrangement of surface drains.

22. I have recommended that surface water be carried off to the utmost extent possible by means of the side-channels of the streets, or other open drains. There is a little difficulty in so doing in the matter of intersections of streets.

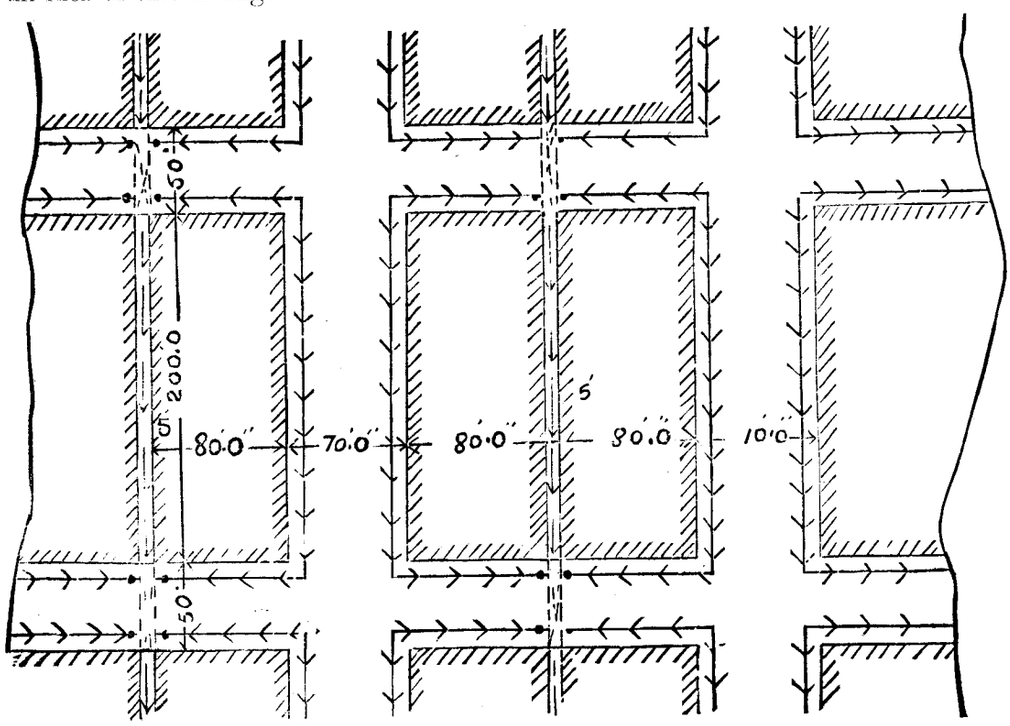
One way of dealing with the matter is shewn in the following sketch :—



The channels of C D are carried across the street A B in a channel very much flattened, so as to cause the minimum inconvenience to vehicular traffic. Any dry-weather flow is intercepted by sewer gulleys G G G and G. Still this arrangement is far from satisfactory. The depression at the intersection of the two streets is an impediment to traffic, especially in the case of tramways. Should the gulleys get stopped, a stagnant mess is the result. To make this arrangement work well it is practically necessary to concrete or asphalt the whole area at the intersection of the crossing streets.

Assuming that scavenging-lanes are recognised, as a necessity, then the difficulty may be got over, by accepting them as the main storm-water drains.

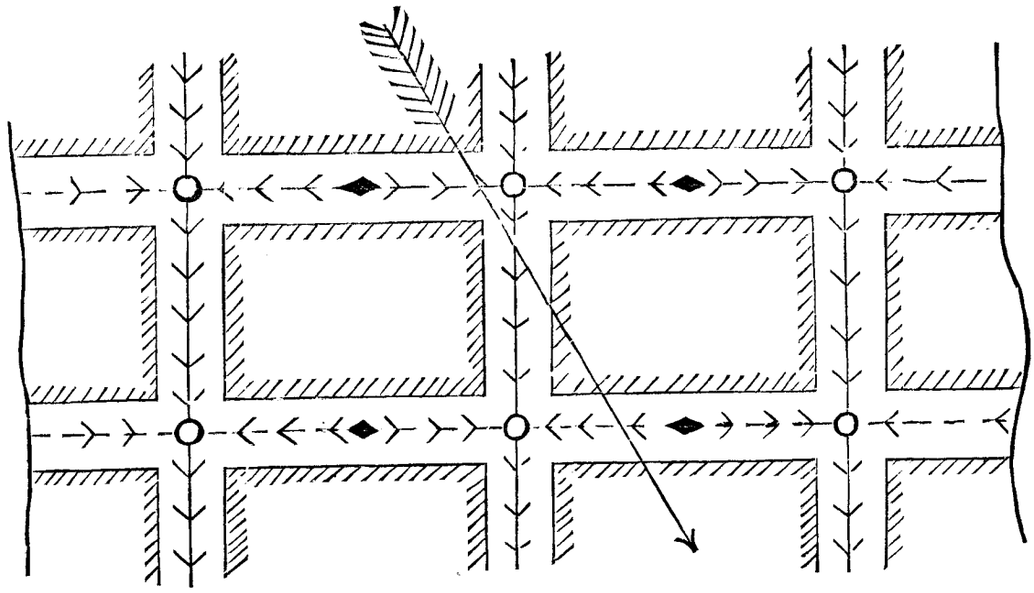
The area to be drained should be sub-divided into alternate streets and narrow scavenging-lanes. The alignment of these should follow, approximately, the greatest slope of the ground. These would be intersected at right angles by other streets. Then all that is necessary to make the said scavenging-lanes serve as storm-water drains, is to lower their surface some 2 to 4 feet below the level of the floors of the adjacent buildings, and of the streets. The following diagram gives an idea of this arrangement :—



When the combined scavenging-lane and drain passes under a cross street, it would obviously take the form of a bridge or culvert, which would, however, be large enough to admit a man for the purpose of scavenging, access to each length of lane being gained by a flight of steps. The lane would have a channel or channels formed at its centre or sides. These channels would conduct the sewage to trapped sewer gulleys, communicating with a sewer laid under the scavenging-lane. Thus in dry weather or even during moderate rain, the scavenging passage would serve its normal purpose, namely, the removal of excreta and dry refuse, and could always be scavenged and kept clean. In heavy rain it would serve as a storm-water channel. Care, however, must be taken to proportion the width of the scavenging passage and its depth, below the adjacent building lots to the maximum quantity of water that it may have to carry during heavy rain. This arrangement has the great merit that it reduces the lengths of covered drains to mere bridges or culverts. At the same time all street obstructions at crossings are avoided. Such arrangement has been adopted in the case of some land recently laid out for building purposes in Trinidad. It is, I am aware, one that cannot be carried out everywhere; but I give it as a suggestion, for it may be applicable to the Eastern Reclamation, Kowloon, and in the New Territory. Where applicable, it will offer many advantages over the present system of covered drains.

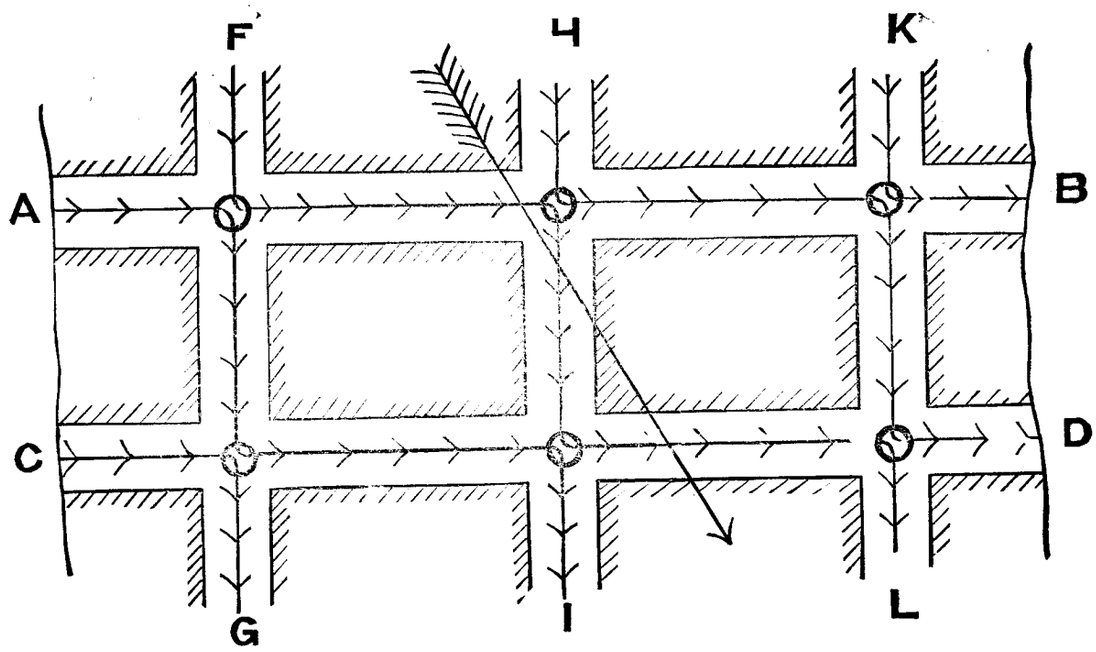
Serpentine arrangement of sewers.

23. Before concluding this report, I may be permitted to record an arrangement of sewers which has been found advantageous in many places, and which may be applicable to drains, especially when they have to be covered. It is best described by considering a portion of a town laid out in regular squares.



COMMON SYSTEM

Assume that the general inclination of the land is in the direction of the arrow. Then a common arrangement would be to lay main sewers in the directions shown in full lines, following the streets having the greatest slope and to provide branches as shewn in dotted lines, to provide for the effluent of the houses in the lateral streets. These branches run right and left, from heads marked thus ◆. Now these lateral branches receive, individually, but little sewage. Consequently they must be small in diameter and laid at a steep slope in order to be self-cleansing. This necessitates an augmented depth in the main sewers. At the best, these branch sewers are but indifferently flushed, for they are indeed only prolongations of the house-sewers of houses on the cross streets. The following arrangement wherever applicable is an improvement :—



SYSTEM RECOMMENDED.

The sewer starting from F turns to the right on reaching the cross street A B, follows it as far as the street H I, runs down the latter to its intersection with the cross street C D, then along this cross street to K L, and so on. The merit of this arrangement is that each length of sewer in the cross streets A B and C D, presumably those having the least natural fall, is fully flushed, not merely by the sewage from the abutting houses, but from the whole district above.

It may happen that the formation of the ground will permit of a continuous self-cleansing gradient along the streets A B and C D. If such is the case, then it is convenient to make the change of direction of the two sewers, namely, those in the main and cross streets in a common manhole, placing the inverts of the semi-circular channels at the same level. There is the advantage that, should a stoppage occur in any one street, the overflow will escape by another. Perfect venting and circulation is moreover secured. A common flush tank, of considerable capacity, may flush the whole system, for by a little arrangement in the manholes a flush say at A might be shunted down any one street or series of streets.

Obviously this arrangement is not universally applicable but it is one which I introduce whenever practicable.

24. It seems possible that this serpentine arrangement might in many cases be applied for flushing covered branch drains whenever such are absolutely necessary. Application of serpentine system to covered drains.

The perennial flow of water from one nullah might be intercepted and passed down through a branch drain to a second nullah and so on.

I have the honour to be,

Sir,

Your obedient Servant,

OSBERT CHADWICK.

GOVERNMENT NOTIFICATION.—No. 534

It is hereby notified that His Majesty the King has not been advised to exercise his power of disallowance with respect to the following Ordinances:—

Ordinance No. 12 of 1902, entitled—An Ordinance to amend the Law relating to the Widows and Orphans' Pension Fund Ordinance (15 of 1900).

Ordinance No. 13 of 1902, entitled—An Ordinance for the Naturalization of Ho Ngok Lau, alias Ho Ngok, alias Ho San Lam.

Ordinance No. 14 of 1902, entitled—An Ordinance to facilitate the hearing and determination of claims to rent in respect of land in the New Territories.

By Command.

F. H. May,
Colonial Secretary.

Colonial Secretary's Office, Hongkong, 4th September, 1902.