Sewer Maintenance; Under Whose Supervision and Why?

Extracts from a paper presented to the American Society of Municipal Improvements by John A. Kelly, City Engineer, North Adams, Mass.

The object to be sought in the maintenance of sewers is to provide at all times for an unobstructed flow of the sewage, to prevent solid material from blocking the main line or its laterals, and to secure good ventilation. Neglect of the first is likely to result in a set-back into house fixtures and an overflow at their lowest outlet. Neglect of the second leads to decomposition and the attendant offensive or dangerous gases; and of the third to an increased pressure of those gases until they are forced through the house traps and into residences. Only about 1 ounce pressure per square inch is sufficient to force the seal of an ordinary house trap; and I propose that in every city there are many residences whose plumbing is of the older methods and is practically without ventilation. This means that when sewer gas has once entered the house it has no means of escape other than through fixtures into the rooms.

The first requisite for successful maintenance is good construction. This consists in having proper foundation, thorough tamping about the base, and a careful bedding, imperviousness of joints, uniformity of grade and good alignment between manholes or lantern-holes, easy curves and smooth flow surfaces at the manholes, frequent Y branches for connecting house laterals, all with a plan and profile containing a clear and reliable record of location, depth, grade, position of Y's and other sewer adjuncts and sometimes the proximity of water or gas pipes. The designer and the inspector have always to contend against a disposition towards cheap construction—a tendency to use an easy way around difficulties because, no doubt, of the belief that, when covered, a critic's eye may not see the faults, and, too, of the possibility that he who causes them may not have to suffer from their results.

The ideal conditions that should be striven for are those that will cause all matter entering the sewer to be delivered so quickly at the final outlet that there has been made for decomposition. These conditions very rarely if ever exist in any extended system.

The second requisite for good maintenance is systematic vigilance. It is likely to be injudicious, expensive and the cause of much annoyance or damage to neglect the sewer until it has become stopped, and the only way to avoid such a condition is to take proper precautionary measures which should include regular examinations at not too great intervals. There is probably no more efficient and economical method of keeping the sewer clean than frequent flushing.

Manhole covers should be placed flush with the surface of the street both for convenience and as a means of ventilation.

Laterals entering from factories and similar buildings should be provided with some arrangement for keeping from the sewer anything that is likely to form in it an obstruction. A piece of cloth, 50 yards in length, laid from the bottom, or a piece of 4-inch belting 10 feet long found within the sewer are indications that some people are indifferent. I know of no better provision for such places than a manhole near the outside of the building, its bottom made slightly below the outlet, enough so that the discharge is made first into a quarter-turn, opening downward. This works very well, it keeps the outlet opened and acts as a trap. It is objectionable in that matter accumulates in the manhole and may need occasional cleaning out, but it is probably less objectionable than the usual form of connection.

In a combined system or in the surface water sewer of a separate system there is frequently an accumulation of gravel or street dirt that greatly reduces the capacity of the sewer or stops it entirely. Too often this condition is not known until there is a heavy shower and the sewer refuses to do its work. There is great liability to trouble of this sort wherever the higher parts of the system are along dirt roads and along steep hills. The strong wash along street surfaces carries gravel and sometimes stones beyond the catch-basin trap into the sewer, thence to the flat grades where the reduced velocity allows them to stop and accumulate. These places of accumulation should be watched and frequently attended to. If taken in the obstructions may generally be removed by a strong stream of water obtained by a direct connection with the street main as already described or through a line of hose attached to the nearest hydrant. Sometimes a heavy chain with knots in it may be drawn either way in the sewer, thus loosening the material that has been deposited. Much of this may be taken from the next manhole below if a shoveler is kept constantly at work and the water is made to flow over a blocking which covers the lower half of the outlet of that manhole. When the sewer is large enough so that men can conveniently work inside it becomes simply a case of shoveling the material and conveying it out by an arrangement that best suits the conditions.

When the sewer is entirely stopped the problem is one of greater difficulty. No rule can be set down for its treatment and the solution must be as the case requires with the taking up of a portion of the street, if necessary. Ordinarily the obstruction must be worked at from the manhole next below. Sometimes a man may be probed for 200 or 300 feet by a rod made up of sections, either in wood or iron, each 3 or 4 feet in length, joined at their ends by Felton's improved coupling. These constitute a convenient arrangement and may accomplish the purpose in small sewers of from 5 to 12 inches in diameter. Sections made of wood are light and easily carried about. A stronger rod and one capable of greater length may be made of ¼ or ½ inch iron pipe, cut in sections of the same length as above described and fastened together by screw couplings. This with the hook of the maw at the end is likely to do better work than the other. It is slower to make up and much heavier to handle than the one made of wooden sections.

A water-jet may, at times, be very useful. Perhaps a mirror may be made to throw sunlight into the sewer and help to determine the location and character of the obstruction.

Whatever the difficulty I believe it is well to keep a tabulated record of the date, character, location, cost of removal and such other explanations as may seem wise, as well as a record of the flushings. They are convenient for reference, they explain accounts, and are likely to be of use to the successor in office.

Cleaning catch-basins is an important item of maintenance and one of the most expensive unless well managed. Hardly another bit of work has so strong a tendency to slowness on the part of the workmen. As suggestive of a good method now being used, I take the liberty to quote from a letter recently received on this subject as follows:

"All catch-basins are numbered and are regularly inspected by a man who records the depth of the dirt in each. From this record, lists of the basins needing cleaning are made out and given to the cleaners, with the route they are expected to follow. The cleaners make a return each day of the number of loads taken from each. From these re-
turns we obtain a check upon the work each
cleaner is doing and are able to obtain the cost
per cubic yard of the material removed from
the basins.

"When the cost per cubic yard runs above nor-
mal figures we detect it and at once investigate
the cause. By the adoption of this method we
have succeeded in greatly reducing the cost of
cleaning (I believe it to be capable of still
further reduction), and obtain a record of each
basin which is valuable in case of complaints.

"By this method the men do not stop to clean
a basin that has 3 feet of water and only 1 foot
of dirt but attend to only those basins which
need attention. They do not have to be accom-
panied by a foreman, as the returns show the
amount of work done each day."

The same writer says that the cost per cubic
yard for removing and hauling away was $0.665
in the year 1899 and was $0.63 in the year 1900.
The haul was probably about 2,000 feet and the
difference in cost probably due to the difference
in length of haul.

The manner of connecting house laterals
with pipe sewers is a matter that belongs fre-
quently to maintenance and is of considerable
importance, especially if no Y has been pro-
vided, in construction, for the connection. Cut-
ing an opening through the side of the sewer
should not be allowed. Removing a length of
pipe and replacing it by another that contains
a Y branch is objectionable because with any
considerable run in the sewer or with the run
turned on before the cement has had time to
set is very likely to result in leaky joints. Tak-
ing up three or four lengths of the old pipe in
order to not be obliged to cut away any of the
hulls in relaying is open to the same objection.
The writer believes there is no better method
than to excavate entirely around the pipe and
encase it in brick masonry or concrete nearly
to its top, then carefully cut the hole in the top
of the sewer and join the lateral to this by a
quarter of an eighth bend, making sure that
none of the smaller pipe extends inside the shell
of the larger pipe; then continue the masonry
to cover the joint thus made. This, if properly
done, does not weaken the sewer, nor cause it
to leak or become rough on the inside. It may
reduce somewhat the grade of the lateral but
this it should be able to stand or the elevation
of the fixture is dangerously close to that of
the sewer.

The laying of house laterals is probably more
faulty than that of any other part of the sys-
tem and is, in consequence, the place of more
stoppages. They are frequently laid without
supervision, by contract and at the lowest price.
There is no reason why these should not be
placed, by the city, under the same supervision
and restrictions as other parts of construction.
A license to the drain layer does not insure
good results.

The third requisite for successful sewer main-
tenance is a right kind of man to do the work.
If the system is large divide it into sections
and select a man for each, all subject to the
direction of the head of the department. The
selection should not be made in accordance
with the policy that anything will do. The
man should be intelligent, reliable, and have a
reasonable degree of common sense. His work
is not of an agreeable character but he should
have an interest in it and should take pride in
doing it well. Very much of his method and
what he does may be hidden, so he must have
an ability to see what needs to be done and be
honest in carrying out instructions. He must,
like every other man, in order to do good work,
feel that he has a responsibility and is being
trusted. The one under whom he works must
show that good service is appreciated and must,
as far as possible, make use of the subordinate's
Judgment. Respect him and let him know it. If he is unworthy of this he should not have the place. Make him feel and know there is as much dignity and honor in well filling his position as there is in filling any other. This, it seems to me, is the only way to get from a man the best that is in him.

The question of maintaining ventilation is a somewhat difficult one, especially in dirt roads. In paved streets a perforated manhole cover seems reasonably satisfactory if the perforations are kept open, but in the dirt road they are very liable to become stopped; yet there seems to be no better method even here. To obtain good results they must be watched and frequently cleaned. A 4-inch pipe connected with the drain just outside the running trap of each house and running to a point above the roof no doubt provides a first-class ventilation for the sewer and protects the house from sewer gas as much as is possible. Its expense makes it somewhat objectionable and if carried up in a conspicuous place it is unsightly. The necessity of good ventilation has already been mentioned.

Under whose supervision should the maintenance of sewers be placed? This can not be answered by the man's municipal title. He should not only be competent to design and construct but he should have had experience in it. A knowledge of the theoretical and the practical are most desirable qualifications for supervision of maintenance. He should not only be capable of reading drawings but of making them. He should know when to make them and of what. He should be most familiar with the system and should be able to decide quickly what should be done for the difficulties that are likely to arise. He should attend to a clear and concise record of the work done kept in a form convenient for reference. Finally he should be able to establish a cooperation with his men and a condition of mutual confidence. At the same time he must be master of the situation and must see that his orders are obeyed.