the case of gas, moisture condenses and stays in the low spot, and in time causes interruption in the flow of gas. When the service is of lead, which is now generally used for water services, there is no danger to be feared from sagging, but it may pull out at the main and thus cause a leak. To avoid these troubles, it has been found advisable to use the following support which is less expensive than repairs:—

Fig. 2.—Completed Canvas Cover on Joint.

Two legs 2 ins. x 8 ins. x length; one sill 2 ins. x 8 ins. x length under the tile pipe; one cap 4 ins. x 4 ins. x length; one strut 4 ins. x 4 ins. x length between the legs, to prevent them from buckling. (See Fig. 3.)

The size of this support may be increased when it is necessary to protect a main. For services the average bill of material is 30 ft. B.M. lumber and requires from ½ to 1 hour's labor to cut the pieces and put them in place. The average cost is $1 for each service protected, while if the service is not protected and is subsequently damaged, the repair will cost from $5 to $10. Breaks or interruptions invariably occur either in the trench, union or main where proper protection is not given, while they practically never occur where the above-mentioned protection is used.

Protection Given to a Sewer in Soft Ground.—Where the ground is of a soft nature a pipe would unquestionably settle or perhaps rise as soon as placed. Under such conditions it has been found advisable to use the following construction:—

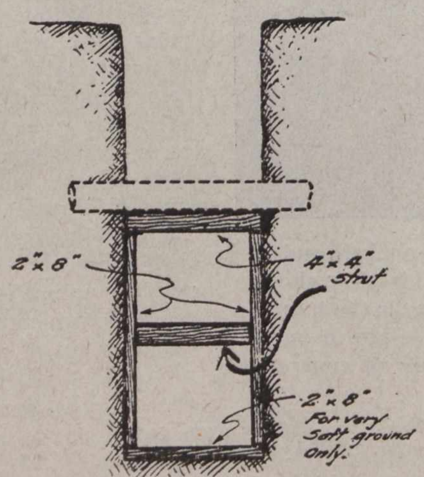

Fig. 3.—Protection Against Mains Settling.

The earth is taken out to a depth of 7 inches below grade and the trench made wider by 4 inches. A box or trough is then made as shown in Fig. 4, 2-inch plank generally being used. This box is 6 feet or more in length, according to convenience. It is lowered to the bottom of the trench and set to grade 5 inches below the grade of the pipe. Four inches of concrete, 1:3:5 mix, is then placed in the box, the pipe set to grade, then the sides filled with concrete. Sometimes, where the ground is very soft, such as in the case of running-sand, it has been found advisable to drive small stake-piles to resistance on either side of the trench, and about 3 feet apart. Sills are placed on them across the trench and then the box is placed on these sills.

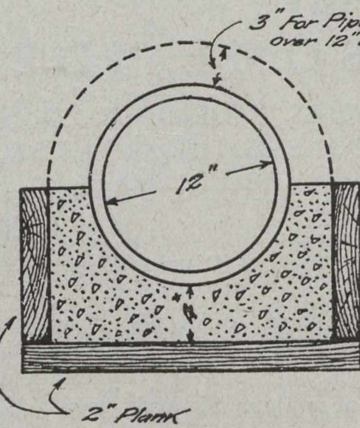

Fig. 4.—Type of Construction to be Used in Soft Ground.

SEWAGE TREATMENT FOR CHIPPAWA, ONT.*

Chippawa is a village of 700 people, situated on both banks of Welland River at its confluence with Niagara River. The community is essentially rural and obtains its water supply from wells, which fact leads to a local feeling that drainage of some kind is needed, for at present any sanitary drainage is limited to two or three private lines to the branch river.

Owing to the presence of the dividing river, sewage treatment for this community would be somewhat costly, involving the construction of parallel interceptors on the two banks, and, if duplicate treatment is to be avoided, requires a siphon from one side to the other. These factors, together with the scattering development, would probably entail the construction of 7,000 lineal feet of intercepting sewer, of which 2,500 feet on each side of the river is applicable to the collection, with 2,000 feet of outfall to a treatment site, which has been placed tentatively at the northerly edge of the village. With interceptor lengths as stated, and to treat the sewage from a population of 850, a rough first-cost estimate would run about as follows:—

SEWER.	
7,000 lineal feet interceptor, at $3	$21,000
Extra for siphon crossing	2,000
1 automatic pump	800
TREATMENT.	
850 persons at $5	4,250
Total	$28,050

Annual charges would be about $2,200, of which $520 are allowed for labor, material and power.

*Abstract from report to International Joint Commission, by Prof. Phelps, consulting sanitary engineer to the commission.