levelled by a stone mason, any low pedestals being chipped for to use a plate.

The foregoing may seem rather elaborate for a small bridge, but as neither the foreman in charge or the carpenter had done any large concrete work before it was none too much, and the end justified the means, for when the bridge

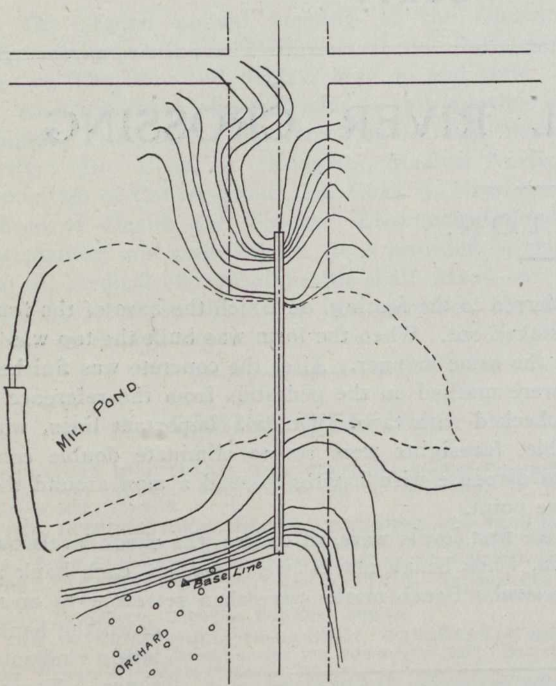

Fig. 2.—Layout of Small River Crossing.

company laid track, spiking to centre of girders, there was no need of relining when the bridge was finished.

The instruments used were a 5-inch transit reading to minutes, a 14-inch dumpy level, a self-reading rod graduated to half tenths, and a band chain.

AMERICAN WATERWORKS ASSOCIATION.

The thirty-third annual convention will be held at West Hotel, Minneapolis, Minn., June 23rd to 27th, 1913.

The following papers are scheduled: "The Diesel Engine for Waterworks," by Edward S. Cole; "Waterworks Special Franchises," by Henry DeForest Baldwin; "Reforestation and General Care of Watersheds," by Ermon M. Peck; "The Bacterial Count on Gelatin and Agar Media and its Value in Controlling the Operation of Water Purification Plants," by James M. Caird; "The Tuscaloosa, Alabama, Waterworks," by Prof. Edgar B. Kay; a paper on filtration, by George W. Fuller; "Charges for Public Water Service to Private Fire Protection Systems," by W. E. Miller; "A Reasonable Basis for the Determination of Charges for Private Fire Protection," by Leonard Metcalf; "Metering Private Fire Services at Kenosha, Wisconsin," by August Baltzer; "How a Private Fire Service Polluted a Public Water Supply and Some of the Consequences," by Robert J. Thomas; "Modern Filter Practice," by Nicholas S. Hill, Jr, "Gravity Water upply at the City of Manila, Philippine Islands," by H. E. Keeler; "Power for Pumping Derived from Refuse," by E. H. Foster; "Pumping Engines," by L. E. Strothman; "Ground Water Supplies," by Charles B. Burdick; "Rates and Rate Making," by Halford Ericson.

On Tuesday and Thursday evenings illustrated lectures will be delivered by Edward Wegman and Dr. William P. Mason.

There will be excursions on Wednesday and Friday afternoons.

NOTES ON SEWAGE DISPOSAL.

By Geo. W. Swinburne, M. Am. Soc. C.E.*

The liquid portion of sewage is not, to any appreciable extent, beneficially affected by being subjected to tank treatment. But, in addition to its dissolved impurities, sewage carries suspended solids, some of which can be eliminated by efficient tank treatment, and others which, under practical working conditions, are not depositable by sedimentation alone.

The operation in ordinary settling, or sedimentation, tanks is a comparatively simple one, since there are but two forces at work, the forward movement of the sewage and the force of gravitation acting on the suspended solids. These solids will be deposited at variable distances along the tank bottom, forming a gradually rising floor of sludge, diminishing the liquid capacity of the tank, increasing the rate of flow of the sewage, and finally causing a greater proportion of suspended matter to pass out with the effluent than is consistent with successful operation. When this condition is reached the tank should be put out of commission, emptied and cleaned.

In septic tanks the decomposition of the sludge results in the addition of a third force. It is often assumed that septic action results in the liquefaction of the organic portion of the sludge, but, while some liquefaction does occur, the result is essentially a gasification. These gases work in opposition to the force of gravitation acting on the suspended solids, and are the chief cause of the large amount of finely divided suspended matter found in septic effluents.

Since septic tanks have a longer sedimentation period and a greater sludge storage capacity than plain sedimentation tanks, the interval between cleanings is naturally longer, but the final result, putting the tank out of commission for emptying and sludge withdrawal, is the same in both cases.

Following a careful study of the results obtained with the two-story tank at the Lawrence Experimental Station of the Massachusetts State Board of Health and an exhaustive investigation of the conditions in which suspended matter is found in sewage, Dr Wm. Owen Travis, of Hampton, England, designed what is now known in England as the Hampton, or Travis, Hydrolytic Tank and in this country as the Hampton Sedimentation Tank. The results sought in designing this form of tank may be stated as follows:—

(1) To effect the sedimentation of the depositable solids of the sewage in such a manner as to maintain continuously the predetermined capacity of the sedimentation chambers.

(2) To increase the sedimentation efficiency and remove the liquid products of the decomposition of the deposited solids by causing a minimum proportion of the sewage to flow into and through the reduction chamber.

(3) To separate the opposing forces of gravitation and gaseous eruption by confining these operations to separate compartments.

(4) To provide for the removal of sludge at will and without interfering with the continuous operation of the tank.

The first tank of this type was constructed in 1904 at Hampton, England, to relieve the rapid clogging of the primary contact beds. An official report by Mr. J. H. Johnson, M.S., **F.I.C., London, England**, covering a period of six months' operation of this tank shows an average retention of 90 per cent. of the suspended solids of the raw

* Mr. Swinburne, to whom we are indebted for the compilation of the above notes, is chief engineer of the Sterilization Company, Newark, N.J.