

spaced about 2'-4" from center to center and supported by abutments. Forms for these arches are made of corrugated galvanized iron of about 20 gauge curved to the proper radius. These forms are inserted between the beams and are held in place by the lower flanges of beams. Concrete is then poured in each space between the beams to a point about two or three inches above the top flanges. The surface of the floor is then water-proofed, sanded, and made ready for traffic.

The steel beams in the floor are secured against spreading by the placing of 1" bars which are spaced about 6 feet apart and run across beams both on top and bottom flanges and are hooked on their ends. Several of these floors were constructed a few years ago over large dredge ditches with the idea in mind that if necessary the floor could be easily removed in order that dredges could pass through, after which the steel could be replaced on the abutments and the floor rebuilt.

In conclusion I wish to emphasize again the fact that it is poor policy to neglect bridge floors or any other part of a bridge for that matter, as we see them neglected by the hundreds over the state. A bridge is not different from other structures or buildings which are subjected to the damaging actions of the elements and to other destructive factors which are constantly attacking them. To erect such structures and then disregard them until they fall to pieces is, to my notion, a mighty poor way for public officials to serve the taxpayers.

## CONSTRUCTING A SEWAGE TREATMENT PLANT

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By W. P. Cottingham,  
City Engineer, Gary, Indiana

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All Indiana cities are going to be interested in the construction of sewage disposal plants—either for themselves or for their neighbors. If your city has no need of a sewage disposal plant, it is more than likely that you are vitally interested in having your nearest neighbor city construct a sewage disposal plant because, without it, it is contaminating your water supply. In our corner of the state we are certain that if our neighboring cities of Hammond, East Chicago, Whiting, and Chicago would stop emptying their waste into Lake Michigan we wouldn't have to keep spring water for drinking purposes at certain seasons of the year. And I suppose each of those municipalities are equally certain that the entire contamination is traceable to the other cities.

It has required an order from the State Health Board of

Indiana to bring about some cooperative action that will result in cleaning up the Calumet district. And similar orders from the Health Board have brought about a general desire on the part of municipalities and industries throughout the state to cooperate more fully in a definite program for the elimination of stream pollution in Indiana.

The specific case in Gary that this talk revolves around came to the Board of Public Works with the annexation of the old town of Miller, situated east of Gary along the shore of Lake Michigan. This territory was an old settlement that had received new life because of the building of Gary and was made a part of Gary to permit the development of a splendid lake front park along the beach. When the old timers had become used to city ways they realized the need of public improvements and petitioned for a sewer system.

The Gary sewer system has been designed from the beginning to provide for ultimate sewage disposal at a central location where all the sewage of the city could be brought to one point and there economically treated. A study of the Miller needs indicated that it would be prohibitive in cost to undertake to bring their sewage to this central point. Consequently a separate outlet and ultimate disposal plant were required.

### Preliminary Studies

During the period of preliminary surveys and planning it was learned that the town of Aetna, a 400 acre townsite development that was undergoing some intensive high pressure operations to convert the old powder mill site into a realtor's paradise, was also planning a sewer system with an outlet sewer and possible disposal works along the Little Calumet River. It is recognized that Gary dominates the district and that most adjacent territory will later be annexed to Gary; therefore it was very certain that we would some day take over this Aetna sewer system. And it was equally certain that the cost of operating two separate sewage disposal plants along the Little Calumet River would be almost double the cost of operating one plant. Our studies had shown that the Miller sewer outlet would properly be into this stream. Negotiations were opened with the subdividers of Aetna and the annexation of Aetna followed. The two sewage districts were combined, one outlet developed, and the construction of a single sewage disposal plant ordered.

It seems a rather simple matter for a board of public works to order the construction of a sewage disposal plant—and from their standpoint it must be a fairly simple matter to construct the plant. A few resolutions are signed, a contract awarded, a final estimate approved, and the job is finished. Some thought is given to the method of financing, and no doubt there must be a decision as to whether the notice shall

be published in this paper or that one, depending probably on the attitude of the papers in the last city election.

The financing problem is one that does cause considerable concern in most instances. Some disposal plants are built at general city expense through bond issues by the city; others are handled through the establishment of sanitary districts. Since Gary has followed the procedure set up under the Barrett law for special assessments, in the district under discussion an assessment district was established for a district sewer, setting up in the declaratory resolution the detailed description of the main sewers and the all-embracing clause "together with a disposal plant and all other necessary appurtenances." The boundaries of the district are indicated on the map and the location of the outlet and disposal works are also shown.

The plans for the main sewers and the disposal works were prepared and adopted, hearings thereon held as provided by law, proceedings confirmed, bids received, and contract awarded. On the basis of bids received, the disposal works, including the purchase of 10 acres of ground, cost \$225,000.00, which was about 25% of the amount of the entire contract.

The general contractor awarded a subcontract for the construction of the disposal works and undertook the sewer construction himself. In excavating for the outfall sewer the general contractor partially accomplished the drainage of the site for the disposal works. At the same time he opened a way into the site which is situated in the center of the Little Calumet River Marsh. This marsh has been described for generations as an impassable morass and has lived up to its description at most seasons of the year.

The site for the disposal works is over a mile south of the nearest railroad and about two miles from the nearest accessible road. An industrial track outfit was placed in operation from the railroad track and a very poor roadway developed along the spoil bank of the drainage ditch that has followed the Little Calumet River. The subcontractor established a camp for his outfit at the disposal site.

### **Description of Plant**

The plant to be constructed included Imhoff tanks, trickling filters, sludge bed, and pump station. There are two tanks, of three units each, designed to serve a population of 12,000 and having a probable detention period of about 3 hours and a sludge storage capacity of 30,500 cubic feet. The tanks have for their object the separation of the sewage solids from the liquids in which they are carried, and the reduction of the solids to an inoffensive condition through digestion. Climatic conditions require the large storage capacity indicated to provide for eight months storage over the winter months.

The liquid from the tanks passes through an automatic syphon in the dosing chamber to the sprinkling filters, which have an area of approximately 1 acre, being 240' x 180' with a 6' stone filter depth. The discharge line from the dosing chamber is 30" and feeds 432 nozzles spaced 10' apart each way for square type distribution. The sludge bed measures 100' x 120' and provides 1 square foot of area per capita.

The pump station, equipped with 3 motor driven sewage pumps, each capable of handling 1,200 gals. per minute, delivers the sewage to the tanks. One pump will handle the normal dry-weather flow, and two will handle the maximum flow that would be put through the plant, leaving the third as a reserve for any occasion. In excessive rainfall periods the station will be by-passed and the flow will be direct to the river.

In the actual construction of the plant we found very little that differed from any other building operation. The tanks required a large amount of careful form work for the reinforced concrete walls, beams, hoppers, and channels. The walls and floors were reinforced and waterproofed to withstand ground water pressure. The walls of the filter beds were carried for footings down through a very unstable marl layer to the underlying sand. The distribution system and the collecting system in the filter beds involved very little that would not be encountered in building construction. A Rawn underdrain provides the method of collection at the bottom of the rock filter. The amount of piping in such a plant is rather startling to one who has not observed the construction of a similar one.

When completed, the plant was operated for acceptance tests, then drained and locked up. It is not being operated at present because of the large volume of ground water being delivered through the main sewers from ditches and from Long Lake in Miller. We anticipate that the dilution of sewage will be sufficient to permit its direct flow into the stream until June or July of this year.

### Financing

After the plant and the main sewers had been completed and accepted, the assessment roll was prepared, adopted and confirmed over a few remonstrances. There was no attack on the assessments because of the construction of the disposal plant as part of the sewer. The entire project cost approximately \$1,000,000.00, including all extras for the contractor, engineering, inspection, clerk's costs, etc. The assessment rates range from 4½ mills per square foot for the most remote section to 3 2-10 cents per square foot for the property adjacent to the main sewer.

This was not the first instance in Gary where structures other than actual sewers had been constructed under district

sewer proceedings. Three years ago we found it necessary to construct a sewage pumping station to overcome the disadvantage of a submerged sewer outlet. The station was built at the main outfall and a sewer district established to include all property contributing sewage to this point. The map shows that this district included about 16½% of the area of the city exclusive of Miller and exclusive of strictly industrial territory. An assessment of about \$3.25 per lot raised approximately \$125,000.00 to pay for the station.

We are now preparing our plans for the ultimate sewage disposal plant for the entire city and will set up another sewer assessment district. An assessment of \$9.99 per lot will yield about \$2,500,000.00, which is approximately the cost of the proposed plant. Upon completion of that project Gary will have established facilities for treating all domestic sewage and will not have created another taxing body, such as results from the establishment of a sanitary district, nor will it have increased its bonded debt.

## SURMOUNTING DIFFICULTIES IN PAVING A MAIN TRAFFIC STREET

By Ernest L. Guyer,  
City Engineer, Newcastle, Indiana

South Fourteenth Street in Newcastle, a bituminous concrete surface on a Portland cement concrete base, has been in need of repairs for eight or ten years. It is a main, heavy traffic street between the industrial section of the city and the railroad freight yards. It is also State Highway Route 3 carrying the north and south traffic along the eastern side of the state. It carries two bus lines and approximately 200 cars per hour. The street is narrow; and I well remember the night at a council meeting attended by a large number of property owners when I advised the council to widen the street. The property owners defied me to widen it one inch, because it had taken forty years to grow the beautiful trees that were in the parkway space.

It was the general thought of the citizens, especially the abutting property owners, that the traction company was responsible for the failure of the old pavement. The traction company reasoned that for the small amount of time they used the street there must have been some other cause of failure, and after making an investigation, they reported to the city that the bus line was just as responsible as they.

About five years ago Prof. Ben H. Petty, of the Highway