made provision for alternative propositions for a reinforced concrete bridge. An alternative bid was accordingly submitted by the Young Construction Company for a 690-ft. reinforced concrete bridge designed under the Thomas System, the bridge being about £4,000. This alternative bid was accepted after the highway commission's engineering department checked the plans carefully, and the county secured a longer bridge and saved a large sum in cuts and fills.

The bridge was designed to carry a load of 250 pounds to the square ft. It consists of six spans, four of which are 103 ft. in length, the two end spans being 107 ft. The bridge is 19.4 ft. in width over all, with 18 ft. roadway. The foundation for piers and abutments consists of thirty piles to each pier and abutment, the piles being cut off two feet below mean low tide, the foundations thus extending down about three and half feet below the river bed. The bridge is located about half a mile back from the ocean and on account of the tide action no danger from scouring was anticipated. The riverbed is firm gravel. Each pile was figured to sustain a 17-ton load. The foundations of piers are 12 ft. in width and 26 ft. in length. The concrete used in piers and abutments was 1:3:6. A departure from accepted practice in this vicinity was made by the use of beach gravel in the concrete aggregate, to which was added 15 to 25 per cent of broken stone, the gauge varying to suit the work. There is no reinforcement in piers. In the arch ribs the concrete aggregate was 1:2:5, beach gravel also being used. The arch ribs were made on the ground under the respective positions which they were later to occupy in the completed structure. These arch ribs or beams are 11 feet on centers and are reinforced with a steel frame work consisting of twelve ¾-in. round rods and ¼ x 1¼in. flats, the reinforcing being connected at the crown end of the beam to cylindrical plates of steel having a ball joint mated into a cup in the opposite beam, the semi-spherical protuberances. At the reverse ends of the beam are ½-in. semi-circular plates forming portions of the hinges at skew-back on the piers. The hinge shoe on piers consists of 1-inch bolts, the rods extending deep into the concrete.

The spandrel posts, also made separately on the ground, were poured in 12 x 16-in. sections, the concrete aggregate being the same as in the arch ribs; that is, 1:2:5. The longer posts are reinforced with four 5/8-in. round rods; the shorter posts have four ½-in. rods. These rods were left protruding from the sides, top and bottom of the posts. The rods extending from the top form a tie to connect the spandrel arches with the spandrel posts; the rods protruding from the bottom have a thread, and they extend through the rack, beam and bolt the spandrel post to the beam; the rods extending through the sides of the beam are embedded in diaphram cross braces and hold the posts to a rigid position.

Holes are left in the spandrel posts and the wooden centering for spandrel arches to provide means for firmly bolting the floor supports to the spandrel posts; the monolithic concrete deck was then poured in the usual manner. The floor was reinforced with 5/8-in. round rods running transversely across the bridge and the outside cantilever portion of the floor has rods running longitudinally 6-inch on centers.

Before the bridge was tested officially, the ribs of three arches were subjected during construction to a very interesting test as to their stability by inadvertent unsymmetrical loading after the pile supports were removed from supporting the arch ribs. The floor was started at the north bank and carried across toward the south bank. Thus these three arches had the weight of the floor and spandrel arches to carry without any load to balance them on the opposite side. A strain sheet was made, and it showed a thrust on the unloaded arch beams on the opposite side to pass to the outside edge of the reinforcement of the beams, also passing down through the foundation and passing out toward the opposite side of the pier outside the supporting piles while this loading was in progress. Careful observations were made of the arches to see if any unequal settlements or other signs of alarm appeared, but no deflection or other irregularities were noticed on the work.

The bridge is finished with a 1½-inch railing and the deck is covered with 2-inch asphalt surfacing. Construction was started about September 1910, by the Young Construction Company under the supervision of Mr. Thomas and Resident Engineer Yost for the highway commission.

The three hinged arch is recognized as having many advantages over the other types of construction, particularly where seismic disturbances may occur or settlements of foundations may cause cracks in the arch ring, in that it has greater flexibility than any other class of design. The designer of the San Luis Rey bridge claims for this type and method of construction used that it will make possible the building of concrete arches of large span that have heretofore been considered too expensive on account of the great cost of falsework having no value after the structure has been completed and which is not necessary where the arches are built on the ground and hoisted into place. It has been found in the Santa Cruz bridge referred to previously that the 83-foot arch raised or lowered ¼-inch with a difference of twenty-five degrees in temperature, and in the San Luis Rey structure a raising or lowering of .18-inch was observable with a variation in temperature of twenty degrees.

Schemes for the erection of 3800 houses in Manchester have been approved. According to estimate, the city's requirements are for 17,000 houses.

* * * *

Remodelled Name.—"Why do you keep referring to von Ananias? There is no such person mentioned in the Bible."

"I put the 'von' in myself. The name of the original mendacity expert should be Germanized as much as possible."—*Washington Evening Star.*