tests indicated very clearly that the supporting strength of the pipe after cracking depended upon the bearing power of the soil at the sides of the trench. The soil in which these tests were made was probably more firm than the average in drainage work so that the values of the supporting strength after cracking are valuable for comparing with each other rather than for indicating what may be expected in other places.

The pipe laid in concrete cradles as specified in the standard specifications for "Concrete Cradles" for "Solid Soils" were tested as class 3. The concrete used was proportioned 1:8, as mentioned above. The bottom of the trench was shaped to fit the lower 90° of the pipe and 2 ins. of concrete placed on it. The space between the sides of the trench and the pipe, about 2½ ins. at the mid height of the pipe, was then spaded full of concrete up to a height of one-fourth the nominal diameter of the pipe above the mid height. These pipe had an average cracking strength 64 per cent. greater than those of class 1.

Class 5 beddings were a combination of the earth beddings and the concrete cradle just described. The bottom of the trench was shaped to fit the lower quarter of the circumference of the pipe and the spaces between the pipe and the sides of the trench, about 3 ins., filled with 1:8 concrete. These pipe showed a cracking strength of 46 per cent. greater than those of class 1.

The third class of concrete bedding for solid or firm soils was class 6. The trench was dug with a flat bottom and was about 6 ins. to 8 ins. wider than the outside diameter of the pipe. The pipe was laid in the trench and concrete poured in at the sides, care being taken to get the concrete well around the pipe. Tests of this type of bedding were made with two grades of concrete. In class 6-A a 1:5 mixture was used and in class 6-B a 1:8 proportion. The pipe of class 6-A supported a load 96 per cent greater than class 1 before cracking. Those of class 6-B developed a cracking strength 80 per cent. greater than that of class 1.

It is not certain that the tests determined the maximum supporting strength of the pipe of these three classes as the limit of the apparatus was reached on several occasions. When a large load was left on a cracked pipe for any considerable time, the uneven settlement caused derangements in the best apparatus. However, the maximum loads recorded were very large, the average being more than twice those supported by the pipe in earth beddings.

The tests of these classes also indicated that the supporting strength of a pipe after cracking depends upon the bearing power of the soil. For example, the average maximum loads supported by the pipe of class 6-B was greater than that of the pipe of class 6-A. These two classes were the same except that the concrete used in class 6-B was a leaner mixture than that used in class 6-A. The yielding of the lateral support was a gradual one. These tests all indicated that if the maximum applied load could have been held for a longer time, all the pipe would have collapsed.

The pipe of these three classes showed a marked tendency to develop side cracks at or near the top of the concrete at the sides. Where the side cracks in the pipe were below the top of the concrete it usually cracked opposite the crack in the pipe. In each case in class 3, the concrete was cracked along the centre-line at the bottom, the crack appearing simultaneously with the crack in the bottom of the pipe. In a great many cases the cradle was cracked near the lower ⅛ points by the continued application of pressure after the pipe had cracked.

The pipe all cracked at the top at the same or less load than at the bottom. In general, the development of a single crack at the top was indicated by a slight decrease in the indicated load, and the appearance of cracks in both top and bottom by a marked decrease in the indicated load. The side cracks usually developed while the load was being again raised to that at which caused the cracks in the top or top and bottom.

The bedding designated as class 7 was patterned after the Philadelphia method. This type of bedding or cradle would be equally effective in all soils firm enough to allow of the construction. The trench was dug a little wider than the outside diameter of the pipe and the bottom left flat. About 3 ins. of 1:8 concrete was placed the full width of the trench and the pipe laid upon it. Concrete was then placed around the pipe to a height of 6 ins. or one-fourth the inside diameter, above the bottom of the pipe. This bedded the pipe in concrete for a little over 90° but furnished no side support whatever, as the top of the concrete was just about even with the surface of the ground.

The pipe of this class showed an average strength before cracking 82 per cent. larger than those of class 1. As these pipe received no side support, they collapsed as soon as the main fractures were developed. These pipe all cracked at the top at the same time, or before, they did at other points. In no case did one of these pipe crack through the portion bedded in the concrete. The general failure was at the top and at the sides at the top of the concrete. Some pipe also cracked at one ¼ point at the side but in no case at both sides ¼ points.

An examination after the tested pipe were removed from the concrete showed that each of the concrete cradle was free from cracks. It may be that as great a supporting strength can be produced in the pipe with a lighter cradle of this type. This type of cradle is easier to construct and required less concrete than some of the other types in which the pipe had no greater supporting strengths.

As it was impossible to secure soils which would reproduce the conditions met with in work in what are termed yielding soils, a condition which was more severe was provided. After the concrete in the cradles had set, the earth was dug away at the sides down to the bottom of the concrete. This method gave the pipe no side support except that furnished by the concrete cradle.

Tests were made of pipe bedded in "Concrete Cradles" for "Yielding Soils" as specified in the "Standard Specifications for Drain Tile." In class 4-A a 1:5 concrete was used and in class 4-B 1:8 concrete.

The trench was dug 10 ins. wider than the outside diameter of the pipe and with a flat bottom. A 3-in. layer of concrete was placed in the trench and the pipe laid upon it. Concrete was then poured in at the sides up to the specified height of ¼ the inside diameter above the mid height.

The pipe of class 4-A showed an average strength before cracking 38 per cent. larger than those of class 1, while those of class 4-B supported 50 per cent. more load before cracking than did those of class 1. The fact that the cradle of the leaner concrete gave the larger support is attributed to the fact that the pipe of class 4-B were laid before those of class 4-A and that cool weather and frosty nights prevailed after the cradle of class 4-A were poured.

The pipe of these two classes usually cracked at or near the four ¼ points at the same time, though the side cracks were often at or near the top of the concrete. In