

found a swing bridge. The material was partly excavated and then piles were driven. Between these the slipped material was replaced by loose stone, over which a 2-ft. platform of concrete was laid, and the bridge built thereon.

#### REGULATING CULVERTS.

No overflow weirs are used, but regulating culverts, Fig. 15, the design of J. L. Allison, C. E., are used instead. There are two of these communicating between the side ponds and an outfall one. Each one consists of twin tunnels of concrete leading through the bottom of the embankment and throttled by "Stoney" sluices which operate

used with economy and success. It was set against the face mold about 1½ ins. from it and held back the stone in the concrete mass till mortar was tamped in front and the grating withdrawn.

#### SPLAY WALLS.

Above and below each lock splay walls revet the sides until the 2 to 1 slope is reached by their spreading flare. These are very massive, and built as concrete monoliths, only the coping being of stone. Their section was determined by the Engineering News rule: "3-7 height and odd inches thrown in." The mean thickness thus obtained



FIG. 16. VIEW OF LOCK 3, DURING CONSTRUCTION.

upwards through shafts by the usual chains and counterweights.

The parallel tunnels are 6 ft. wide and 7 ft. high, with an arched roof 2 ft. thick, all formed as a concrete monolith. A smooth face finish was secured by the use of tarred paper spread over the molds, against which a 2-in. layer of mortar was plastered. This gave a smooth finish, but the imprisoned air left "worm marks." Stove-pipe iron gave a very smooth finish, and was much used by the writer in curved work.

For mortar facing a large "rake," or grating, 4 ft. long and 18 ins. high, formed of vertical iron rods, set 1 in. apart like teeth, in a flat bar, was

was multiplied by the height and this area distributed as the case allowed. All walls have plumb faces and their backs formed in steps, upon which, as far as possible, loose stone filling was piled. The base projected 1 ft. front and rear, which allowed of setting up mold posts and correcting alignment of face. The walls varied from 120 to 140 ft. in length, and were built without transverse bulkheads, but vertical slip joints were made where the wall joined the lock wing. These have proved quite sufficient for contraction, even though subjected to a range of from — 30° F. up to 120° F. Walls of immense size have developed hair cracks, but they are of no consequence, while