

eye loops and twisted into a clip. The changed plan required only four longitudinal strands; the two outside ones passed through the eye loops, the upper one serving to anchor the blocks to the paving, and the lower one to lock the system or hold the blocks *en masse*; the two inside strands laid along alternate joints are held in place by the

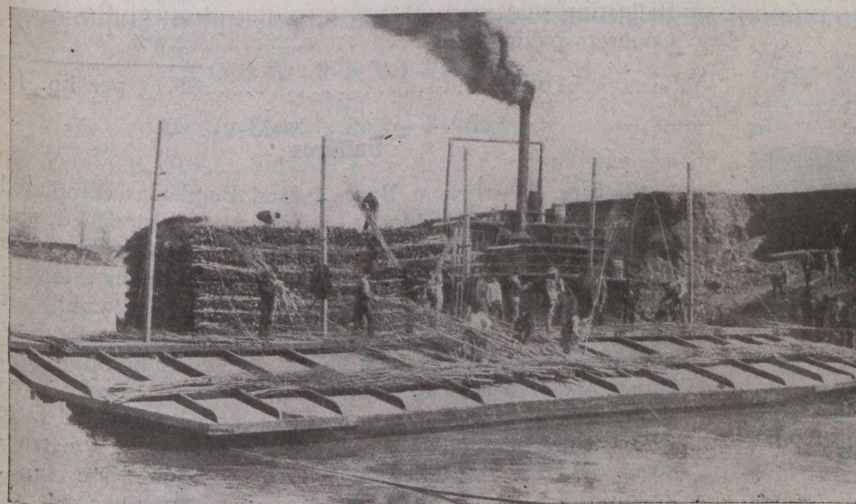


Fig. 3—Header for Willow Brush Mattress; Starting Stitch

twisted clips. The blocks are laid as close as possible, longitudinally, with no ties between. On account of the weight of the blocks, it was necessary to place them in advance of the paving and ballasting of the mattress and well up to the mattress barge and later anchored them to the paving.

In this way they also serve as the lower forming for the concrete slab. (Fig. 4.)

The mattress is then ballasted with one-man stone of sufficient quantity to cause it to be in good contact with and take the shape of the river bed, and to allow the mixing plant to come near the toe of slope.

Paving

After the bank is graded, and mattress woven and ballasted in place, the slope is prepared for the concrete paving. It is divided into panels 8 feet wide, from top of bank to water surface, by placing a forming of 1-in. x 4-in. plank on edge, held in place by small wooden pegs, the inside pegs being removed as the aggregate is placed; the panel is then divided into 8-foot sections by placing ordinary plastering laths across the panel, or longitudinally with the bank under the mattress and block anchor strands; this forming makes the joints of the slabs. At the foot of the paving additional short pieces of $\frac{3}{8}$ -inch strand are so placed as to provide the required number of fastenings for the 2-foot blocks. The reinforcing wire mesh is then laid in place by unrolling the bundle from top to bottom of slope and held in place by pegs (which are removed as the aggregate is placed), two widths to the panel, each overlapping about 3 inches along the middle line and cut off at the bottom to the required length.

The concrete mixer and delivery plant were installed on a barge, 30 ft. x 80 ft. x 4 ft. (mattress barge). The mixer was a standard make on skids; the delivery plant or cableway, consisted of a regulation 3-drum hoisting machine and stiff-leg braced mast, with top sheave for the hoisting cable carrying the mortar bucket. For convenience in moving and to procure the proper land height the carrying end of the cable was passed over a wooden

horse about 8 feet high. The mast and mixer were so placed that the bucket could easily pass to and from the discharge spout.

After the bucket was filled it was raised to proper height and travelled ashore by gravity; a reverse operation returned the bucket to the mixer. A movable stop block on the cable, held by dogs, marked the place desired, and a trip on the running sheave of the bucket coming in contact with the block automatically deposited the aggregate of the slope. (Fig. 5.) The method of depositing the aggregate as described above was later changed to the use of governing cables connected to the bail of the bucket, with a trip, worked by hand, to tilt the bucket. After experimenting for cable anchorage the following was evolved and proved very satisfactory: The carrying cable, after passing over the horse, was connected with a sheave and shackle so as to run in the bight of a double cable, about 350 feet long, running parallel to the bank and anchored to deadmen at each end. Two of these cables were provided, and when placed, were laid with the ends overlapping about 50 feet, so that the arrangement carrying the sheave could be run from the end of one cable direct to the other

without delaying the work. The cable behind would then be carried forward and placed ahead of the one in use and so on continuously. These cables were found to carry the strain without danger and were especially advantageous for allowing ready movement forward or backward from one slab to the next. The deposit of the aggregate on the slope began at the top, which always gave a downward movement of the material. No attempt was made to give a finished surface other than that produced by a 2-in. x 4-in. scantling in evening up the aggregate to the required thickness after the necessary spade spreading. Before the final set occurs the top of the longitudinal joint is made, by a roller cutter, through the concrete down to the top of the lath (the lath being left in place).

The slope is paved in alternate panels; that is, if the panels should be numbered 1, 2, 3, 4, 5, 6, 7, etc., panels



Fig. 4—Placing Concrete Blocks

1, 3, 5, 7, etc., would be completed and after sufficient set of the odd numbered panels the forms are removed and placed ahead for a new section, leaving the finished panels to become the forming of the unfinished even numbered panels. The mixing plant is then moved back and panels