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A STUDY OF MOVABLE CREST SLUICE GATE DEVICE ON THE BASIS OF SHAPE AND SIZE

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ABSTRACT

Sluice gates are typically installed in open channels such as streams to determine discharge (flow rate) and to divert flow; the basic principle is that discharge is directly related to the water depth. ***.*** *Sluice gates are extensively used in hydraulic structures to control the flow depth and discharge. In this paper ,I have study of movable crest sluice gate on the basis shape and size.*

Key words:-Q, g, y, a, L, Cd, Cc,K$_{1,}$

I INTRODUCTION

The study consists of two parts. In first part various types of gates used in hydraulic structures are described in detail. In second part the sluice gates used in canals or rivers are described with reference to their alignment about channel axis.

II SLUICE GATE BASED ON SHAPE/SIZE

Based on shape/size sluice gates are classified into:

1. Flashboards, Stop Logs, And Needles
2. Tainter Gates
3. Hinged-Leaf Gates
4. Vertical-Lift Gates
5. Bear-Trap Gates
6. Rolling Gates
7. Drum Gates
8. Rodney Hunt flush-bottom closure sluice gate
9. Self-contained sluice gate
10. An inverted gate

III OVERVIEW OF MOVABLE-CREST SLUICE GATE DEVICE

Flashboards, stop logs, and needles are the simplest and probably the oldest types of movable-crest devices. Where the size and type of installation is such that they can be readily handled by the operating force available, they are efficient and economical. However, where the installation is large or where frequent freshets require continual manipulation, the operation becomes laborious and hazardous. They may be often adopted with considerable saving in cost for portions of the spillway that will be in use only during the most extreme floods. One example of this use at the Wyman Dam on the Penobscot River in Maine. New England is replete with ingenious adoptions of both flashboards and stop logs.

Flashboards: *Pin Supported*. The most customary type of flashboard is that supported on edge by vertical pins set in pipe sockets along the crest of the dam. This form is usually limited to a maximum height of about 3 ft, the length of the board being reduced as the height increases, so that the weight of a panel is not excessive for handling. Usually the ends of the boards overlap at each alternate pin, every other panel of single-thickness boards being reversed so that the cleats will bear against the intermediate pins. Double-thickness boards are built with an offset at each end so that adjacent panels will have a single-thickness overlap of several inches.

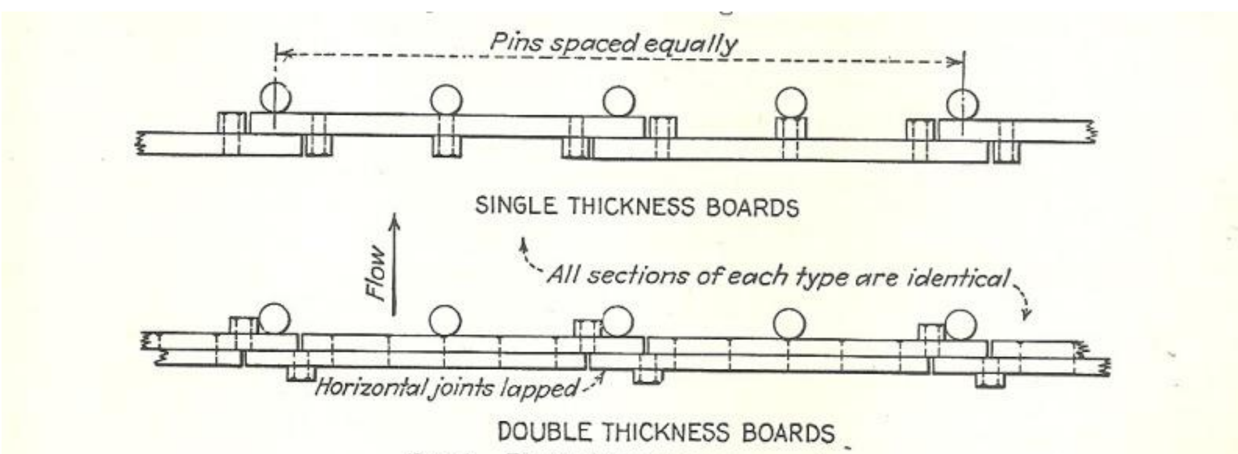

Fig. 2.1: Pin flash board arrangements.

Braced: When a flashboard is so high that pin supports alone are not feasible, or when a ready means of tripping is desired, the pins or stanchion member may be arranged so the whole support, or horse, will overturn when the headwater reaches a predetermined level, or the braces may be tripped by a cable extending the length of the dam and passing through holes near the foot of each brace. The cable can be pulled at an angle from the bank downstream, or with buttons attached, it can be pulled lengthwise to trip the braces individually.

Hinged: Hinged flashboards have the advantages that they are not lost when tripped, and, with the proper facilities, they can be raised against considerable head. They may be built simply or as elaborately as the head or prevention of leakages may require. Figure 2 shows a board of this type, which may be considerably varied in design to meet local conditions. One end of each panel should be left rough and with a slight overlap when constructed, so it can be sawed to match the finished end of the adjacent panel at the time of erection.

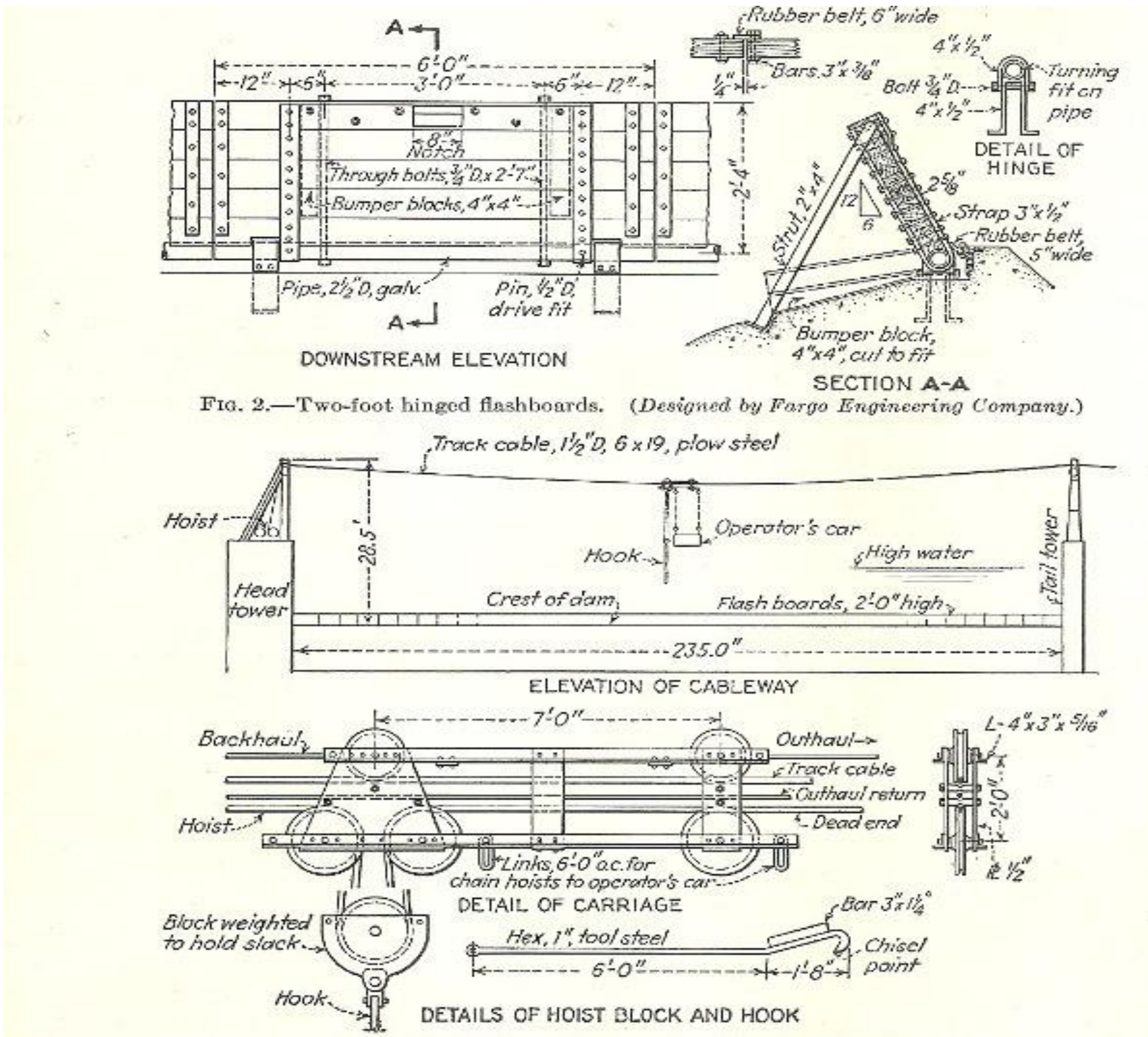

Fig. 1: Cableway for operating hinged flashboards.

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Stop Logs: The customary stop logs are dimension timbers spanning horizontally between vertical grooves in adjacent piers. They are built up one on another, a vertical bulkhead being formed from the crest of the spillway to the headwater level. They may vary in size from short lengths, which can be handled by one man, to sizes limited only by the span and the capacity of a power winch to raise them. A means of handling is provided by cutting a longitudinal slot vertically through the timber near each end. A bolt is then passed transversely through this slot on the horizontal center line of the timber. A pike pole having a special hook with a line attached is lowered down the groove in the pier until the hook enters the slot and engages the bolt, after which the line may be hoisted by hand or by a power winch:

Since the logs must be handled through overflowing water, it is imperative that the grooves in the piers be made amply deep to protect the hoisting device from the current during the fishing operation. This depth is usually deeper than the allowable bearing stress of the timber requires and, for any considerable depth of overflow).

Stanchion Type: Where a portion of the spillway is used infrequently, during excessive floods, the stanchion type of stop log is economical and is easily operated. As shown in Fig. 4, the opening between piers is divided into several short bays by vertical beams which are hinged to the runway at the top and seated in the spillway crest at the bottom. These bays are closed by small stop logs. By jacking up the beams slightly, they are unseated at the bottom and swing free; this action releases the stop logs.

Needles: Needles are set on end side by side to close an opening. They are supported at the top by a runway, from which they are handled, and are supported at the bottom by a ledge on the sill or spillway crest. They are usually made of dimension timbers. The most outstanding example of their use is at the Bonnet Carre spillway on the Mississippi above New Orleans.

Needles are somewhat difficult to place in swift water of considerable depth. Hence, their use is largely confined to emergency spillways where they are seldom raised and where they can readily be replaced after flood waters have receded. For emergency bulkhead construction in still water, needles are preferable to stop logs for the reason that they sink readily and can be staunched as placed. On the other hand, it is difficult to hold stop logs down and force them into proper sealing contact without differential head. After the entire bulkhead has been placed and a differential head established, the frictional resistance may become so great that the logs cannot be forced into position to close the leaks between them.

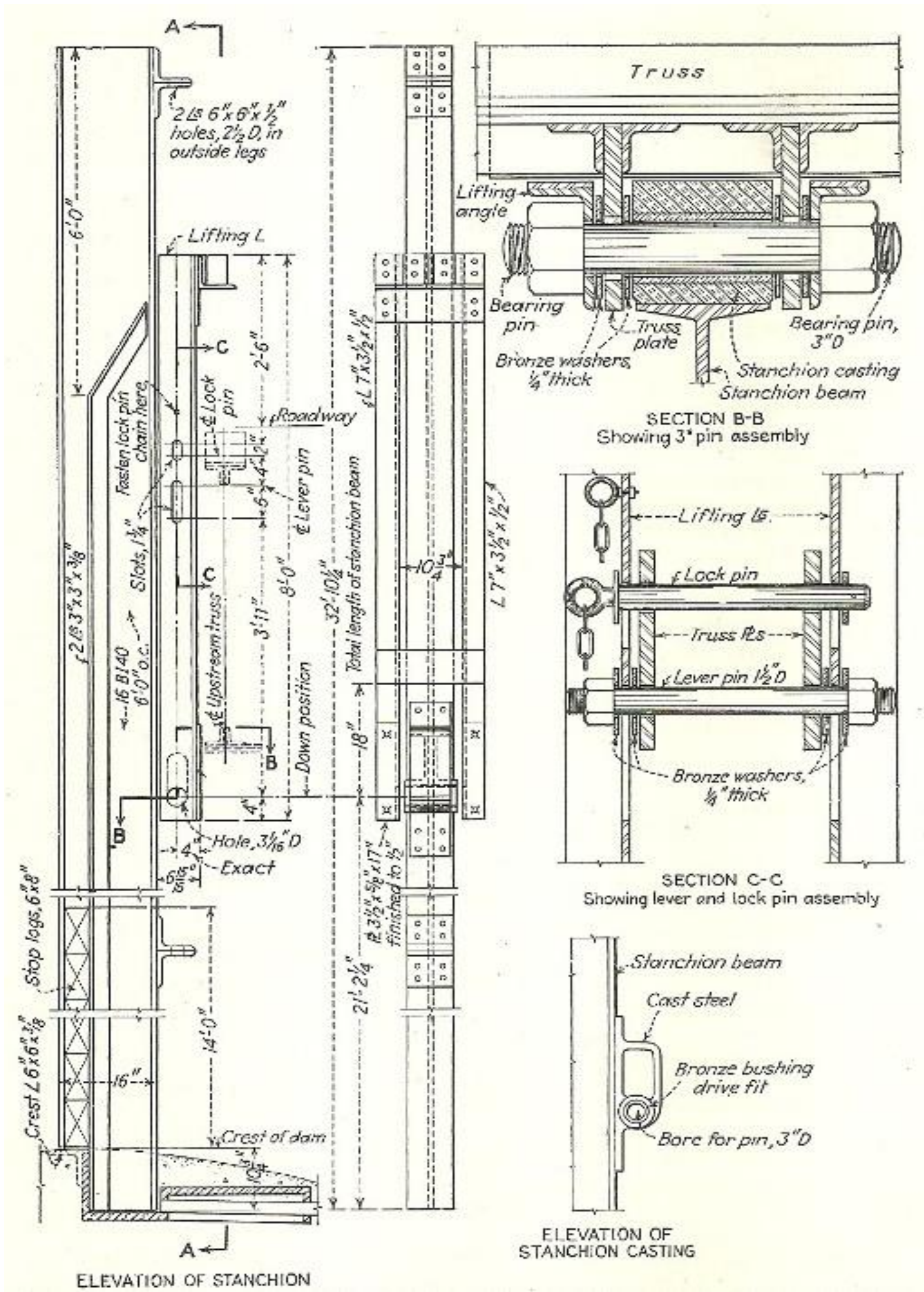

Fig. 2: Stanction sections, Highfalls Dam

IV CONCLUDING REMARKS

The above review of literature reveals the following significant facts:

Lot of works has been carried out by various investigators on normal and side sluice gates and suitable relationships for discharge coefficient C_d have been presented by them in literature for estimating flow rate in open channels.

Other non conventional shapes of sluice gates were also tried by few investigators for special uses.

It is found that scanty almost no work has been presented by any investigator on skew sluice gates. Thus need was felt to carry out detail study of skew sluice gates and to develop empirical relationship for discharge coefficient as well as flow rate in terms of flow and geometrical parameters of sluice gates.

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