

The upper tumbler is cast in one piece, without flanges and fitted to the shaft and secured by two keys. The faces of the body of the tumbler are steel plated all round. The plates are planed to fit truly and are put on with countersunk rivets of the best tough iron. The sides of the hexagon are  $\frac{1}{4}$  inch smaller than those enclosed by the links of the bucket chain when folded round it. The lower tumbler has a cast iron body, flanges, and gudgeons, and is protected on the sides with  $\frac{3}{4}$  inch steel plates bedded on dried oak packing  $\frac{3}{4}$  inch thick and rivetted to the body. The bearing surfaces of the gudgeons are chilled.

The lower end of the bucket frame is supported with two sets of wire rope tackle. The rope is made of steel wire and  $\frac{5}{8}$  inch in diameter. The sheaves of the blocks are 20 inches in diameter. The upper blocks are secured to the cross bridge of the A frame by four  $1\frac{3}{4}$  inch bolts to each block. The standing part of the rope is attached to the bridge with a screw so as to have an adjustment of 6 inches in length. The chain for connecting the lower blocks to the buckets is made of  $1\frac{3}{4}$  inch iron.

A steam winch with two cylinders 8 inches in diameter by 10 inches stroke is secured to the deck for lifting the bucket frame and working the bow chain of the dredge. The gearing is so arranged that the wire rope barrel for the bucket frame, or the bow chain sheave may be worked, either separately or together, by means of loose pinions and suitable clutches on the second counter shaft.

Steam winches with double cylinders 7 inches in diameter by 8 inches stroke, are placed, one at the bow and the other at the stern on deck for breasting or working the dredge athwartwise. A small steam winch with two cylinders of 5 inches diameter by 7 inches stroke is placed near the chute for handling the scows and for general use.

Wrought iron steam pipes are brought from the main boilers to all the winches.

Three of the breasting chains lead over the gunwale on cast iron sheaves 14 inch diameter to bottom of grooves and hung with wide checked blocks on ball and socket joints so as to freely accommodate themselves to the lead of the chain. Each block is provided with a spring pawl set between the cheeks and so arranged as to prevent the chain running out in case of its breaking inboard, and also to let go easily when required. The after chain on the same side as the chute is led out through a small well opening just inside the bilge fitted with a hawse pipe, the mouth being chilled and formed so as to offer little resistance to the chain and also so as to be easily renewable by a diver.

The chute for carrying off the dredgings is 4 ft. 8 inches in width and 2 feet deep inside, with a moveable cover over part of it. The shell or body is of  $\frac{3}{8}$  inch boiler plate strengthened with 3 by 3 inch angle iron transverse ribs, inside the main framing and of  $\frac{1}{4}$  inch plate with similar ribs in the remaining portion to the gunwale. The bottom, outside the frame, is lined with extra plating  $\frac{3}{8}$  inch thick and well rivetted to the outer shell. Within the frame and under the buckets the whole inside is lined with longitudinal bars  $1\frac{1}{2}$  inch thick, laid close together and rivetted to the shell. The head end is of  $\frac{3}{8}$  inch plate and it has a cast iron flange with a four inch opening rivetted into it

near the bottom, for the admission of a water jet nozzle.

The cover is made of  $\frac{1}{2}$  inch plate strengthened with 3 by 3 inches angle iron ribs at its ends, and it is bolted to the under part of the shoot by angle iron flanges on both.

The outer section of the chute beyond the gunwale is made of  $\frac{1}{4}$  inch plate strengthened by 3 inches by  $\frac{5}{8}$  inch bars at the edges and outer end and with a 3 by 3 inch angle iron at the upper end and the bottom is lined with  $\frac{1}{4}$  plate.

The outer end of the lower section is carried by a suitable bale,  $1\frac{1}{2}$  chain, davit and counter weight, and the whole so arranged that it may be set and held at any inclination below the level when at work or may be folded in board over the other part.

The chute within the main frame is bedded its full on a blocking of pine timber built up nearly solid from the deck to the chute so as to afford weight of mass as well as strength.

A neat wrought iron derrick crane is provided for lifting the buckets off and on the frame, for lifting parts about the lower tumbler and other uses. The crane is adjustable from fifteen feet to four feet radius, and is supported from its own mast through the deck. It can wind up 25 feet of chain on its own barrel without riding, it is adapted to carry 2 tons and is provided with friction brakes capable of lowering the same.

### GENERAL SPECIFICATIONS FOR ORDINARY IRON HIGHWAY BRIDGES.

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(Concluded from page 231.)

*Sizes of Stay Plates.*—The dimensions of stay plates in struts where latticing or double rivetted lacing is employed, are not to be less than those given in the following table of the distances between the inner faces if the channels be more than the depth of the latter and less than one and a quarter times the same, either the thickness of the stay plates must be increased one sixteenth of an inch above that given in the table, or the width must be increased sufficiently to allow space for one more rivet at each side; or if the distance between the faces be between one and a quarter and one and a half times the depth of the channels, both of these changes in the thickness and width must be made;

Depth of channels.	Thickness of Stay Plates.	Width of Stay Plate.	No. of Rivets on a side.
4 inch.	$\frac{1}{2}$ inch.	4 inch.	2
5 "	$\frac{3}{4}$ "	4 "	2
6 "	" "	4 "	2
7 "	$\frac{1}{2}$ "	4 "	2
8 "	$\frac{1}{2}$ "	4 "	2
9 "	$\frac{1}{2}$ "	6 $\frac{1}{2}$ "	3
10 "	$\frac{1}{2}$ "	6 $\frac{1}{2}$ "	3
12 "	$\frac{1}{2}$ "	6 $\frac{1}{2}$ "	3