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SECRET

NOTES

ON

FLOATING BRIDGE

EQUIPMENT

JANUARY 1944

F O R E W O R D.

The following notes are issued for guidance in assembly and erection of floating bridge equipment which forms part of the D.Tn. Scheme. No attempt has been made to deal with other specially designed equipment used in this Scheme.

For information on pier head units etc., reference should be made to the War Office publication "NOTES ON PIER HEAD ASSEMBLIES".

The site plans shown on Sketches 1 and 2 are typical only and the physical features depicted and purely imaginary.

Generally the methods of erection and operation are based on experience gained with prototype equipment which has been erected on a moderately exposed coast for close on twelve months. No artificial protection has been provided for the prototype which from time to time has experienced severe lee-shore conditions without any signs of distress. The design and development has been carried out under the direction of D.Ports & I.W.T. branch, War Office. The prototype has shown the necessity and effectiveness of the somewhat unusual mooring principle, particularly in the case of telescopic spans. The equipment includes some minor features which at the time of press remain untried so that there does remain the possibility of some small modifications in the standard method of erection.

With regard to availability of the equipment, large scale mass production has been in operation for some considerable time and first bulk deliveries have already been received. Copies of Engineer production drawings can be obtained from Tn.5(D) Branch, War Office.

for Lt.Col.R.E., A.D.Tn.5(D).

NOTES ON FLOATING BRIDGE EQUIPMENT.

JANUARY. 1944.

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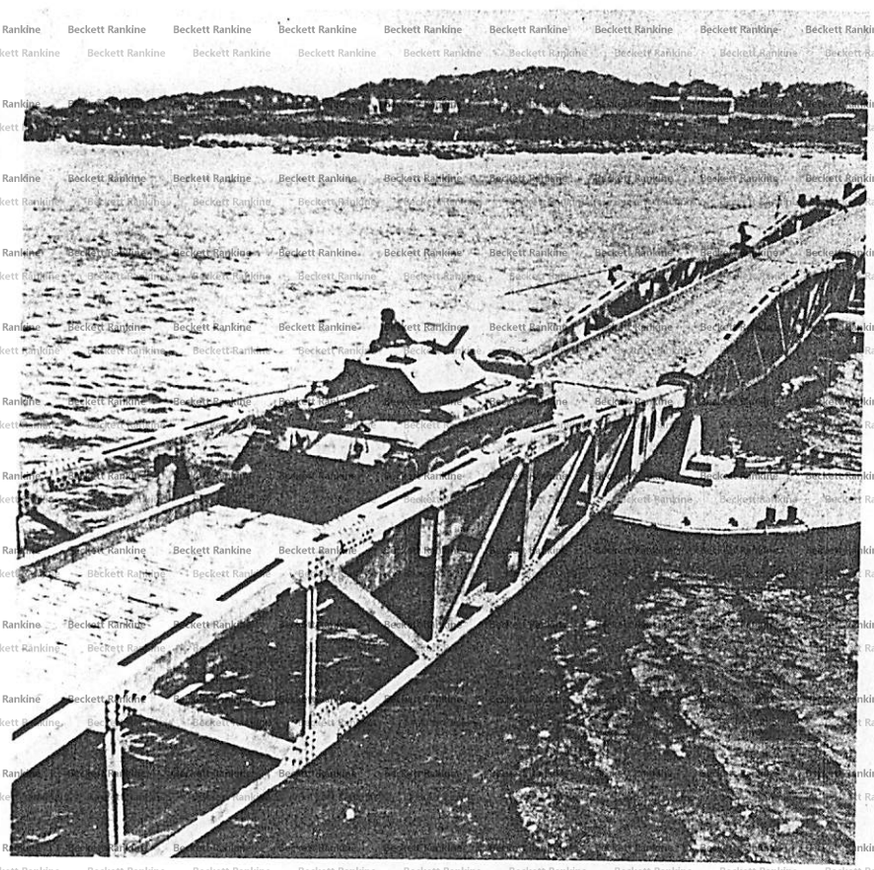
PLATE A



A CRUISER TANK CROSSING FLOATING BRIDGE AT 40 M.P.H.

NOTE: CORRECTLY TENSIONED MOORINGS MAKE THESE SPEEDS POSSIBLE.

NOTES ON FLOATING BRIDGE EQUIPMENT

FEBUARY 1944

CHAPTER I

Section I General Discription

1. This flexible sea bridging equipment has been designed primarily for use in conjunction with spud pontoon peir head qquipment, and to provide a rapidly established means of unloading vessels on newly captured or hostile beaches.

2. The spud pontoons are used in various combinations to form a peir head and the connecting road to the beach is made, using floating bridge equipment. For description of spud pontoons reference should be made to "Notes on P.Head Ass"

3. The floating bridge is a semi-rigid structure and consists of a series of 80ft spans connected end to end and supported at each joint by a bridge float. The bridge spans include a steel deck, giving a heavy duty road 10ft wide, and of any desired length. Due to the special construction of bridge spans, bearings and method of mooring the bridge peir behaves like a long flexible chain that yields to the movement of the sea. It is usable without protection in all but the roughest weather. The bridge floats are designed to give the minimum disturbance to bridge spans in bad weather, and their shape allows towing in any direction.

A typical length of bridge is shown on sketch 3.

The limiting feature to use in rough weather is the alongside berthing of vessels at peirhead, and some form of protection is advisable, if unloading is to proceed under all conditions. This protection may of course be natural or artificial as the site allows.

4. The range includes two types of equipment, Mk.I suitable for tank loading up to 25 tons, and Mk.II, suitable for 40 ton tanks.

In each case the minimum spacing under maximum load conditions is 80 ft. Much of the equipment for the two ranges is identical, the centres of bridge girders being 13'9" in each case. Complete details of all components for both ranges of equipment are given on Sheets 52 to 121 . In use, erection and general principle, Mk.I & Mk.II equipment are similar.

5. The limitations to use of this equipment, due to beach conditions etc, are few. There are no serious limitations as regards flatness of the beach, tidal range, length of pier, sea bed conditions etc. The bridge pier is, in all cases established at high water, so that at low tide a considerable portion of its length will be grounded. Although special provision is made for grounding on fairly flat rock, it will not be satisfactory to site the equipment on precipitous and irregular rock. Grounding on sand, gravel, shingle and hard or soft mud, presents no difficulties.

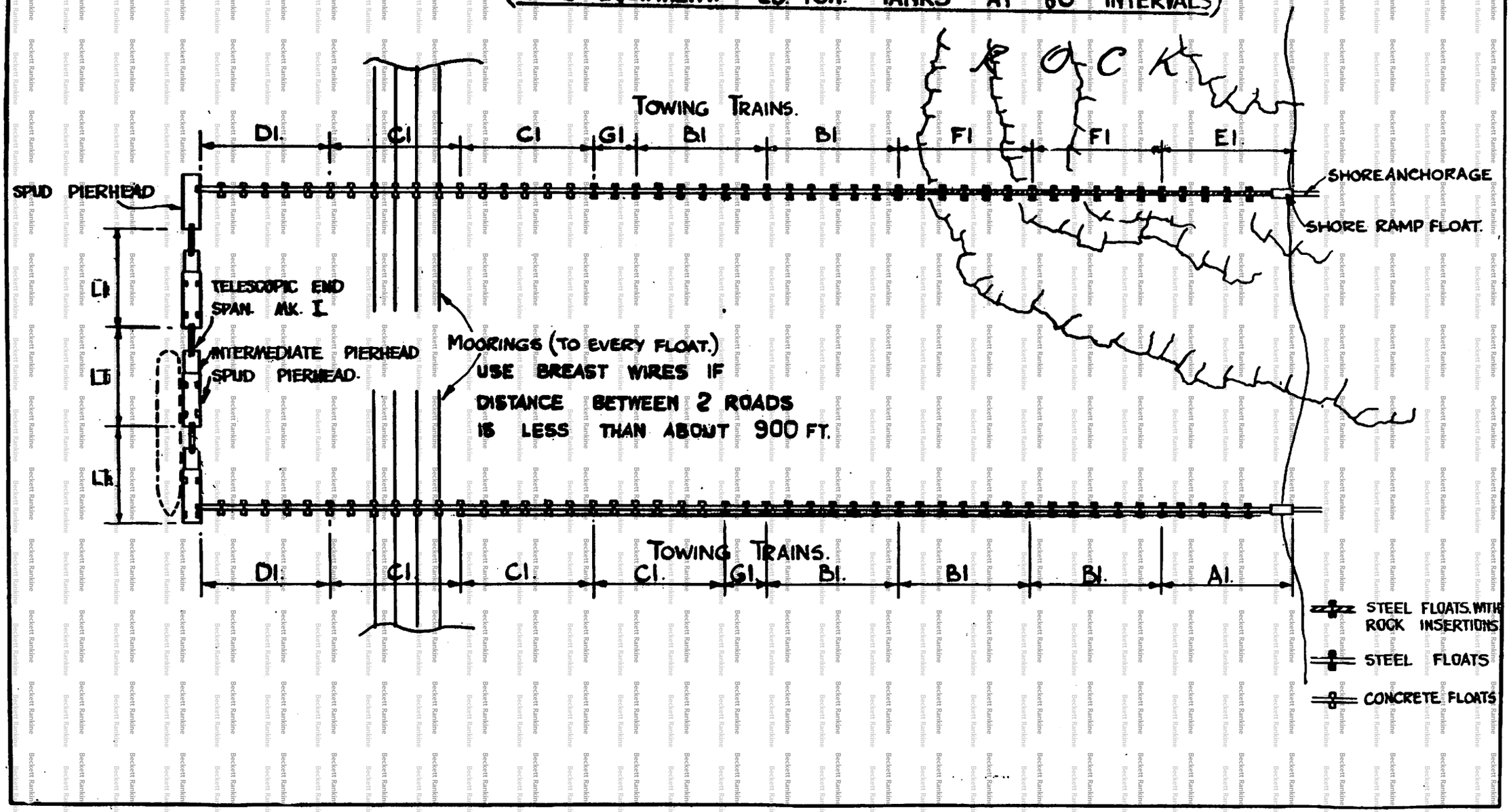
6. Should the beach terminate in a sea wall of reasonable height, this can be overcome without loss of time, using Bailey bridging as described in Chapt. III Section 18.

7. The equipment includes special features i.e. telescopic spans (Sketch 12) and shore ramp floats (Sketch 6), which allow a simple solution to the water gap problem. The telescopic spans allow the bridge pier to be increased in length at any time and without the interruption of traffic. The shore ramp float is of light construction, and with a very shallow draught. It allows the shore end of the bridge to be beached in a 6" depth of water. Should, subsequent to the erection, the depth of water at the shore end become greater than 6", the bridge can be quickly stretched out, and the shore ramp float berthed in its minimum draught. This operation need not involve the interruption of traffic. Thus the equipment provides a first class dry road ashore under all conditions. Sketch 6 shows the shore end of the bridge.

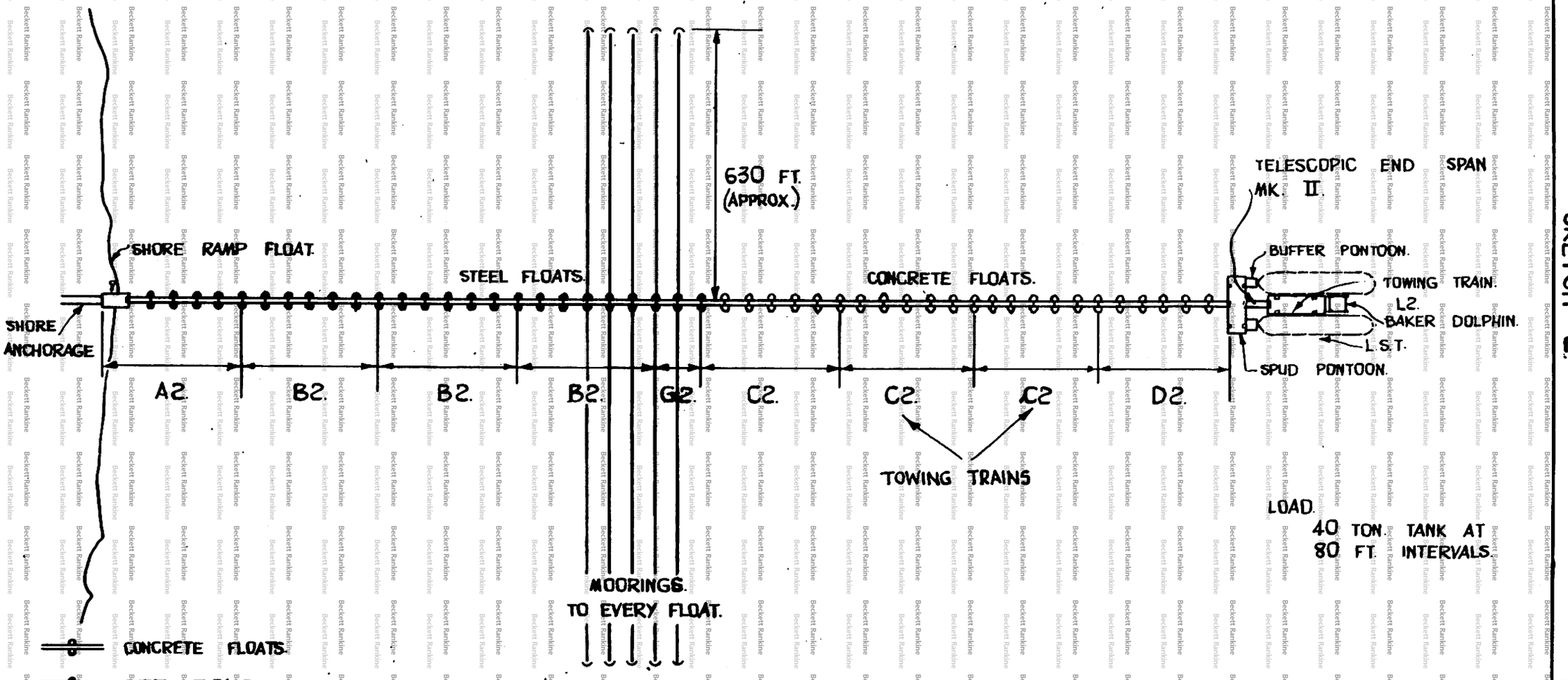
8. The method of erection involves towing long lengths of the bridge (about 500 ft) and quickly mooring in position. The time for coupling bridge lengths has been found to occupy less than 15 minutes, so that erection times depend entirely on the skill of tugmasters and mooring parties. With trained personnel, erection at the rate of 500 ft per hour, should be easily possible. Sketch 7 shows the method of coupling bridge lengths, using erection tank and trumpets.

TYPICAL LAYOUT FOR GENERAL SERVICE PIER.

(MK. I. EQUIPMENT. - 25. TON. TANKS AT 80' INTERVALS)



SKETCH 1.



TYPICAL ARRANGEMENT OF L.S.T. PIER. (MARK II EQUIPMENT.)

9. Methods of replacement of damaged bridge lengths can be as rapid as erection, so that effects due to enemy action should not be serious, or cause the bridge to be long out of use, provided an adequate supply of spare equipment is at hand.

10. If required, floating bridge equipment can be transported to any part of the world by sea, road, rail or canal. Under such conditions, it will of course, be necessary to use steel floats throughout, as these are constructed in suitably sized sections.

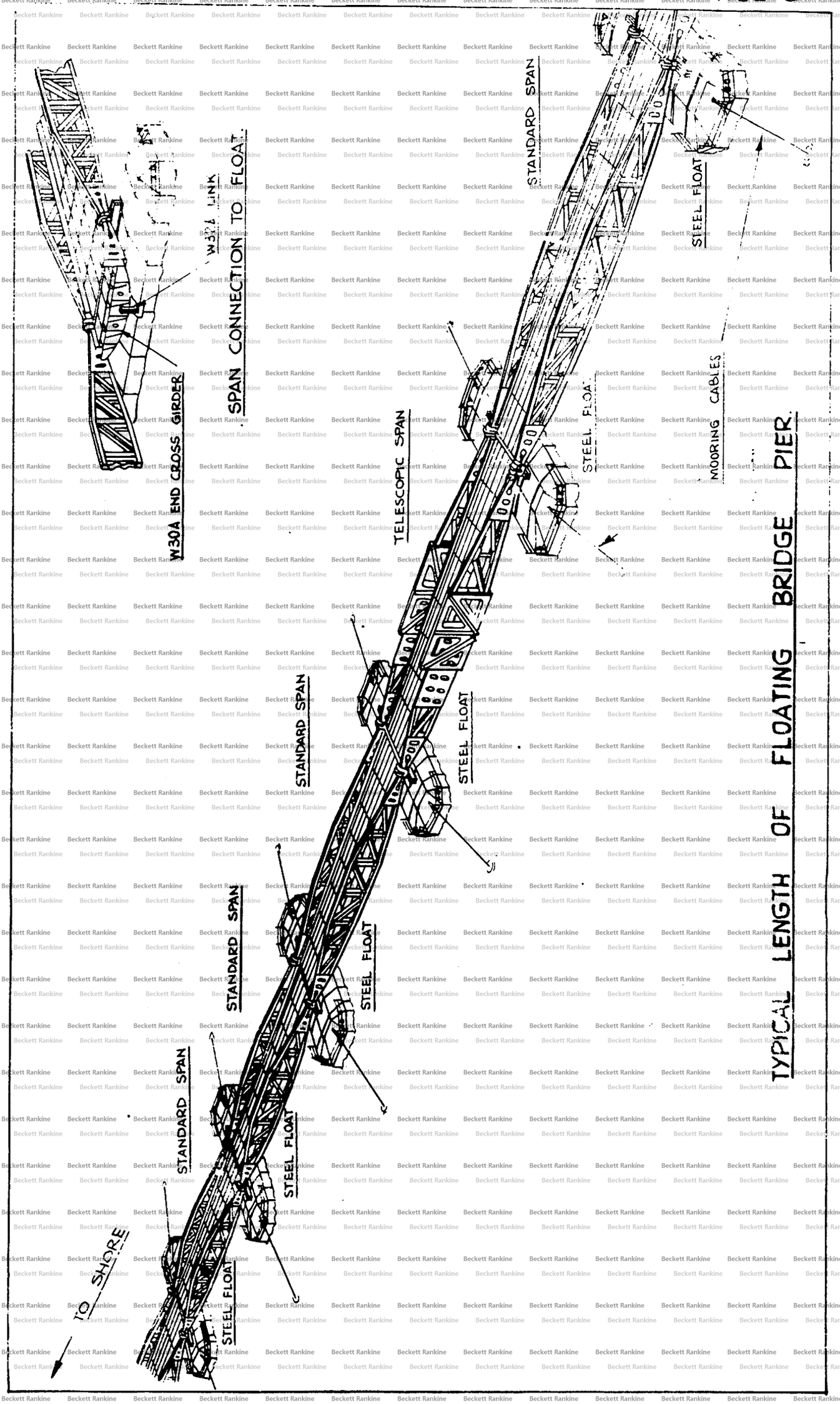
SECTION 2 General Application

1. Used in conjunction with spud pontoon pierhead units, M.T.Piers and L.S.T. Piers can be formed similar to those shown on Sketches 1 & 2 respectively. The M.T.Pier is used only for alongside unloading of cargo vessels or M.T.Ships, so that a long pierhead is required. Since wheeled vehicles only are expected to use this pier, and the probable maximum load is the 10 ton lorry, Mk.I equipment is suitable. The L.S.T. pier is suitable for rapid berthing & discharge of L.S.T.Carrying Tanks. Since the maximum weight of tank carried by L.S.T. is 40 tons, Mk.II equipment must be used for the bridge pier.

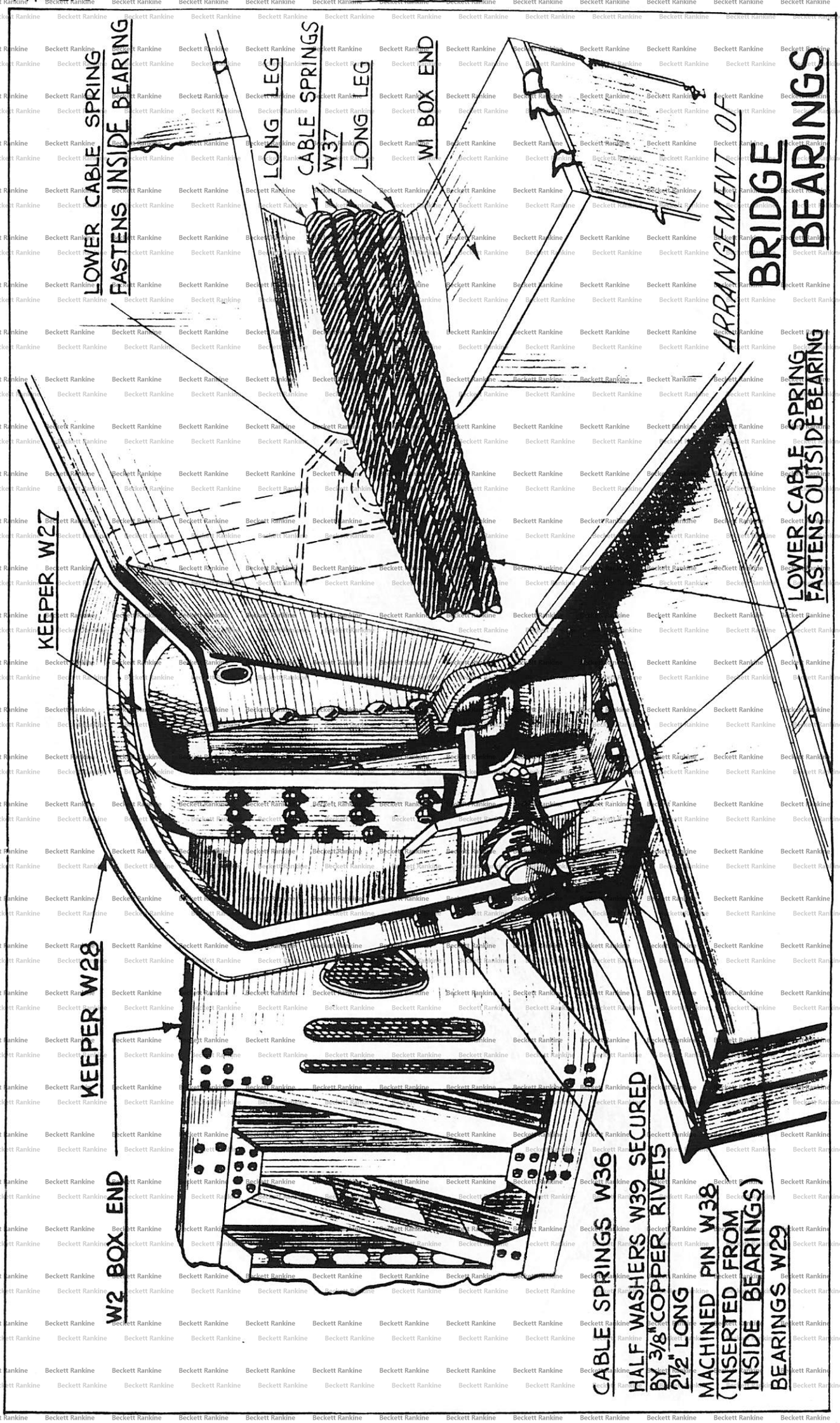
2. To give sufficient length for the M.T.pier head(see Sketch 1) it is necessary to use a series of spud pontoons, spaced at intervals. Between the spud pontoons, are sited the intermediate concrete pontoons, and the remaining gaps are bridged by telescopic END.spans seated on pivot plates. Each intermediate pontoon is securely attached to the adjacent spud pontoon which is effective in keeping it moored in position. Any misalignment or irregularity in spacing is allowed in the connecting telescopic end spans. The components for this span are similar to those of the telescopic span used in the bridge pier, but are differently arranged(see Sketch 13).

3. The bridge piers connecting the M.T.Pierhead with the shore, are arranged to allow continuous traffic on and off. Three roads are provided so that should one be put out of operation by enemy action, the continuous run of traffic will not be interrupted while this road is being repaired. The provision of three roads also gives a better flow to the pierhead and allows for the slower speed of loaded lorries. The system of mooring the bridge piers, however, becomes less simple as more are introduced. In erection it will be necessary to work outwards from the centre,and repair or replacement of centre piers will obviously be more difficult than in the case of a single road. Access by water to the inside roads can be provided by removal of one of the telescopic end spans, in the pierhead. This can be quickly carried out, using 4 erection tanks which lift the pivot plates in addition to the span. Where roads are sited close together, the method of mooring will be with breast wires, and care must be exercised in erection that when mooring the second or third road, the floats do not ground on temporary anchors laid out for the first road. Thus it will be seen that where possible in erection, it is advantageous to position and moor the three roads simultaneously. Connection of the bridge piers and pierhead units is made by means of a pivot plate, which allows an out of square angle of the bridge up to 6° each side of the mean. Sketch 5 shows the pivot plate connection to pierhead. It should be noted that the floating bridge pier should be sited in a straight line. Although in practice, the pier can be strained round to a curve of very large radius, this can only be done with a 50% loss in strength and should always be avoided.

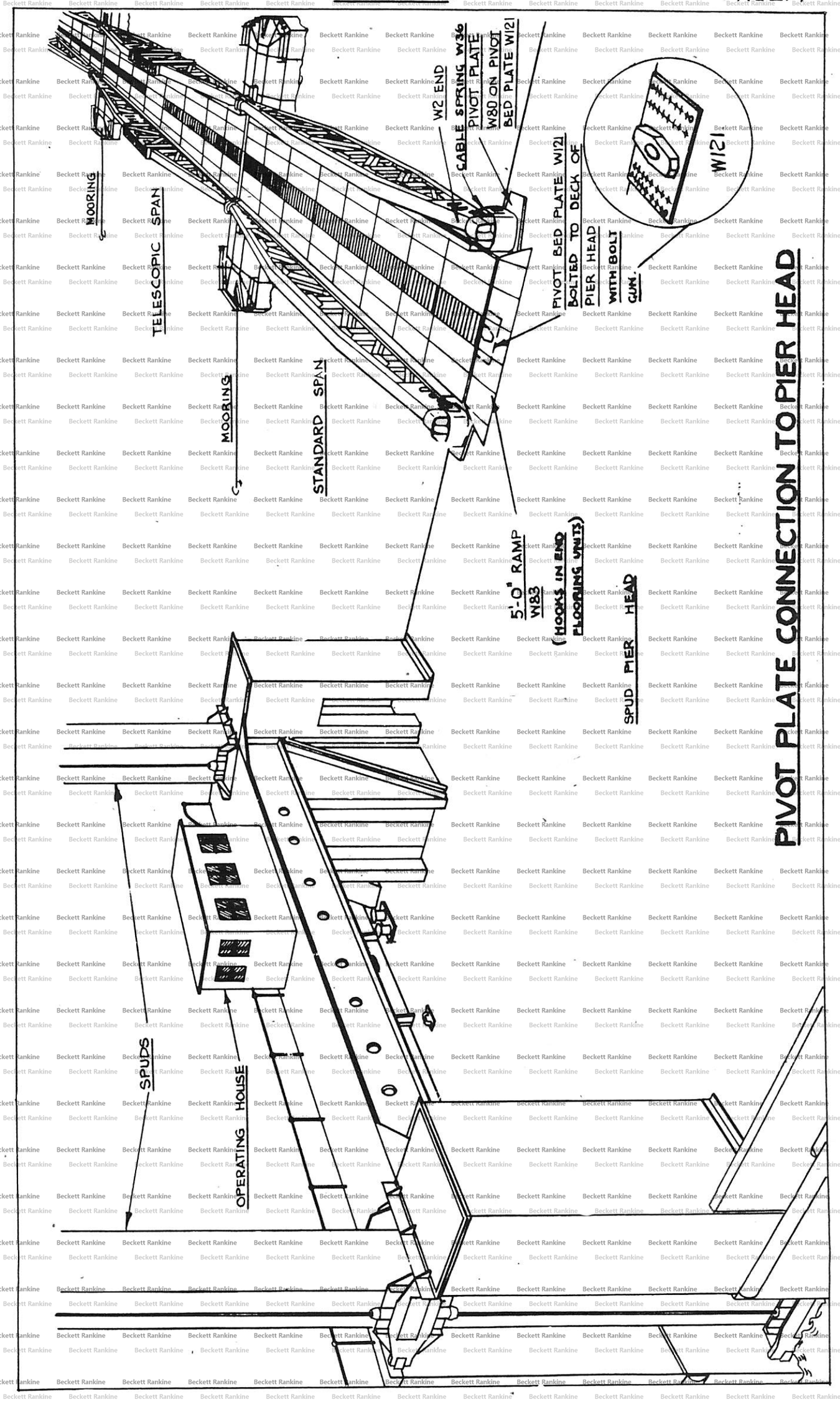
4. The L.S.T.Pierhead is formed using two spud pontoons(Sketch 2) connected by means of a telescopic end span, Mk.II, with pivot plates. Buffer pontoons are connected to the pontoon, forming the head of the T shaped arrangement so that L.S.T's, when berthing, can run the bow of the vessel on to this buffer and make fast alongside the seaward spud pontoon. Thus a quick bring up is possible, also simultaneous discharge from upper and lower deck. Two vessels can be berthed at the same time. A "Baker" dolphin is sited at the seaward end of the pierhead to give additional latteral control to the stern of the vessels. Erection and mooring of the bridge piers, is simple, since only one road is used. Connection at the seaward end is by means of pivot plate, allowing 6° out of squareness each side of the mean. As in the case of M.T.Piers, the floating bridge should be sited straight. Erection should, in all cases, commence from the shore end, and finish by the placing of pierhead units. This allows full unobstructed freedom of movement for tugs etc. and avoids the necessity of using too much of the length adjustment available from telescopic spans, when connecting up to pierhead.


W30A END CROSS GIRDER
W30A LINK
SPAN CONNECTION TO FLOAT
STANDARD SPAN
STEEL FLOAT
TELESCOPIC SPAN
STEEL FLOAT
MOORING CABLES
STANDARD SPAN
STEEL FLOAT
STANDARD SPAN
STEEL FLOAT
STANDARD SPAN
STEEL FLOAT
TO SHORE
TYPICAL LENGTH OF FLOATING BRIDGE PIER.

SKETCH 4


LOWER CABLE SPRING FASTENS INSIDE BEARING
LONG LEG
CABLE SPRINGS W37
LONG LEG
W1 BOX END
ARRANGEMENT OF BRIDGE BEARINGS
KEEPER W27
LOWER CABLE SPRING FASTENS OUTSIDE BEARING
KEEPER W28
W2 BOX END
CABLE SPRINGS W36
HALF WASHERS W39 SECURED BY 3/8" COPPER RIVETS 2 1/2" LONG
MACHINED PIN W38 (INSERTED FROM INSIDE BEARINGS)
BEARINGS W29

SKETCH 5.


W2 END
CABLE SPRING W36
PIVOT PLATE
W80 ON PIVOT
BED PLATE W121
PIVOT BED PLATE W121
BOLTED TO DECK OF
PIER HEAD
WITH BOLT
GUN
W121
MOORING
TELESCOPIC SPAN
MOORING
STANDARD SPAN
5'-0" RAMP
W83
(HOOKS IN END
FLOORING UNIT)
SPUD PIER HEAD
SPUDS
OPERATING HOUSE
PIVOT PLATE CONNECTION TO PIER HEAD

SECTION 3 Description of Units

1. The following 14 primary units are used for the construction and erection of bridge piers. They are assembled at suitably situated depots, from the various components illustrated in sketches 52 to 121. The assembly depots are siuted as near as convenient and within easy towing distance from the final erection site. Subsequent to assembly at the depot, the units are connected up to form towing links, of 4, 5 or 6 spans dependant upon ease of manoeuvre, tug power etc. The standard forms of towing links are shown on sketches 32 to 41.

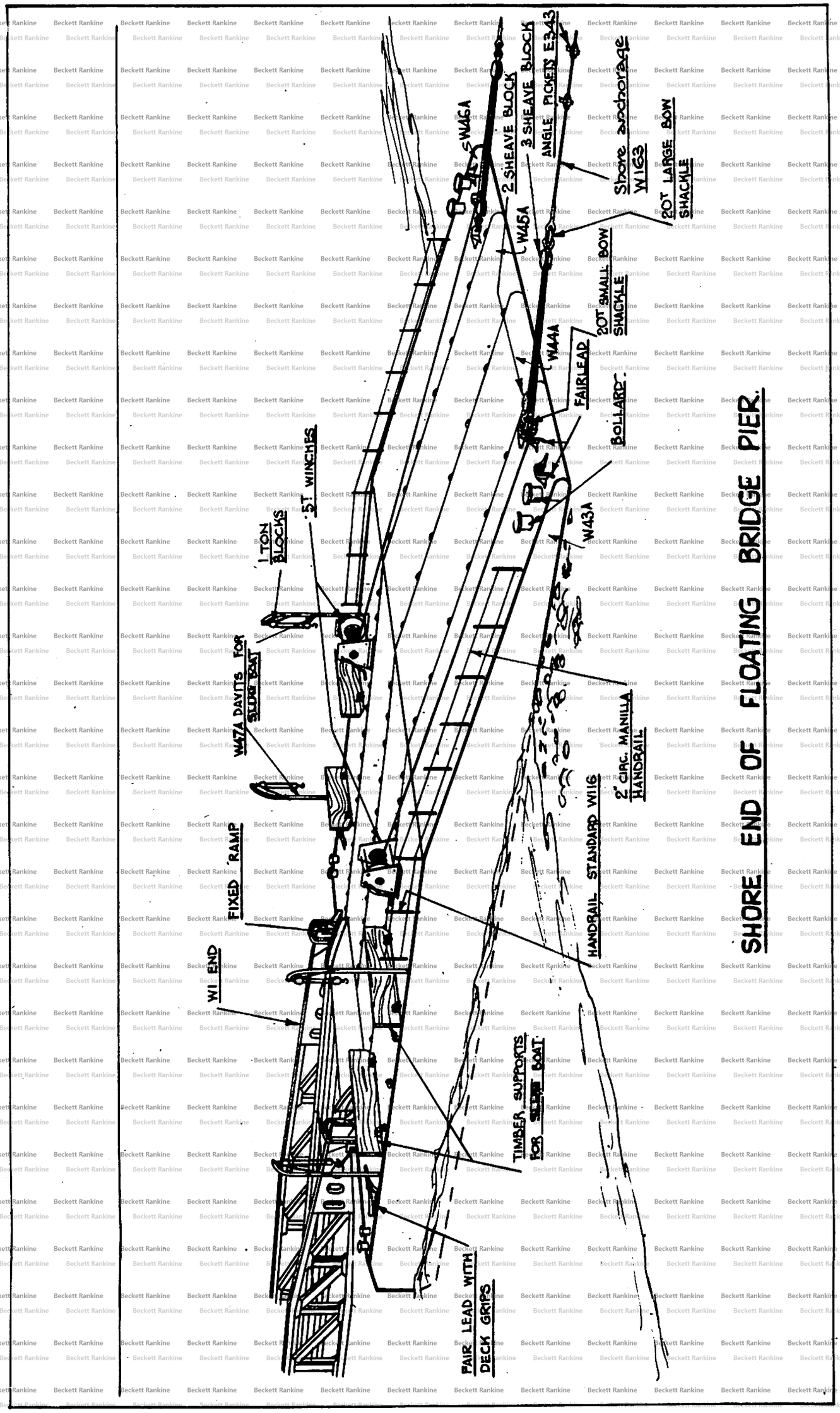
2. Standard Span - This is a half through bridge with lozenge shaped main girders, carrying a steel deck. Sketch 9 shows the general arrangement for the Mk.I standard span, and sketch 10, the general arrangement for the Mk II Standard span. In both cases, the centres of bearings are 80' - 3", the centres of main girders 13'-9", and the width between wheel guides is 10'-0"

3. The main girders terminate at each end in a box end W1 or W2, which incorporates the spherical bearings. For all cases, of standard spans, W2 box ends occur at the seaward end, and W1 boxends towards the shore. The design of the box ends which are common throughout the whole range of the equipment, is such that the W1 boxend of a span seats INSIDE the W2 boxend of the span adjacent but towards the shore. In the same way at the seaward end of the span, the W2 boxend seats on the transon carried by the float and itself carries the W1 boxend of the span adjacent, but to seaward.

4. To prevent the possibility of bearing displacement, the transon carries bearing seatings with keepers and provision for cable spring attachments. Sketch 4 shows the arrangement of bearings and it can be seen that the position of cable springs is such that they pass right through the boxends and connect to the side plates of the bearing seatings. Thus a continuous chain action between spans is ensured. Care should be exercised when fitting cable springs, since these are of two lengths, W36 is to be used with W2 boxends, and W37 (painted red) to be used with W1 boxends. In all cases when positioning cable springs, one end is fastened inside the check plates of the bearing seating and the other end outside, also the leg of the spring with metal label attached marked "LONG LEG" must be positioned OUTSIDE in the sheave in the boxend. All cable springs are prestretched and precision drilled after making up so that it is essential for above precautions to be observed when assembling, otherwise the cables will not seat fairly, and there is a danger of overstressing etc.

5. With regard to span construction all cross girders are pin ended with the exception of the centre cross girder W16. At the W2 end, a special deep cross girder W30A is introduced to which is made a link connection with the float. Flooring units are fully bolted to this cross girder. By this means, float rolling and probable violent contact with the span is avoided.

6. Cross Girders are connected between main girder web verticals, using machined pin W18 washer W78 and 1/4" split pin. All joints in main girders are made using 7/8" dia. black bolts. Flooring connections to cross girders are made, using ferrules W34 in the hole in flooring unit only, black bolts W94 and 3/16" split pins. Centre flooring units only, are wood topped and marked W96. Flooring units are NOT bolted one to another thus the requisite amount of looseness for sea movement is obtained. Care should be exercised to position flooring units W19 & WH19 the right way round. An examination of the deck grips will show that at one end the tansverse grips are omitted. In all cases, this end of the flooring unit should be positioned towards the W1 Box end. This provision allows the dished cover W26 to seat correctly. To the centre cross Girder brackets W15 are fastened, and all connections for this unit are made, using 7/8" black bolts, with spring washers W93, under head, and nut, and Split Pins. NO ROUND WASHERS are used here. Connections for wheel guard units to cross girders, and end flooring panels are made in the samexway.


SHORE END OF FLOATING BRIDGE PIER.
W46A
2 SHEAVE BLOCK
3 SHEAVE BLOCK
ANGLE PICKETS E343
Shore anchorage W163
20T LARGE BOW SHACKLE
20T SMALL BOW SHACKLE
W44A
FAIRLEAD
BOLLARD.
W43A
5T WINCHES
1 TON BLOCKS
W47A DAVITS FOR SLUDGE BOAT
2" CIRC. MANILLA HANDRAIL
HANDRAIL STANDARD W116
FIXED RAMP
W1 END
TIMBER SUPPORTS FOR SLUDGE BOAT
PAIR LEAD WITH DECK GRIPS

7.

The weight of the Mk.I Standard Span complete, is 28 tons and for the Mk. II Standard span, the weight is 30 tons. The differences between the two spans occur in main girder top and bottom chords, subsidiary cross girders and outside flooring units. Units for Mk.II equipment similar and used in the corresponding position to those in Mk.I equipment are given the same numerical marking, but have the additional prefix letter "H" i.e. for flooring units, W19, for Mk.I, and WH19 special and extra for Mk II. The lists of components for these spans are given on Tables I & 2.

8. TELESCOPIC SPAN

This span is generally similar to the standard span with the exception of the centre section. A 9ft range of movement is possible, the bearing centres in the closed position being 71'-3" and in the open position, 80'-3". Sketches 11 & 12 show the Mk.I & Mk II telescopic spans respectively.

9.

Sliding boxes are introduced into the main girdrs with the outer box towards the seawards end and the two centre flooring bays are arranged to slide one on the other. The centre cross girder on tepescopic spans is shorter than for standard spans, it connects direct to outer boxes, and spring washers W93 are used under head and nuts of bolts. Subsidiary cross girders are as for standard spans, except in the case of that connecting the shore end of outer sliding boxes which is shorter in length. The sliding flooring units at shorewards end of the span, are fully bolted to the cross girder, and do not include a ferrule. These particular flooring units are bolted one to the other, since this is the only means of providing resistance to transverse forces.

10.

The sliding bearings are formed of hardwood in the case of Mk.I equipment, and special machined spherical surface castings for Mk.II equipment. If necessary, Mk.II bearin s can be used in Mk.I Spans. In all cases, provision is made for force greasing the bearings using a grease gun. Relief wedges W137 are also provided by the use of which load can be removed from the bearings, which can then be changed if so desired.

11.

The weight of Mk.I telescopic span, complete, is 32 tons, and the Mk.II telescopic span weighs 34 tons. Lists of components for each of these spans are given on Table 3 & 4. The load to open telescopic spans, depends on the greasiness of the bearings, and varies between 10 and 30 tons. Under test conditions on Mk.I equipment, this load was found to be 25 tons, to start movement, and 12 tons to maintain movement. Telescopic spans are never coupled one to another, but always arranged between standard spans.

12. Telescopic END Spans

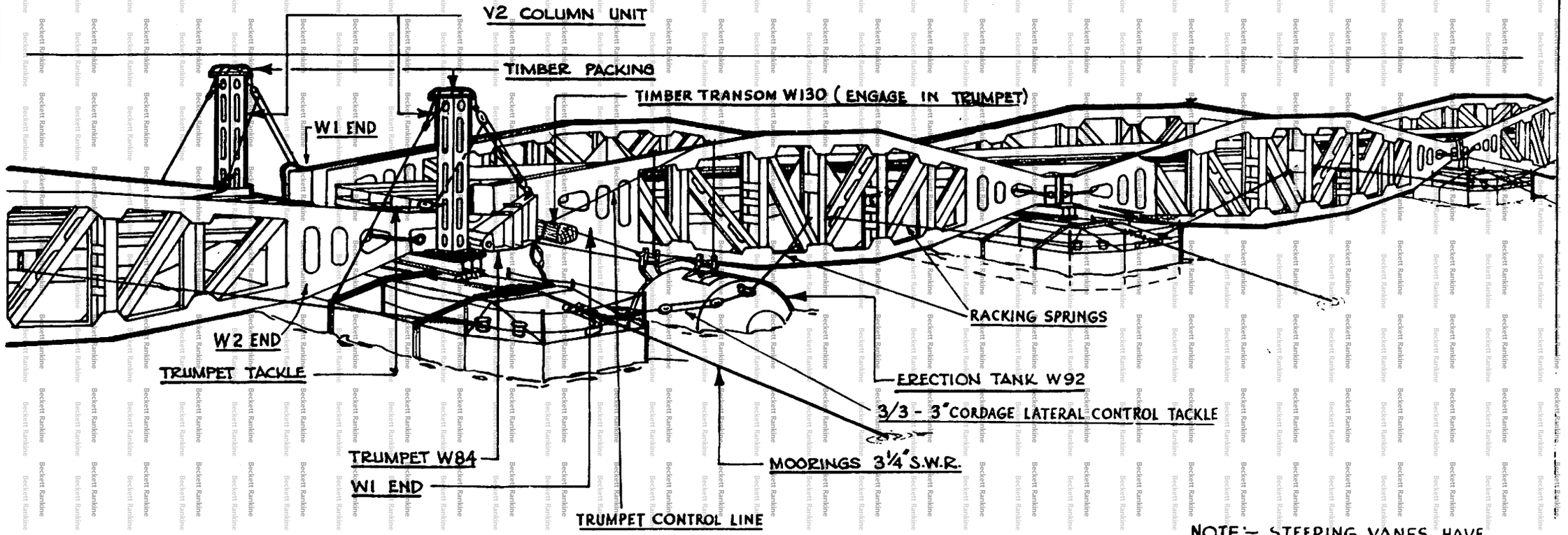
These are similar generally to the telescopic span, except that W2 box ends are used throughout, to allow seating at each end on a pivot plate. These spans are used only for connecting pier head units, and do not occur in the bridge piers. Sketches 13 & 14 show Mk.I and Mk.II telescopic end spans respectively. In these spans, the deep cross girder W30A is replaced by the standard subsidiary cross girder, since no link connection is needed. The weight is as for telescopic spans. Lists of components are given on Tables 5 and 6.

13. Transom Sets

These form the means of connecting bridge spans to floats, and consist of 3 - 15" x 6" R.S.J's, carrying bearing seatings W29. The connection between transoms and bearing seatings is made, using black bolts and spring washers W93, under head and nut. No taper washers are used.

14.

The centre joist W62, includes a central flooring seating and must be arranged to face towards the side of the float, carrying the link connection. This member carries also, the moving leaf W35B, which is located in position by brackets W35C. When bolting these brackets in position, all washers are omitted. Thus the moving leaf W35B is in a position to carry the flooring of the span, at seaward side of the float. Since a movement of W1 box ends is allowed inside the adjacent W2 box ends, a similar movement must be allowed in the flooring connection, and the opening in the flooring is covered, using the dished cover W26.



SKETCH 7.

NOTE:- STEERING VANES HAVE BEEN CUT ADRIFT BEFORE THIS STAGE.

PERSPECTIVE SHOWING METHOD OF CONNECTING SPANS

15. The connection of flooring units is made, using bolts W23, with 2 hemispherical washers W25 and spring washer W24 with 3/16 split pin. The nut should be tightened against the SPLIT PIN, and not the spring washer, so that sufficient freedom of movement will be allowed. The components forming one transom set, are listed on Table.7.

16. Steel Floats

This unit is formed by bolting together six or more welded air-tight sections, and does not involve forming a watertight joint. The size of the sections allows transport by sea, road, rail or canal. Sheets 15 & 16 show the arrangement for Mark I & Mark II Spans respectively, and show also the transoms in position. The only difference is that Mark II floats include the extra sections W131 & W132. All sections are provided with a hatch for entry, inspection and flooding if required. Providing at least 2 sections remain empty, the float can be flooded down to any required level.

17. The connections between float sections, are made using 3/4" dia. black bolts with square washers W117, under head and nut. The end sections of the float are provided with hinges, so that if necessary, they can be swung back for easy stowage in a ship's hold, though generally it will be more convenient to stow the sections separately. Handrail Standards W116 are provided. They are positioned in "drop in" sockets. The rail is formed with 2" circ. cordage.

18. Care should be exercised when fitting the link plate W60, the 3.5/8" dia. hole being towards the bottom. When fastening down the R.S.J. Transoms Spring Washers W93 should be used under head and nut, and taper washers ommitted. In some cases, shims are provided to allow for manufacturing inaccuracies, and these are wired to the appropiate transom seatings.

19. These floats are of shallow draught(4'7½" with 2 Standard spans) and are suitable for use where severe grounding conditions are to be met. Hardwood bumpers are provided to reduce the shock load when pounding. On floats used at the inshore end of the bridge pier, these bumpers are omitted when the draught with 2 spans is 4'1½". The float shape is such that gives minimum disturbance to the bridge in rough weather, allows grounding on moderately bad sea beds without straining, and permits towing in any direction. The weight of the Mark I float is 16 tons, and the Mark II float, 20 tons. Lists of components are given on Tables 8 and 9. The draught of this float under various loadings is given on Tables 23 and 24.

20 Rock Inserts.

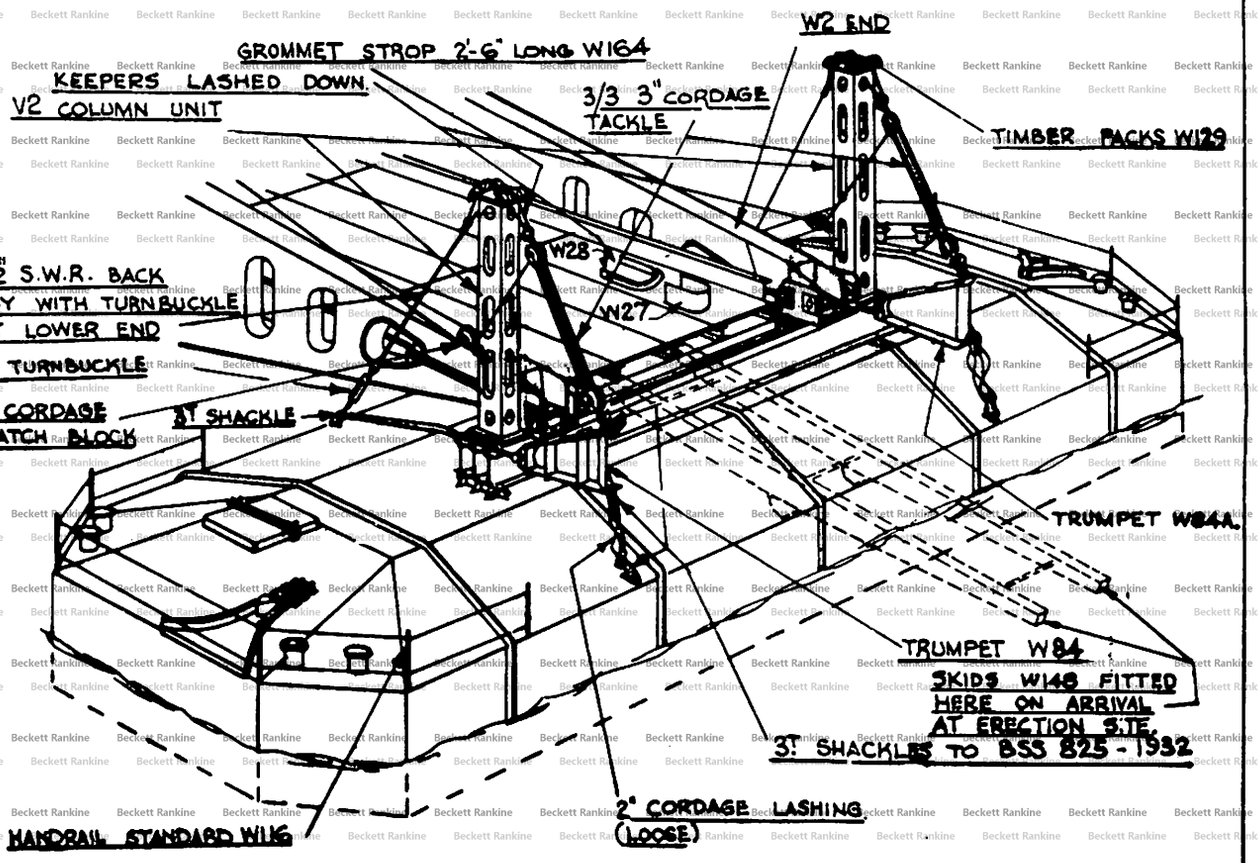
These are the additional float sections W131 and W132, used for extra buoyancy, with Mark II equipment. They can of course, be added to the Mark I float if necessary. Their use in conjunction with sliding columns, allows the equipment to be beached on rock as described in detail, in Section 6. The list of components for one set insertion units, is given on Table 10, and should be read as equipment extra to the normal floats. These components cannot be used with concrete floats.

21 Concrete Float or "Beetle"

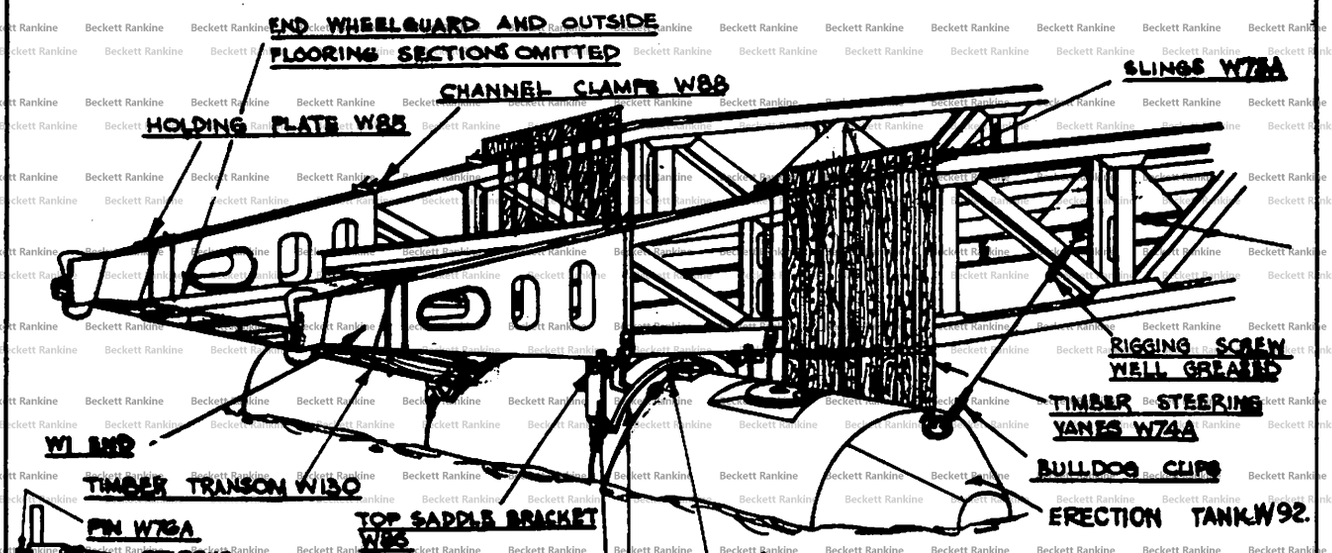
This is a one-piece unit, and supplied in two sizes, P.P.6, suitable for Mark I equipment, and P.P.7, suitable for Mark II equipment. These floats are shown on Sketches 17 and 18 respectively. In general appearance, they resemble the steel float though the draught is about 1'3" greater. The weight of the P.P.6 is approximately 45 tons, and the P.P.7. approximately 55 tons. A feature of concrete floats is that the transoms fasten down through a hardwood pack capped by a steel liner. This allows the necessary give in a seaway, and permits accurate seating and bedding down the transom.

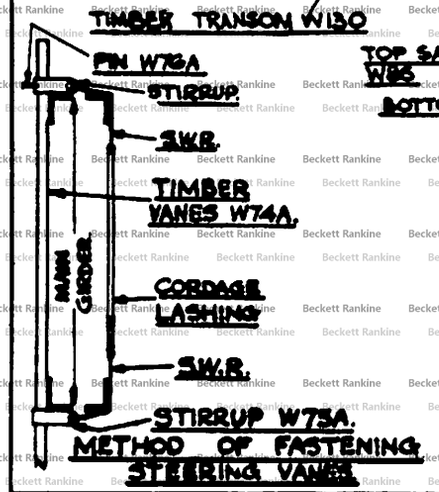
22. These floats are not fitted with renovable botton bumpers and handrailing is replaced by the provision of a life line and hook connection. Reasonable care should be exercised in handling these floats, since the thickness of the concrete panels is 1.1/4". The draught under various loadings is given on Tables 23 and 24. Small tools are carried in boxes on the deck. The inventory is given on Table II.

(PLEASE TURN TO PAGE 46)



DETAIL "X"





DETAILS AT ENDS OF TOWING LINKS.

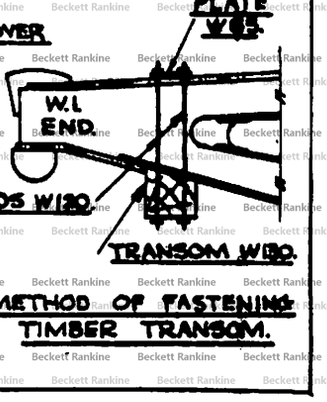


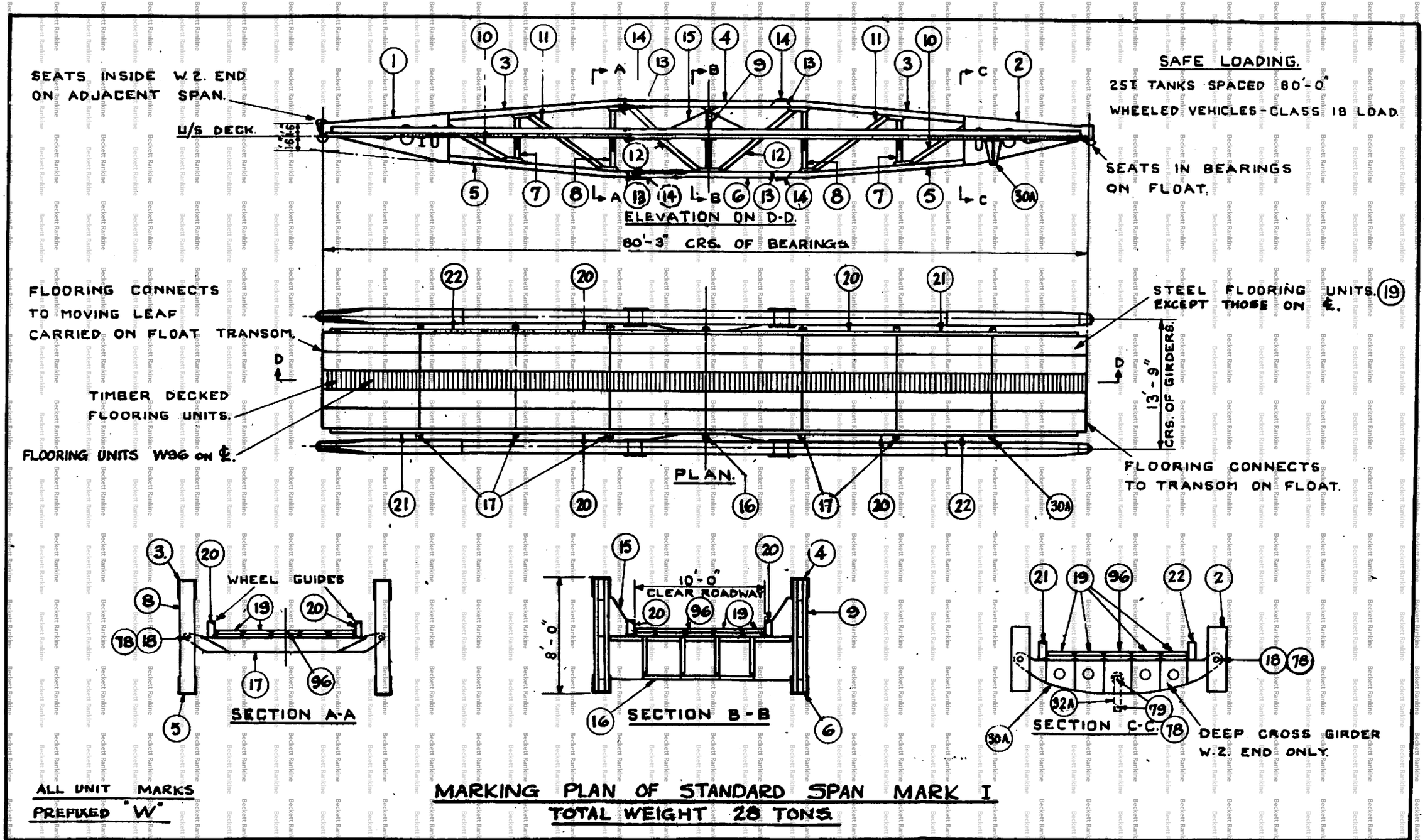
TABLE I.

SCHEDULE OF COMPONENTS FOR ONE STANDARD SPAN MARK I.

FOR GENERAL ARRANGEMENT SEE SKETCH NO. 9.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.1	2	Girder ends carrying inner bearing
W.2	2	Girder ends carrying outer bearing
W.3	4	End top chord units
W.4	2	Centre top chord units
W.5	4	End bottom chord units
W.6	2	Centre bottom chord units
W.7	4	Vertical posts
W.8	4	Vertical posts
W.9	2	Centre vertical post
W.10	4	Diagonal web members
W.11	4	Diagonal web members
W.12	4	Diagonal web members
W.13	32	Chord cover plates
W.14	16	Chord cover plates
W.15	2	Centre brackets
W.16	1	Main cross girder
W.17	5	R.S.J. Cross Girder
W.18	12	2.1/2" dia. Pin & Nut with 1/4" split pin
W.19	32	Flooring units
W.20	4	Centre wheel guards
W.21	2	End wheel guards
W.22	2	End wheel guards
W.23	20	7/8" dia.H.R.H.Bolts x 4.1/4"lg.with 3/16" Split Pin.
W.24	20	1.7/8" O.D.Spring Washer
W.25	40	1.13/16"dia.Hemisphorical Washer
W.27	2	Keeper covers for outer bearing bolted in position to W.2 end
W.30A	1	Link cross girder
W.31	160	7/8" H.R.H.Bolt x 2.3/4" lg. with 3/16" split pin
W.32A	2	Links
W33	80	7/8" H.R.H.Bolts x 3" long with 3/16" split pin.
W.34	160	1.1/8" O.D.Ferrule x 9/32" long
W.36	4	Cable springs W.2 End
W.37	4	Cable springs W.1 End
W.38	8	M/C Pin for cable spring
W.39	16	Half washer for cable spring
W.78	14	5" dia.Washer x 1/2" drillod 2.9/16" dia.holes.
W.79	2	3" dia. Link Pin
W.93	370	15/16" dia. Spring Washers.
W.94	36	7/8" dia.H.R.H.Bolts x 2" lg. with 3/16" split pin.
W.96	8	Centre flooring units complete with timber deck.
	16	Cuphead copper rivets 3/8" dia. x 2.1/2" long.
	560	7/8" dia.H.R.H.Bolts x 2.1/4" lg.
	840	7/8" dia.H.R.H.Bolts x 2"lg.
	1400	7/8" Dia.Ordinary Washers.

NOTE:- No. of bolts are not requirements.



MARKING PLAN OF STANDARD SPAN MARK I

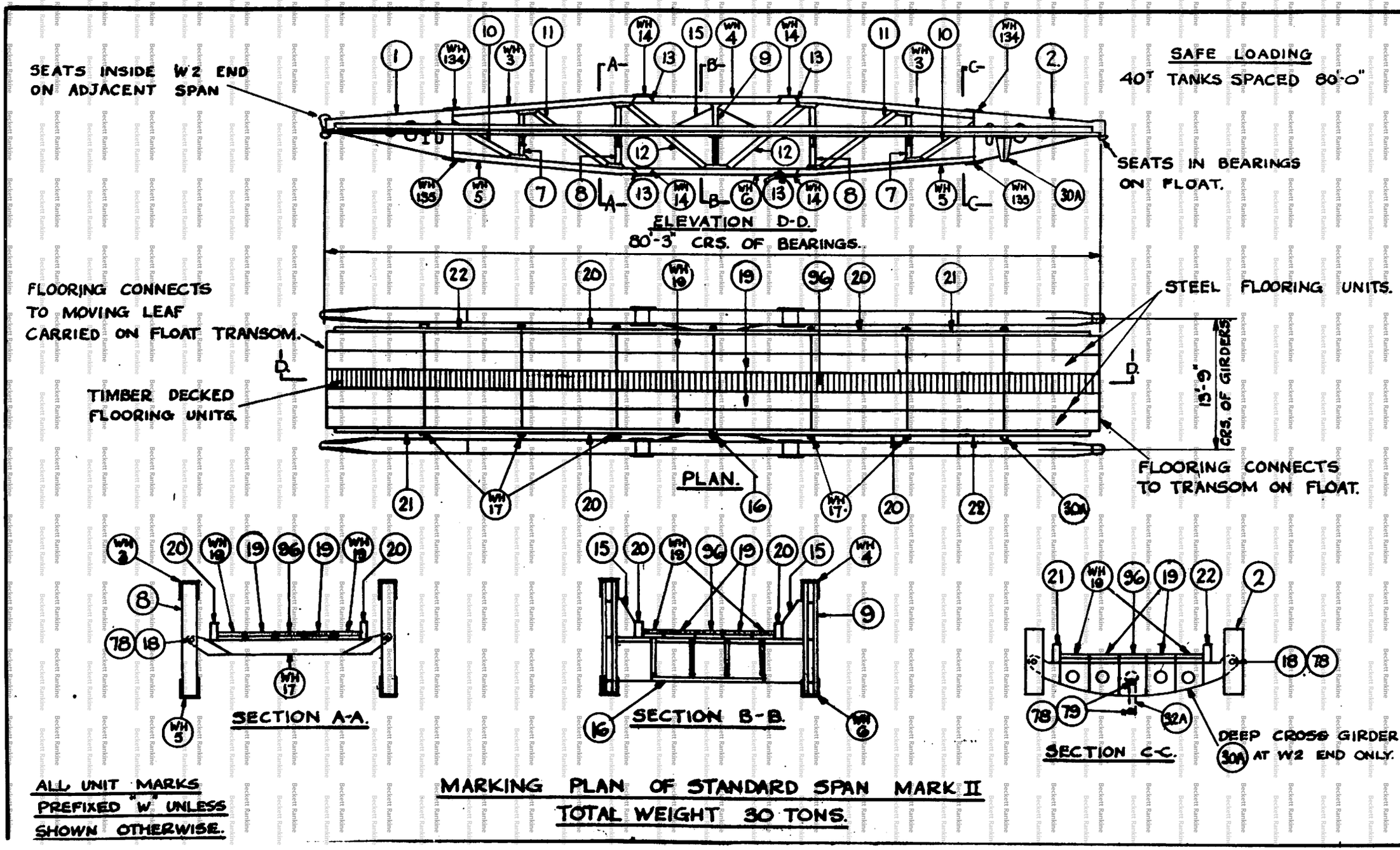
TOTAL WEIGHT 28 TONS

SCHEDULE OF COMPONENTS FOR ONE STANDARD SPAN MK.II.

FOR GENERAL ARRANGEMENT SEE SKETCH NO. 10.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.1	2	Girder ends carrying inner bearings.
W.2	2	Girder ends carrying outer bearings.
WH.3	4	End top chord units
WH.4	2	Centre top chord units
WH.5	4	End bottom chord units
WH.6	2	Centre bottom chord units
W.7	4	Vertical posts
W.8	4	Vertical posts
W.9	2	Centre vertical posts
W.10	4	Diagonal web members
W.11	4	Diagonal web members
W.12	4	Diagonal web members
W.13	32	Chord cover plates
WH.14	16	Chord cover plates
W.15	2	Centre brackets
W.16	1	Main cross girder
WH.17	5	16" x 6" x 50lbs.R.S.J. Cross girder.
W.18	12	2.1/2"dia. Pin & Nut with 1/4" split pin.
W.19	16	Flooring units 1/4" thick bent plate.
WH.19	16	Flooring units with 5/16" Thick bent Plate
W.20	4	Centre wheelguards
W.21	2	End Wheelguards
W.22	2	End Wheel Guards
W.23	20	7/8"dia.H.R.H.Bolts x 4.1/4"lg.with 3/16" Split Pin.
W.24	20	1.7/8"O.D.Spring Washer
W.25	40	1.13/16"dia.Hemispherical Washers.
W.27	2	Keeper Covers for outer bearing
W.30A	1	Link cross girder
W.31	160	7/8"H.R.H.Bolts x 2.3/4"lg. with 3/16" Split Pin.
W.32A	2	Links
W.33	80	7/8"H.R.H.Bolts x 3"lg with 3/16" Split pin.
W.34	160	1.1/8"O.D.Ferrules x 19/32" long
W.36	4	Cable spring for W.2 end
W.37	4	Cable spring for W.1 end
W.38	8	Link pin for cable spring
W.39	16	Half Washer for cable spring
	16	Cup head copper rivets 3/8" dia x 2.1/2" long
W.78	14	5"dia.Washers x 1/2" drilled 2.9/16" dia.Hole.
W.79	2	3" dia.Link pin and nut with 1/4" split pin
W.93	380	15/16"dia.Spring Washers
W.94	36	7/8"dia.H.R.H.Bolts x 2"lg. with 3/16" split pin.
W.96	8	Centre flooring units complete with timber decking.
WH.134	4	Cover plate top chord to box end.
WH.135	4	Cover plate bottom chord to box end.
	370	7/8"dia.H.R.H.Bolts x 3"long.
	150	7/8"dia.H.R.H.Bolts x 2.1/2" long
	455	7/8"dia.H.R.H.Bolts x 2.1/4" long.
	786	7/8"dia.H.R.H.Bolts x 2" long
	1744	7/8" dia. Ordinary Washers

NOTE: No. of Bolts are net requirements.



MARKING PLAN OF STANDARD SPAN MARK II

TOTAL WEIGHT 30 TONS.

SCHEDULE OF COMPONENTS FOR ONE TELESCOPIC SPAN MK. I.

FOR GENERAL ARRANGEMENT SEE SKETCH NO. 11

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.1	2	Girder ends carrying inner bearings.
W.2	2	Girder ends carrying outer bearings.
W.7	2	Vertical members for outer sections.
W.10	2	Diagonal members for outer sections.
W.17	4	R.S.J.cross girder
W.18	12	2.1/2"dia.Pin with nut & 1/4" dia.split pin
W.19	24	Flooring units
W.20	2	Centre wheel guards
W.21	2	End wheel guards
W.22	2	End wheel guards
W.23	20	7/8"dia.H.R.H.Bolts x 4.1/4"lg.with3/16"dia. Split Pin.
W.24	20	1.7/8"O.D.Spring Washers
W.25	40	1.13/16"dia.Hemispherical Washers
W.27	2	Keeper covers for outer bearing
W.30A	1	Link cross girder
W.31	180.	7/8"dia.H.R.H.Bolts x 2.3/4"lg.with 3/16" dia.split pin.
W.32A	2	Links
W.33	80	7/8"dia.H.R.H.Bolts x 3" lg.with3/16"dia.Split Pin
W.34	160	1.1/8"O.D.Ferrules x19/32" long
W.36	4	Cable Springs W.2 end
W.37	4	Cable Springs W.1 end
W.38	8	Machined pins for Cable Springs.
W.39	16	Half washers for Cable Springs.
	16	Cuphead copper rivets 3/8"dia.x 2.1/2"lg.
W.78	14	5"dia.Washers x 1/2"drilled 2.9/16"dia.Hole.
W.79	2	3" dia. Link Pin.
W.106A	**4**	**Sets of Locking Pins.**

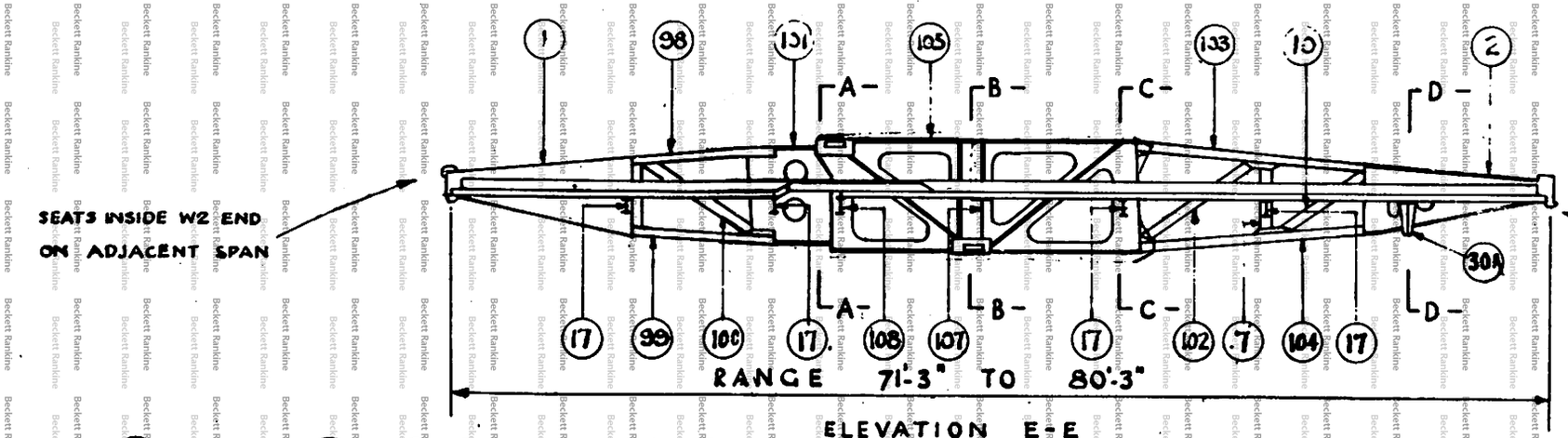
UNIT MARK.	NO. OFF.	DESCRIPTION.
W.93	350	15/16"Dia.Spring Washers
W.94	86	7/8"dia.H.R.H.Bolts x 2"lg. x 3/16"dia.Split Pin
W.96	6	Centre flooring units.
W.98	2	Top Chord units for inner section.
W.99	2	Botton chord units for inner section.
W.100	2	Diagonal members for inner section.
W.101	2	Inner boxes
W.101A	2	Bearing stops
W.102	2	Diagonal members for outer section.
W.103	2	Top chord units for outer section.
W.104	2	Bottom chord units for outer section.
W.105	1	Outer box for outer section
W.106	1	Outer box for outer section.
W.107	1	Centre cross girder
W.108	1	R.S.J.Cross girder.
W.109	5	Bottom leaf units.
W.110	3	Top leaf centre units
W.111	1	Top leaf unit with wheel guard.
W.112	1	Top leaf unit with wheel guard
W.113	1	Wheel guard to botton leaf
W.114	1	Wheel guard to botton leaf
	494	7/8"dia.H.R.H.Bolts x 2"lg.
	110	7/8"dia.H.R.H.Bolts x 2.1/4" long.
	80	7/8"dia.H.R.H.Bolts x 2.1/2"long.
	32	7/8"dia.H.R.H.Bolts x 3"lg.
	8	7/8"dia.Hex.Head Set Screws x 1.1/4"long.
	836	7/8"dia.Ordinary Washer
	2	2"circ.Manilla lashing x 200ft. long.

NOTE:- No. of bolts are net requirements.

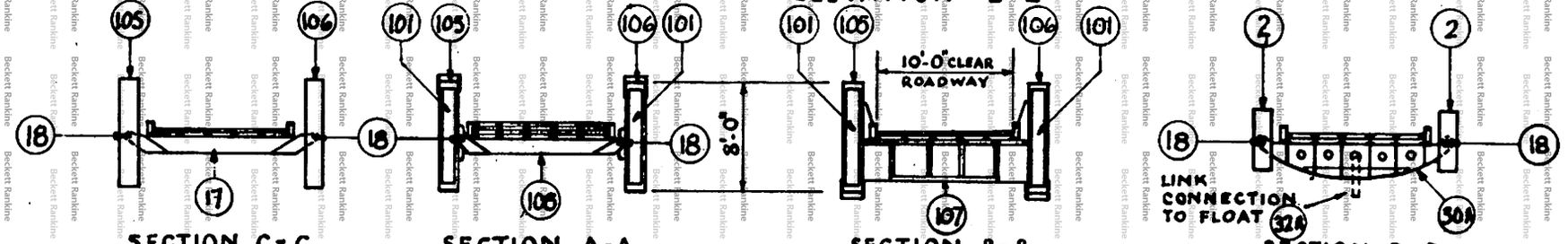
SAFE LOADING

25T TANKS SPACED 80'-0"

WHEELED VEHICLES - CLASS 18 LOAD



ELEVATION E-E

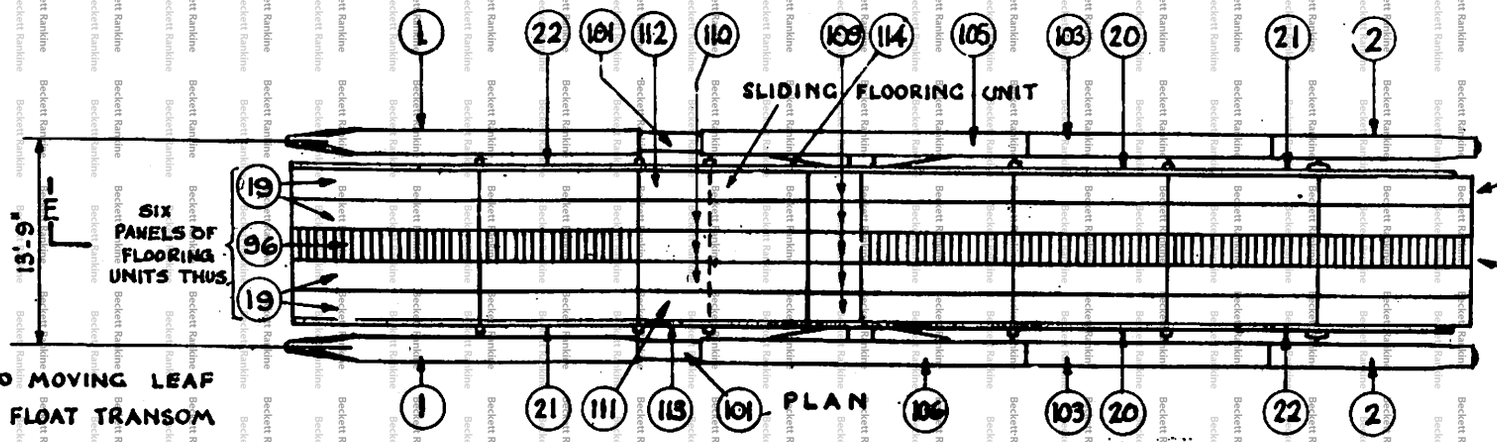


SECTION C-C

SECTION A-A

SECTION B-B

SECTION D-D



ALL UNIT MARKS PREFIXED "W"

MARKING PLAN OF TELESCOPIC SPAN MARK I.

TOTAL WEIGHT 32 TONS.

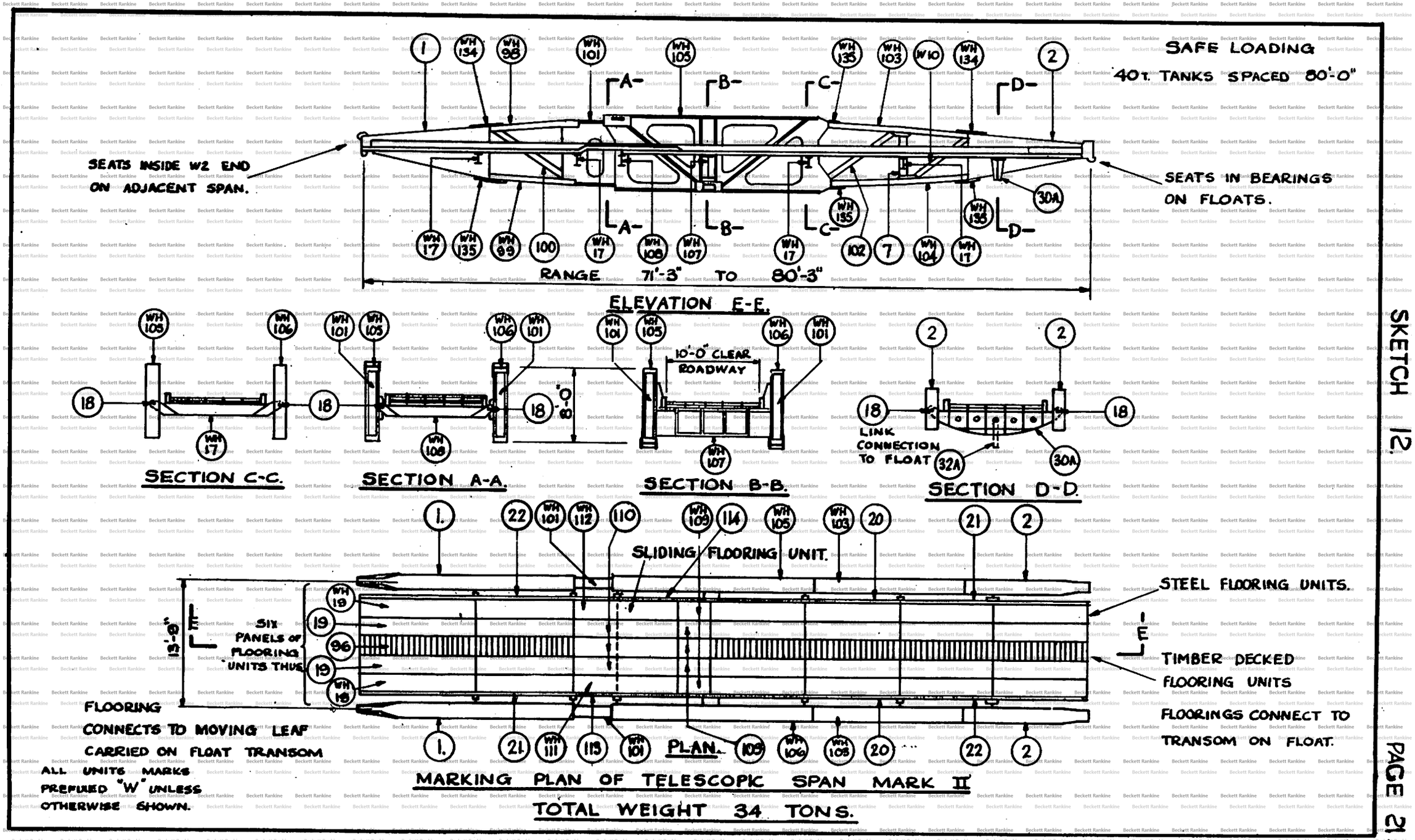
SCHEDULE OF COMPONENTS FOR ONE TELESCOPIC SPAN MARK II.

FOR GENERAL ARRANGEMENT SEE SKETCH No.12.

UNIT MARK.	No. OFF.	DESCRIPTION.
W.1	2	Girder ends carrying inner bearings
W.2	2	Girder ends carrying outer bearings
W.7	2	Vertical members
W.10	2	Diagonal members for outer section
WH.17	4	16"x 6" x 50lb.Ft. R.S.J.Cross Girder
W.18	12	2.1/2"dia.Pin with nut and 1/4"dia.Split Pin
WH.19	12	Flooring units 5/16" Thick bent Plate
W.19	12	Flooring units 1/4" thick bent plate
W.20	2	Centre wheel guards
W.21	2	End Wheel guards
W.22	2	End wheel guards
W.23	20	7/8"dia.H.R.H.Bolts x 4.1/4"lg.with 3/16"dia.split pin
W.24	20	1.7/8"O.D.Spring Washer
W.25	40	1.13/16"dia.Homispherical Washers
W.27	2	Keeper covers for outer bearings
W.30A	1	Link cross girder
W.31	180	7/8"dia.H.R.H.Bolts x 2.3/4"lg. with 3/16" dia.Split Pin
W.32A	2	Links
W.33	80	7/8"dia.H.R.H.Bolts x 3"lg with 3/16"dia.Split Pin
W.34	170	1.1/8"O.D.Ferrules x19/32"lg
W.36	4	Cable springs for W.2 End
W.37	4	Cable Springs for W.1 End
W.38	8	Machined pins for cable spring
W.39	16	Half washers for cable springs
	16	Cuphead copper rivets 3/8"dia. x 2.1/2"long
W.78	14	5"dia.Washer x 1/2"thick
W.79	2	3" dia.Link Pin
W.93	350	15/16"dia.Spring Washers
W.94	86	7/8"dia.H.R.H.Bolts x 2"lg. x 3/16"dia.Split pin.

NOTE:- No. of bolts are net requirements.

UNIT MARK.	No. OFF.	DESCRIPTION.
W.96	6	Centre flooring units complete with timber decking
WH.98	2	Top chord units for inner section
WH.99	2	Bottom chord units for inner section
W.100	2	Diagonal members for inner section.
WH.101	2	Inner boxes.
WH.101A	2	Bearing stops
W.102	2	Diagonal members for outer section
WH.103	2	Top chord units for outer section
WH.104	2	Bottom chord units for outer section
WH.105	1	Outer box for outer section
WH.106	1	Outer box for outer section
W.107	1	Centre cross girder
WH.108	1	16" x 6" x 50lbs R.S.J. cross girder
W.109	3	Bottom leaf units 1/4" thick plate
WH.109	2	Botton leaf units 5/16"thick plate
W.110	3	Top leaf centre units 1/4" thick plate
WH.111	1	Top leaf units with wheelguard 5/15" thick plate
WH.112	1	Top leaf units with wheelguard 5/16"thick plate
W.113	1	Wheelguard to bottom leaf
W.114	1	Wheelguard to bottom leaf
WH.134	4	Cover plates
WH.135	4	Cover Plates
W.136A	4	Cast steel bearing seatings
W.136B	4	Gun metal mearings
	360	7/8"dia.H.R.H.Bolts x 2" long
	62	7/8"dia.H.R.H.Bolts x 2.1/4"long
	410	7/8"dia.H.R.H.Bolts x 2.1/2"long
	108	7/8"dia.H.R.H.Bolts x 3.1/4"long
	8	7/8"dia.Hex.head set screws x 1.1/4"lg.
	910	7/8"dia.Ord.Washers
	2	2"circ.Manilla lashing x 200ft.
W.106A	4	Sets of Locking Pins.


SAFE LOADING
40T. TANKS SPACED 80'-0"
SEATS INSIDE W2 END ON ADJACENT SPAN.
SEATS IN BEARINGS ON FLOATS.
RANGE 71'-3" TO 80'-3"
ELEVATION E-E.
SECTION C-C.
SECTION A-A.
SECTION B-B.
SECTION D-D.
10'-0" CLEAR ROADWAY
LINK CONNECTION TO FLOAT
SLIDING FLOORING UNIT.
STEEL FLOORING UNITS.
TIMBER DECKED FLOORING UNITS
FLOORINGS CONNECT TO TRANSOM ON FLOAT.
SIX PANELS OF FLOORING UNITS THUS
FLOORING CONNECTS TO MOVING LEAF CARRIED ON FLOAT TRANSOM
ALL UNITS MARKS PREFIXED "W" UNLESS OTHERWISE SHOWN.
PLAN.
MARKING PLAN OF TELESCOPIC SPAN MARK II
TOTAL WEIGHT 34 TONS.
SKETCH 12
PAGE 21

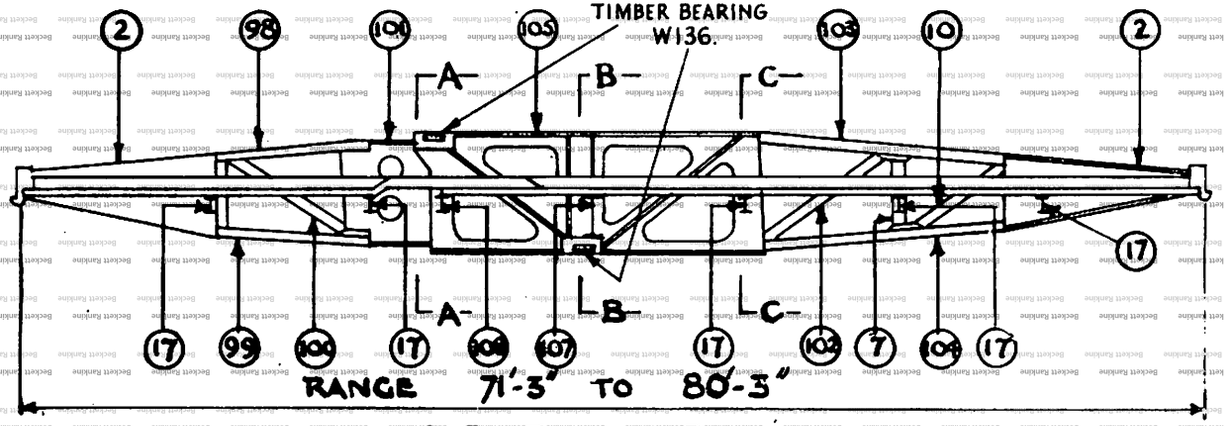
SCHEDULE OF COMPONENTS FOR ONE END TELESCOPIC SPAN MARK I.

FOR GENERAL ARRANGEMENT SEE SKETCH NO. 13.

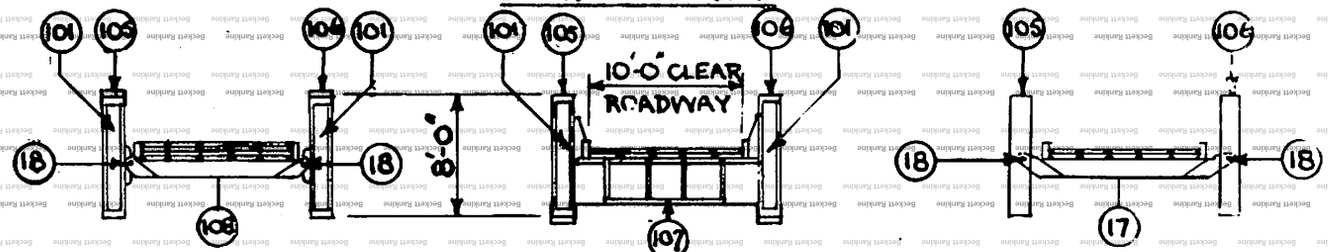
UNIT MARK.	NO. OFF.	DESCRIPTION.
W.2	4	Girder Ends carrying outer bearings.
W.7	2	Vertical members for outer sections.
W.10	2	Diagonal members for outer sections.
W.17	5	R.S.J.Cross Girder.
W.18	12	2.1/2"dia.Pins with nut and 1/4" dia.Split Pin.
W.19	24	Flooring units.
W.20	2	Centre wheel guards
W.21	2	End wheel guards
W.22	2	End wheel guards
W.23	20	7/8" dia. H.R.H.Bolts x 4.1/4"lg. with 3/16" dia.Split pins
W.24	20	1.7/8" O.D. Spring washers.
W.25	40	1.13/16" dia. Hemispherical Washers.
W.27	4	Keeper cover for outer bearing
W.31	200	7/8"dia.H.R.H.Bolts x 2.3/4"lg. with 3/16" dia.Split pin.
W.32A	4	Links
W.33	82	7/8" dia. H.R.H.Bolts x 3" lg. with 3/16" dia. Split pin.
W.34	200	1.1/8" O.D.Ferrules x 19/32" long.
W.36	8	Cable springs for W.2 End
W.38	8	Machined pins for Cable springs.
W.39	16	Half washers for Cable Springs.
W.78	16	5"dia.Washers x 1/2"drilled 2.9/16" dia. Hole
W.79	4	3" Dia. Link Pins.
	2	2"circ.Manilla lashing x 200ft.lg.
	836	7/8"dia.Ord.Washer.
W.93	350	15/16"dia.Spring Washers
W.94	86	7/8"dia.H.R.H.Bolts x 2" lg.with3/16"dia.Split Pin,
W.96	6	Centre flooring units complete with timber deckings.
W.98	2	Top chord units for inner section.
W.99	2	Bottom chord unit for inner section.
W.100	2	Diagonal members for inner section.
W.101	2	Inner boxes
W.101A	2	Bearing stops.
W.102	2	Diagonal members for outer sections.
W.103	2	Top chord units for outer sections.
W.104	2	Bottom chord units for outer sections.
W.105	1	Outer box for outer section.
W.106	1	Outer box for outer section.
W.107	1	Centre cross girder.
W.108	1	12" x 6" x 44lb/Ft. joist cross girder.
W.109	5	Bottom leaf units.
W.110	3	Top leaf centre units.
W.111	1	Top leaf unit with wheel guard.
W.112	1	Top leaf unit with wheel guard.
W.113	1	Wheel guard to bottom leaf.
W.114	1	Wheel guard to bottom leaf.
	16	Cuphead copper rivets 3/8"dia. x 2.1/2"long.
	494	7/8" dia. H.R.H.Bolts x 2" long.
	110	7/8"dia. H.R.H.Bolts x 2.1/4" long.
	80	7/8" dia. H.R.H.Bolts x 2.1/2" long.
	32	7/8"dia.H.R.H.Bolts x3"lg.
	8	7/8"dia. Hex.Head set screws x 1.1/4"lg.
W.106A	4	Sets of Locking Pins.

NOTE: No. of Bolts are net requirements.

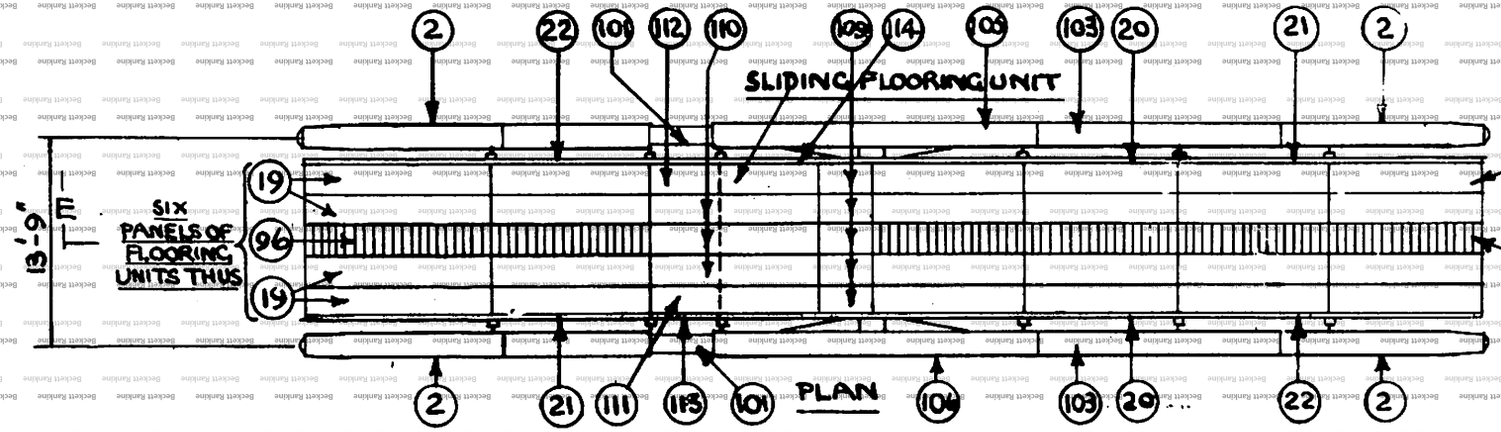
SAFE LOADING
25T TANKS SPACED 80'-0"
WHEELED VEHICLES - CLASS 18
LOAD.



ELEVATION E-E



SECTION A-A | SECTION B-B | SECTION C-C



ALL UNIT MARKS PREFIXED W

MARKING PLAN OF TELESCOPIC END SPAN. MARK I.

TOTAL WT. 32 TONS.

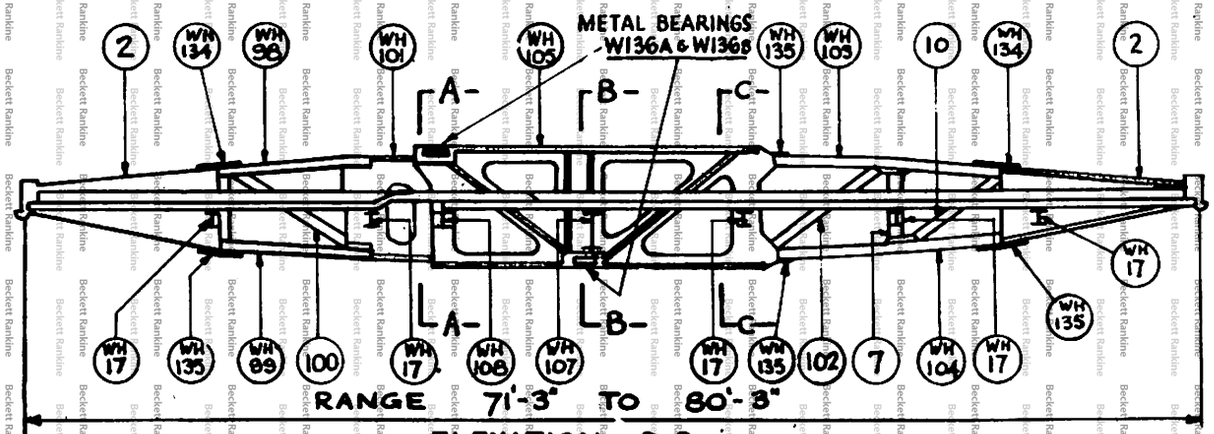
SCHEDULE OF COMPONENTS FOR ONE END TELESCOPIC SPAN MARK II.

FOR GENERAL ARRANGEMENT SEE SKETCH NO. 14.

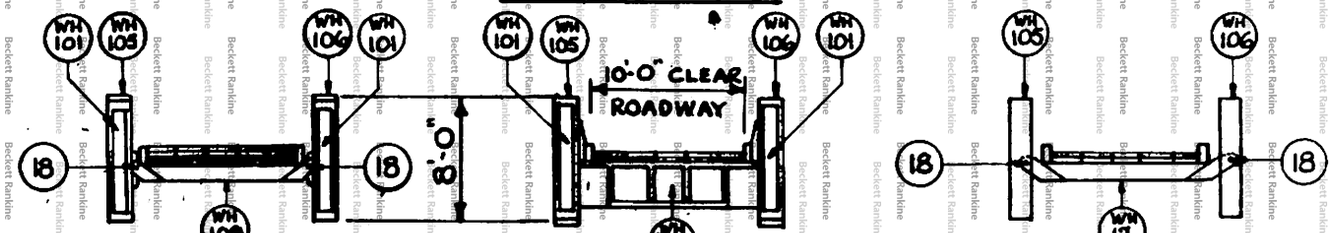
UNIT MARK.	NO. OFF.	DESCRIPTION.
W.2	4	Girder ends carrying outer bearings.
W.7	2	Vertical Members
W.10	2	Diagonal members for outer sections
WH.17	5	16" x 6" x 50lbs. R.S.J. Cross Girder.
W.18	12	2.1/2"dia.Pins with nut & 1/4" split pins.
W.19	12	Flooring units 1/4" thick bent plates
WH.19	12	Flooring units 5/16" thick bent plates
W.20	2	Centre wheel guards
W.21	2	End wheel guards
W.22	2	End wheel guards
W.23	20	7/8"dia.H.R.H.Bolts x 4.1/4"lg. with 3/16" dia. Split Pins.
W.24	20	1.7/8"O.D.Spring Washers
W.25	40	1.13/16"dia. Hemispherical Washers.
W.27	4	Keeper covers for outer bearings.
W.31	180	7/8"dia.H.R.H.Bolts x 2.3/4"lg. with 3/16" dia. Split pins.
W.33	80	7/8"dia.H.R.H.Bolts x 3"lg. with 3/16"dia. Split Pins.
W.34	180	1.1/8"O.D.Ferrules x 19/32"long.
W.36	8	Cable springs-W.2End
W.38	8	Machined Pins for Cable Springs.
W.39	16	Half washers for Cable Springs.
	16	Cuphead copper rivets 3/8" dia. x 2.1/2"lg.
W.78	12	5"dia.Washer x 1/2"drilled 2.9/16"dia.Hole.
W.93	350	15/16"dia.Spring Washers
W.94	86	7/8"dia.H.R.H.Bolts x 2"lg. with 3/16"dia.Split Pins.
W.96	6	Centre flooring units complete with timber decking
WH.98	2	Top chord units for inner section.
WH.99	2	Bottom chord units for inner section.
W.100	2	Diagonal members for inner section.
WH.101	2	Inner boxes.
WH.101A	2	Bearing stops
W.102	2	Diagonal members for outer section
WH.103	2	Top chord units for outer section
WH.104	2	Bottom chord units for outer section
WH.105	1	Outer box for outer section
WH.106	1	Outer box for outer section
W.107	1	Centre Cross Girder
WH.108	1	16"x 6" x 50lbs R.S.J. Cross Girder
W.109	3	Bottom leaf units 1/4" thick plate
WH.109	2	Bottom leaf units 5/16" thick plate
W.110	3	Top leaf centre units 1/4" thick plate
WH.111	1	Top leaf units with wheelguard 5/16"thick plate.
WH.112	1	Top leaf units with wheelguard 5/16"thick plate
W.113	1	Wheelguard to bottom leaf
W.114		Wheelguard to bottom leaf
WH.134	4	Cover plates
WH.135	8	Cover plates
W.136A	4	Cast steel bearing seating
W.136B	4	Gun metal bearings
	360	7/8"dia.H.R.H.Bolts x 2"lg.
	62	7/8"dia.H.R.H.Bolts x 2.1/4"long
	410	7/8"dia.H.R.H.Bolts x 2.1/2"long
	108	7/8" Dia.H.R.H.Bolts x 3.1/4" long
	8	7/8"dia.Hex.Head set screws x 1.1/4" long
	910	7/8"dia.Ord.Washers
	2	2"circ.Manilla lashing x 200ft. long.
W.106A	4	Sets of Locking Pins.

NOTE:- No. of bolts are net requirements.

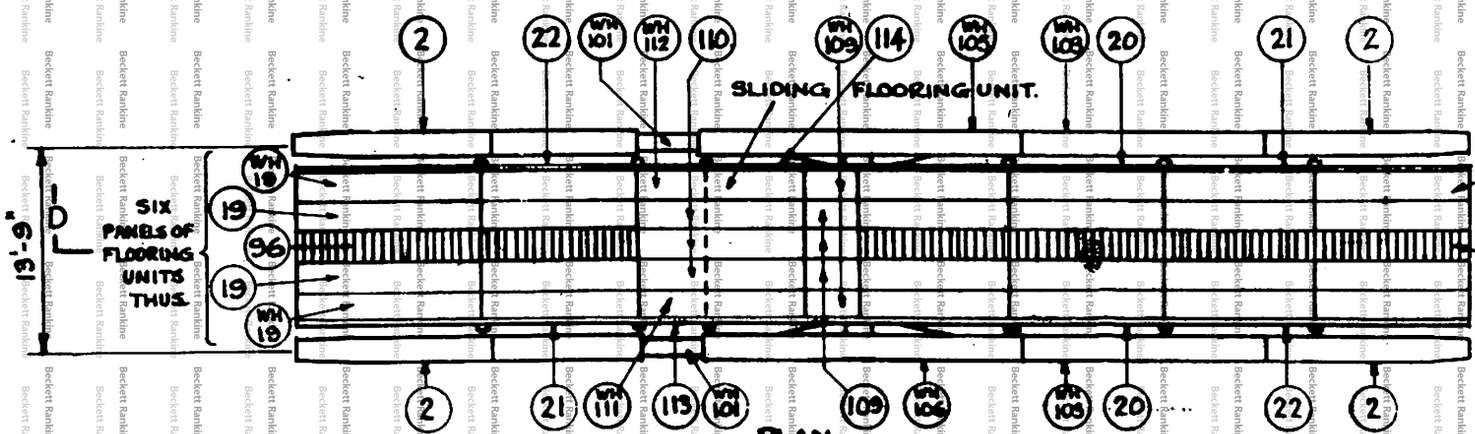
SAFE LOADING.
40T TANKS SPACED 80'-0"



ELEVATION D-D.



SECTION A-A. SECTION B-B. SECTION C-C.



PLAN.

MARKING PLAN OF TELESCOPIC END SPAN MARK II

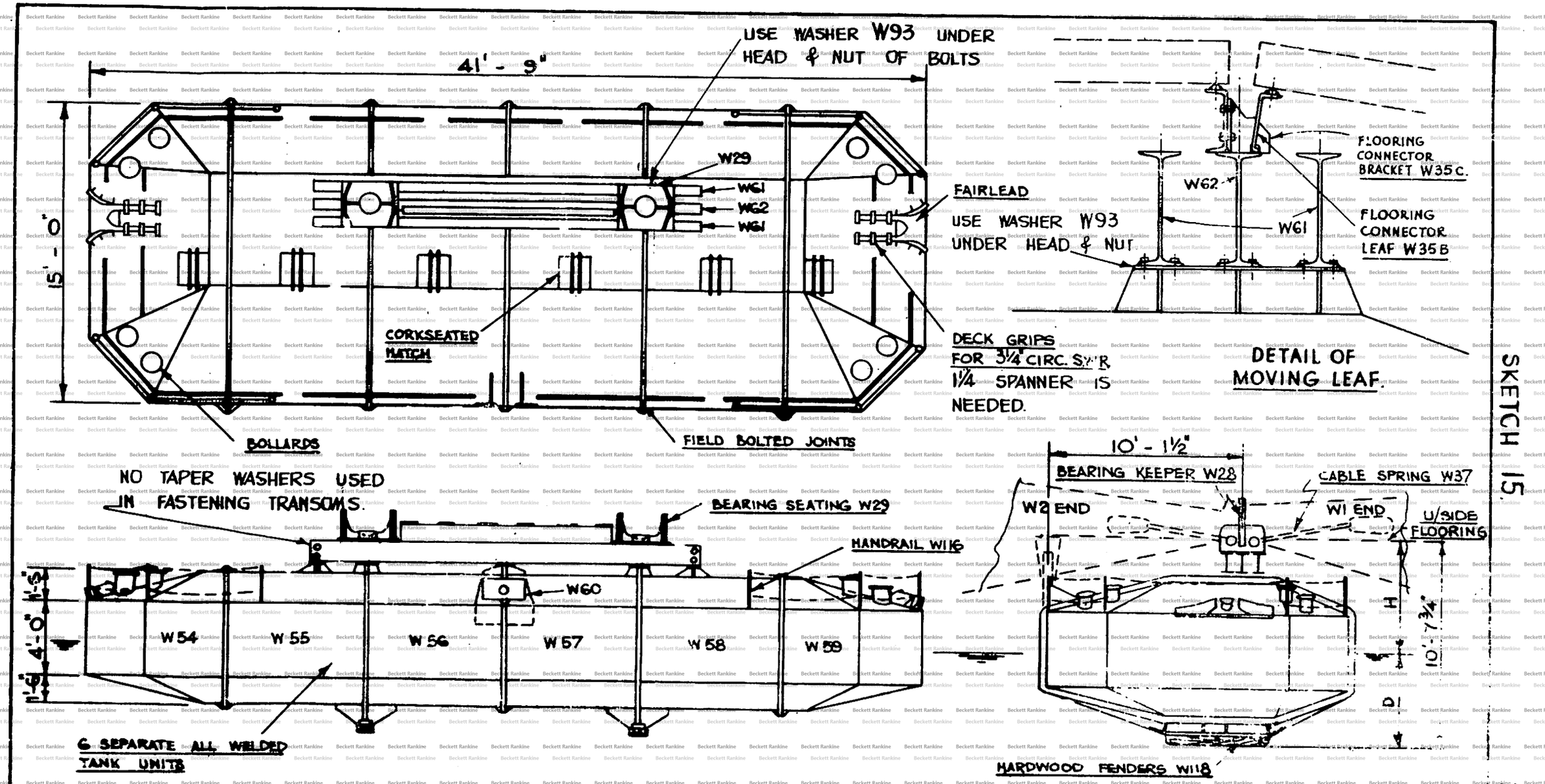
TOTAL WT. 34 TONS.

ALL UNIT MARKS PREFIXED "W" UNLESS SHOWN OTHERWISE.

SCHEDULE OF COMPONENTS FOR ONE TRANSOM SET.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.61	2	15" x 6" R.S.J. transom unit.
W.62	1	15" x 6" R.S.J. transom unit with 8" x 3" channel.
W.26	1	Dished joint cover.
W.28	2	Keepers (to be supplied fully bolted to W.29.
W.29	2	Bearing seatings.
W.35B	1	Flooring Connector Leaf.
W.35C	6	Flooring Connector Bracket.
	108	7/8"dia. H.R.H. bolts & nuts x 3" long.
	24	7/8"dia.H.R.H.bolts & nuts x 2.1/4" long.
W.93	96 for concrete floats. 216 for steel floats	7/8" dia. spring washers.

NOTE: No. of bolts are net requirements.



MARKING PLAN OF STEEL FLOAT.

FOR MARK I. SPANS.

SKETCH 15

PAGE 27

SCHEDULE OF COMPONENTS FOR ONE STEEL FLOAT MARK I.

FOR GENERAL ARRANGEMENT SEE SKETCH NO.15.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.54	1	Float unit complete with cork seated hatch, cable grips and dock fittings to pair W.59.
W.55	1	Float unit complete with cork seated hatch, and all dock fittings to pair W.58.
W.56	1	Float unit complete with cork seated hatch, and all dock fittings to pair W.57.
W.57	1	Float unit complete with cork seated hatch, and all dock fittings to pair W.56.
W.58	1	Float unit complete with cork seated hatch and all dock fittings, to pair W.55.
W.59	1	Float unit complete with cork seated hatch, cable grips and all dock fittings, to pair W.54.
W.60	1	Link Plate.
W.116	12	Handrail Standards.
W.117	604	Square washers x 1/4" thick.
W.118	2	Hardwood bottom fenders 12" x 6" x 4'0" long
	16	7/8"dia.H.R.H.Bolts x 3" long.
	302	3/4" dia. H.R.H.Bolts x 1.3/4" long.
	16	7/8"dia. Ordinary Washers.
	4	2"circ.Manilla rope x 12'0"long-ends whipped.
	2	2"circ. Manilla rope x 50'0"long - ends whipped
	16	1"dia. H.R.H.Bolts x 7" long.
	16	1"dia. Ordinary Washers

EQUIPMENT CARRIED IN STARBOARD END COMPARTMENT.

W.63	1	Rope Grip
	1	Yale pul-lift, 3 tons capacity.
	1	Rat-tail spanner for 1.1/8"dia.nuts to B.S.S.916.

NOTE:- Bolts are net requirements.

1¼" SPANNER NEEDED FOR DECK GRIPS

49'-9"

USE SPRING WASHERS W93 UNDER HEAD & UNIT OF BOLTS.

15'-0"

W62 W61 HATCH

BOLLARDS W54 W131 W55 W56 W57 W58 W132 W59

FAIRLEAD AND ROPE GRIP FOR 3¼" CIRC. S.W.R.

PLAN

USE SPRING WASHERS W93 UNDER HEAD & UNIT OF BOLTS

W62 W61

FLOORING CONNECTOR BRACKET W35C.

FLOORING CONNECTOR LEAF W35B.

DETAIL OF MOVING LEAF.

NO TAPER WASHERS USED ON TRANSOMS.

LINK PLATE W60.

2" MANILLA

HANDRAIL STANDARD W116

BRIDGE BEARINGS W29

R.S.J. TRANSOM.

A A

1'-6" 4'-0" 1'-6"

BUMPERS W118

USE SQUARE WASHERS UNDER HEAD AND NUT OF BOLTS CONNECTING FLOAT UNITS TOGETHER

ELEVATION

CABLE SPRINGS W36

CABLE SPRINGS W37

10'-1½"

U/SIDE DECK

W2 END

W1 END

LINK CONNECTION

END VIEW A-A

WEIGHT OF FLOAT.

22 TONS COMPLETE

WITH TRANSOM AND BRIDGE BEARINGS.)

MARKING PLAN OF STEEL FLOAT MARK II

SKETCH 16

PAGE 29

TABLE OF COMPONENTS FOR ONE STEEL FLOAT MARK II.

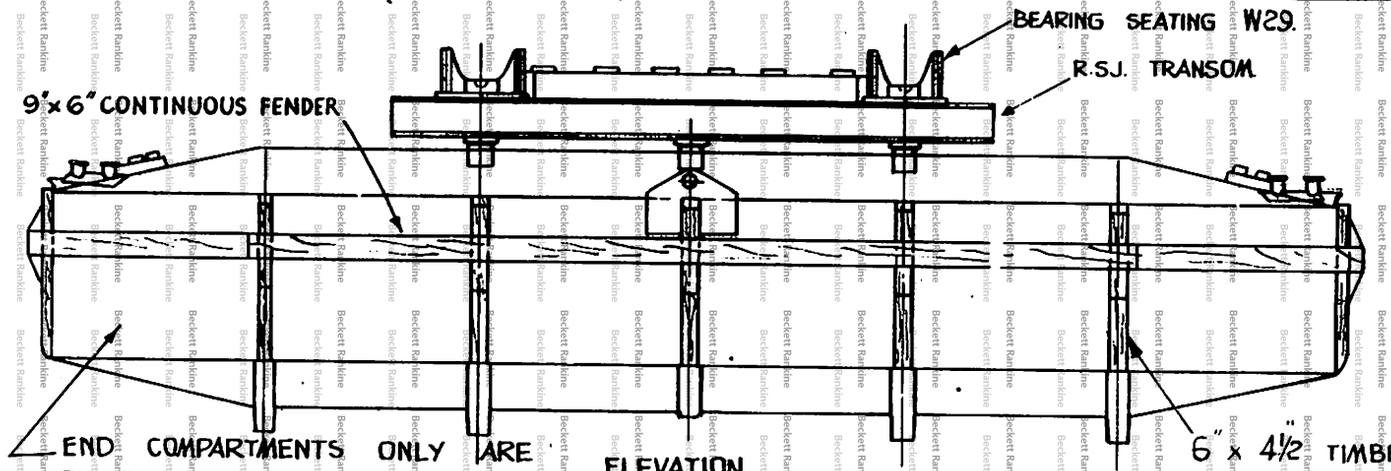
FOR GENERAL ARRANGEMENT SEE SKETCH NO. 16.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.54	1	Float unit complete with cork seated hatch, cable grips and all deck fittings.
W.55	1	Float unit complete with cork seated hatch and all deck fittings.
W.56	1	Float unit complete with cork seated hatch, and all deck fittings.
W.57	1	Float unit complete with cork seated hatch and all deck fittings to pair with W.56.
W.58	1	Float unit complete with cork seated hatch and all deck fittings to pair with W.55.
W.59	1	Float unit complete with cork seated hatch, cable grips and all deck fittings to pair with W.54.
W.60	1	Link plate.
W.116	12	Hand rail standard.
W.117	812	Square washers x 1/4" thick.
W.118	2	Hardwood bottom fenders 12" x 6" x 4'0" long.
W.131	1	Float unit complete with handwheel and screw, pins etc.
W.132	1	Float units complete with handwheels and screws, pins etc.
	16	7/8" dia. H.R.H. Bolts x 3" long.
	406	3/4" dia. H.R.H. Bolts x 1.3/4" long.
	3/4"	dia. C.S.K.R.H. Bolts x 1.3/4" long
	16	7/8" dia. ordinary washers.
	4	2" circ. Manilla Rope x 12'0" long, ends whipped.
	2	2" circ. Manilla Rope x 50'0" long, ends whipped.
	16	1" dia. H.R.H. Bolts x 7" long.
	16	1" dia. Ordinary Washers.

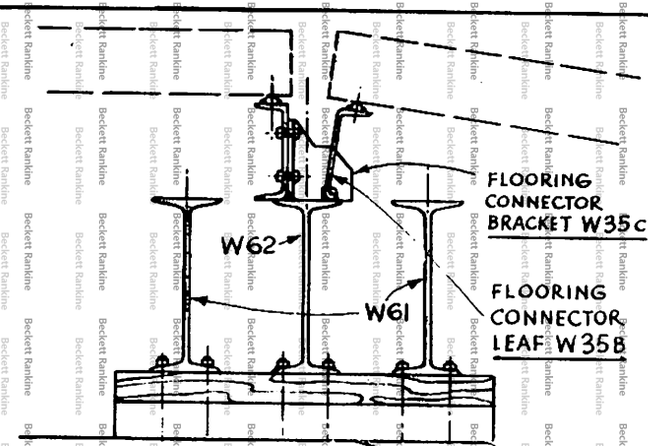
EQUIPMENT CARRIED IN STARBOARD END COMPARTMENT.

W.63	1	Rope grip.
	1	Yale pul-lift, 3tons capacity
	1	Rat tail spanner for 1.1/8" dia. nuts.

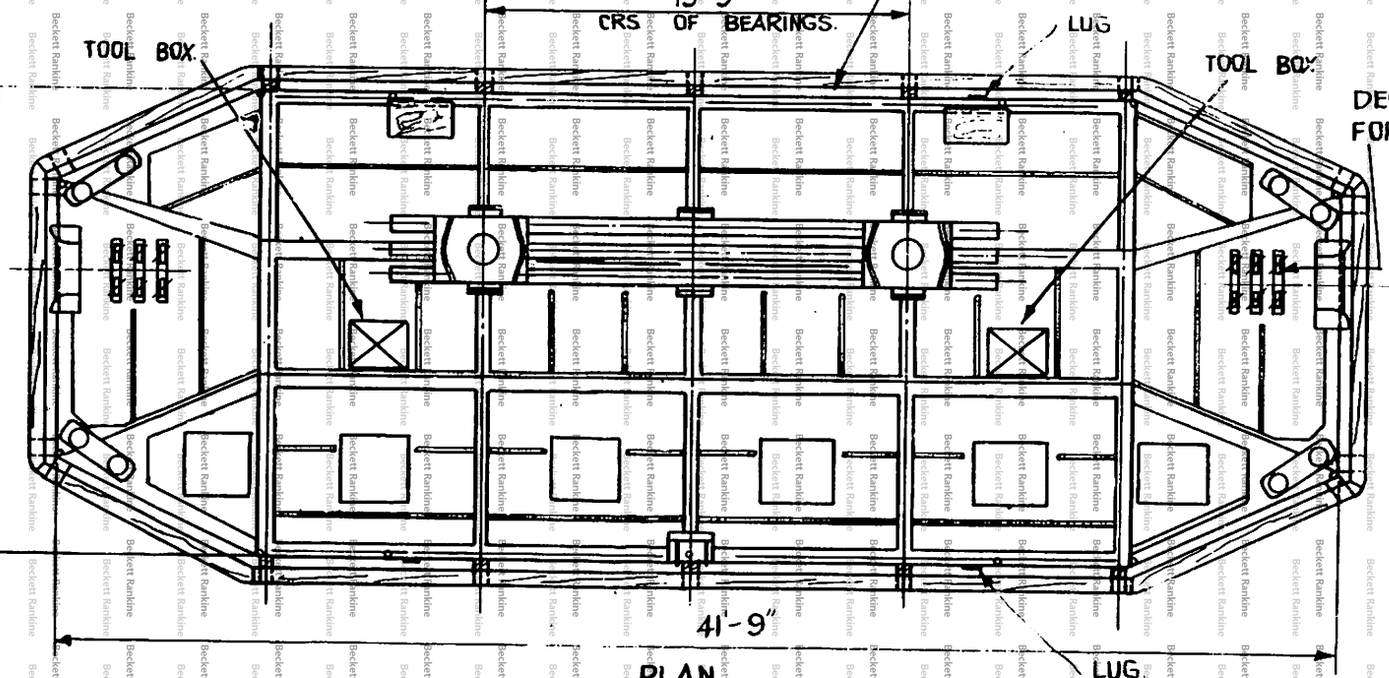
NOTE:- Bolts are not requirements.



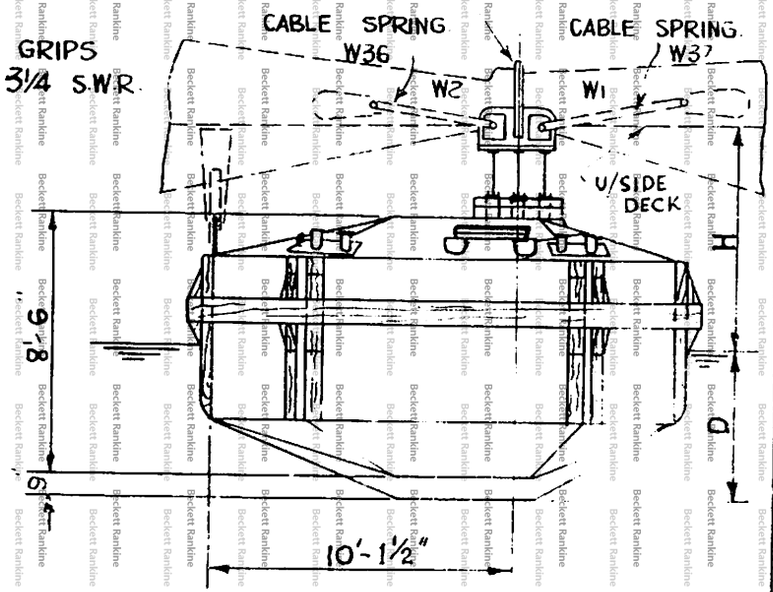
ELEVATION.



DETAIL OF MOVING LEAF



PLAN.



END ELEVATION

SEE TABLES 23 & 24 FOR DRAUGHT UNDER VARIOUS LOADING.

GENERAL ARRANGEMENT OF CONCRETE FLOAT FOR MARK I SPANS (P.P.6.)

WT. OF FLOAT (LESS RANSOM) 45 TONS

SCHEDULE OF COMPONENTS FOR ONE SET OF ROCK INSERTS.

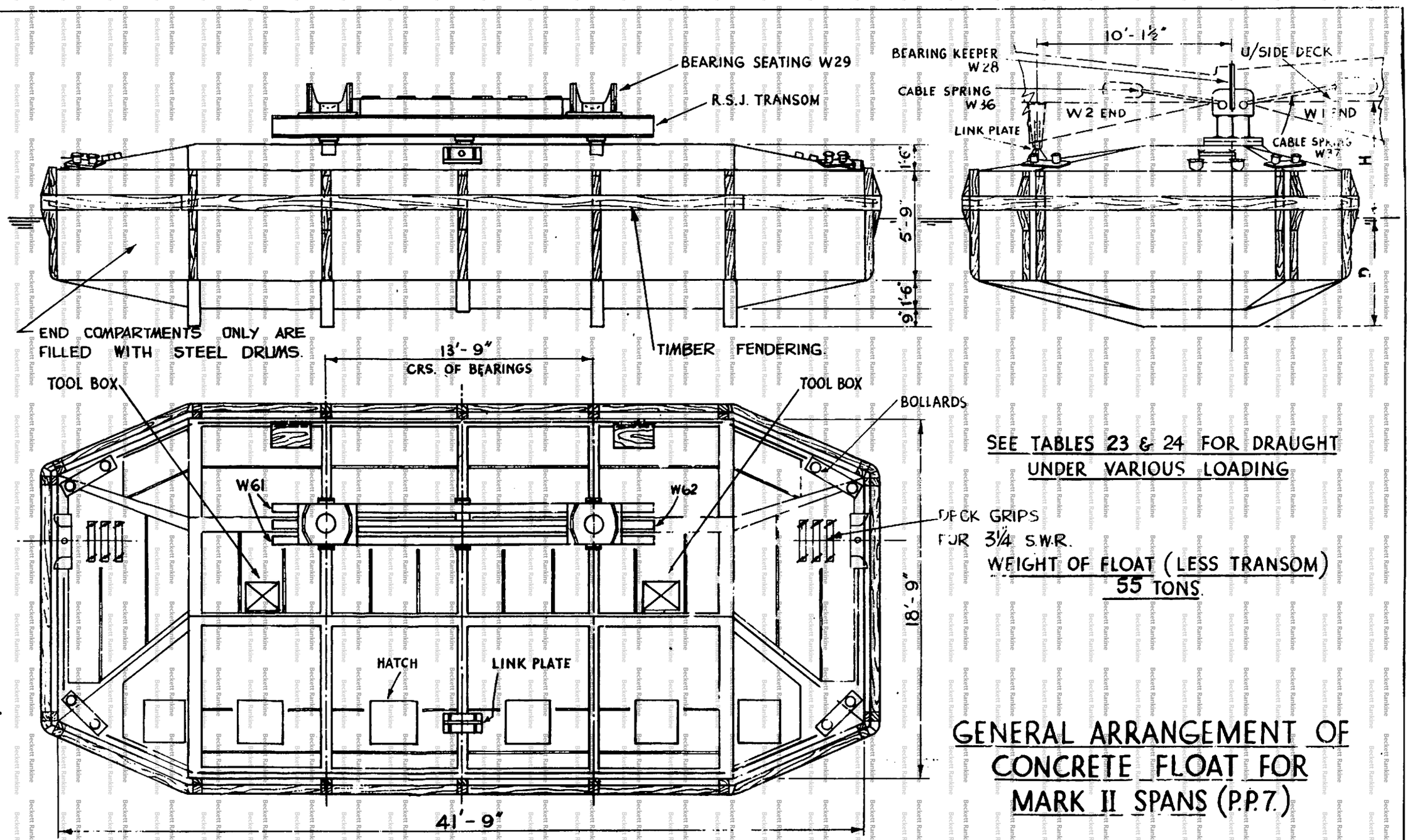
A. FOR STEEL FLOAT MK. I.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.117	200	Square washers
W.129	4	Timber packs
W.131	1	Float unit
W.132	1	Float unit
W.133	24	Guide unit
W.138	180	13/16" Dia. Drift Pins
W.158	3	Rock Anchors
W.164	8	2" circ. S.W.R.Grommet Strops. 2'6"lg.with thimble at each end
V.1	4	Column units 12ft.long
V.3	12	Column units 4ft. long
V.26	4	Screw Guides
V.27	4	Adjustable screw
V.31	4	Driving tube - 14ft. long
V.54	4	Slab foot (complete with 1-V.54A,2-V.54B,3-V54C, 3-V.54D, & 3-V.54E each)
	3	Underwater beehives
	2	7.1/2 ton Shackles
	128	3/4"dia.Bolts x 2.1/4"lg.
	180	3/4"dia.Bolts x 2" long
	100	3/4"dia.Bolts x 1.3/4"lg.
	20	3/4" C.S.K.R.H.Bolts x 1.3/4" long
	308	3/4"dia. Round Washer
	8	3Sheave swivel blocks for 3" cordage
	4	3" circ.Manilla falls 75ft. long

B. FOR STEEL FLOAT MK. II.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.129	4	Timber packs
W.133	24	Guide units
W.138	180	13/16"dia.Drift Pins
W.158	3	Rock Anchors
W.164	8	2"circ.S.W.R. Grommet strops 2'6"lg. with thimble at each end
V.1	4	Column unit 12ft.long
V.3	12	Column unit 4ft.long
V.26	4	Screw.guides
V.27	4	Adjustable screw
V.31	4	Driving tubes 14ft.long.
V.54	4	Slabfoot (complete with 1-V.54A,2-V.54B, 3-V.54C,3-V.54D and 3-V.54E each)
	3	Underwater beehives
	2	7.1/2 ton Shackles
	128	3/4" dia. H.R.H.Bolts x 2.1/4" long
	8	3 Sheave swivel blocks for 3" cordage
	4	3"circ.manilla falls 75 ft. long

NOTE:- See Sketch No.25 for Arrangement.
Bolts are net requirements.



SEE TABLES 23 & 24 FOR DRAUGHT UNDER VARIOUS LOADING

DECK GRIPS FOR 3¼ S.W.R.

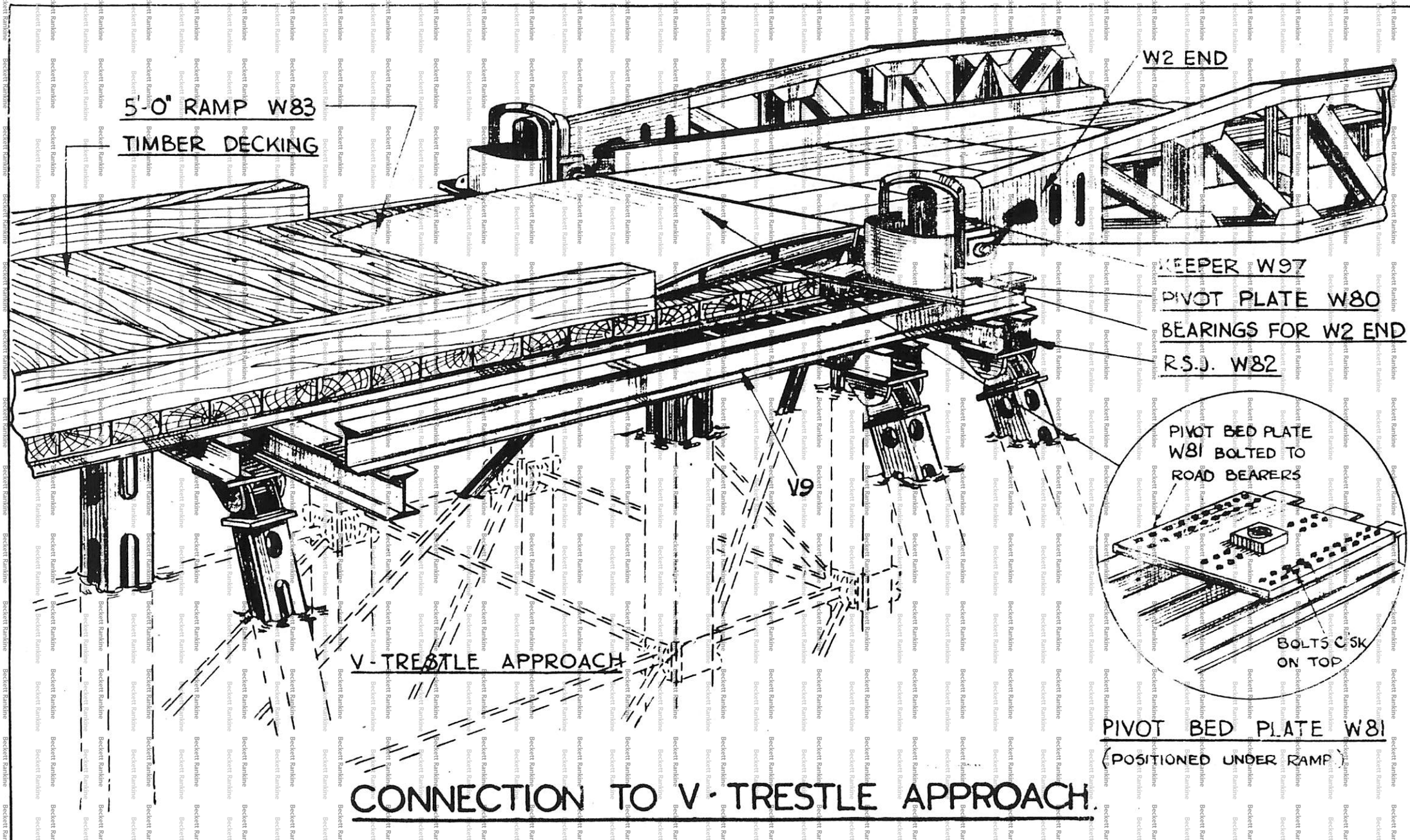
WEIGHT OF FLOAT (LESS TRANSOM) 55 TONS.

GENERAL ARRANGEMENT OF CONCRETE FLOAT FOR MARK II SPANS (P.P.7.)

SKETCH 18

SCHEDULE OF SMALL TOOLS ETC. CARRIED ON ONE CONCRETE FLOAT.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.63	1	1 Rope grip
	1	Yale Pul-lift, 3 Tons capacity
	1	1.1/8" Spanner
	1	1.1/2" circ. Manilla life line 12 ft. long, hook on one end and loop on the other.
	1	Key for lifting device on main cover and control plug.
	1	Set of keys for lifting main cover
	1	Spanner for unlocking screws and tightening fixing down bolts
	1	Tin of graphite grease - 7 lbs.



CONNECTION TO V-TRESTLE APPROACH.

SKETCH 19. PAGE 35

SCHEDULE OF COMPONENTS FOR ONE SHORE RAMP FLOAT.

FOR GENERAL ARRANGEMENT SEE SKETCH NO.6.

UNIT MARKS.	NO. OFF.	DESCRIPTION.
W.28A	2	Bearing keeper
W.28B	4	1/16"thick liner
W.43A	1	Outer float unit (welded field joints necessary if dispatched in 3 parts)
W.44A	1	Centre float unit (welded field joints necessary if dispatched in 3 parts
W.45A	1	Centre float unit (welded field joints necessary if dispatched in 3 parts)
W.46A	1	Outer float unit (welded field joints necessary if dispatched in 3 parts)
W.47A	4	Bent tube davits
W.116	22	Tubular hand rail standards
W.122	2	Rocking fillets
W.123	10	7/8"dia.H.R.H. black bolts x 5"lg with 3/16"split pin
W.162	120	7/8"dia.H.R.H.black bolt x 4.1/4"lg with 3/16"split pin
W.163	2	4"circ S.W.R.Shore anchorages complete with thimbles (No.6 reqd.for poor ground)
W.165	4	S.L.U.G. Boats
W.167	4	Lifting bars
E.343	16	Angle pickets (No.8 reqd.per shore anchorage)
	2	5-Ton winches
	4	Seating timbers for S.L.U.G. Boats.

NOTE:- Bolts are not requirements.

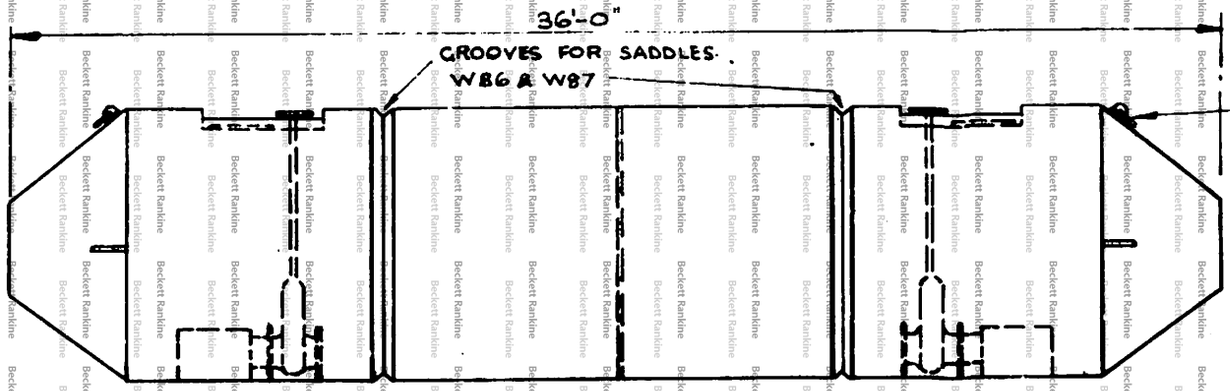
UNIT MARKS.	NO. OFF.	DESCRIPTION.
	8	1/2"dia.H.R.H.Bolts x 8" long
	8	1/2"dia.Round Washer
	120	7/8"dia.Round Washer
	4	2"circ.Manilla Cordage x 35ft. Long.
	4	2"circ.Manilla Cordage 12ft. long
	8	2 Sheave pulley blocks for 3" cordage
	4	3"circ.Manilla fall x 80ft. long
	2	2"circ.Manilla lashing x 100ft. long
	2	2"circ.Manilla lashing x 15ft long
	2	2 sheave 20-ton blocks for 3"circ.S.W.R.
	2	3 sheave 20-ton blocks for 3"circ. S.W.R.
	2	3"circ. S.W.R. x 400 ft. long

Additional equipment to be carried on Shore Ramp Floats of Towing Train M.

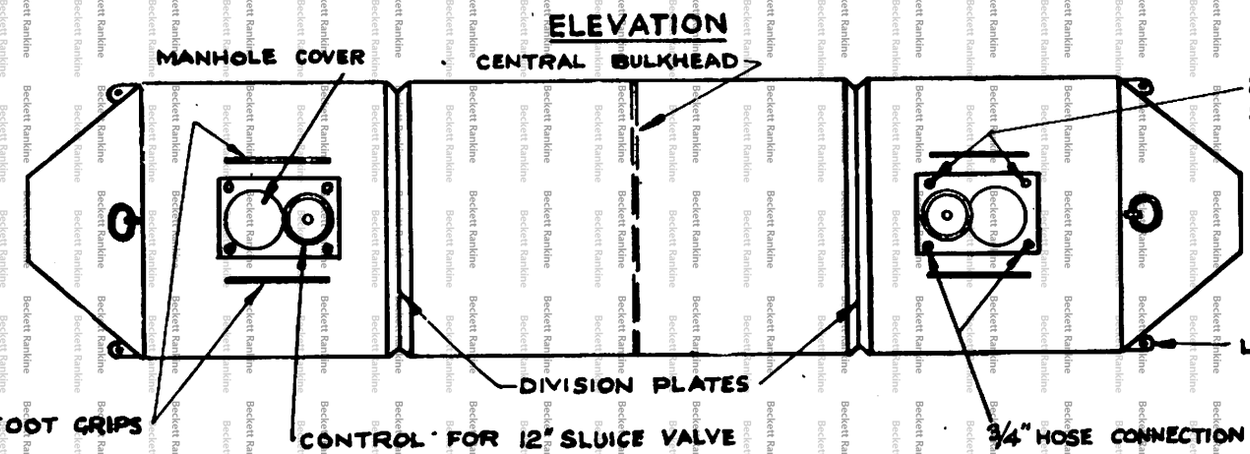
W.139	1	20 Rung ladder
W.140	2	Timber chock
W.141	2	Timber chock
	2	2"circ.S.W.R. x 18ft.lg.
	6	Bulldog clips x 2" circ. S.W.R.

For field welding of float units and extra material required see Drgs.No.466A/S-26 & 467A/S-26.

20 Ton blocks are supplied with Shackle attached.



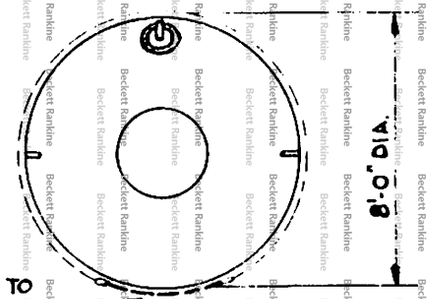
ELEVATION



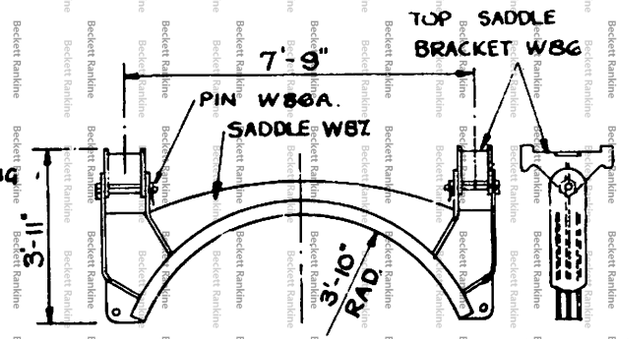
PLAN

WEIGHT LESS SADDLES 5½ TONS.

GENERAL ARRANGEMENT OF ERECTION TANK.



END ELEVATION



DETAILS OF SADDLE.

SCHEDULE OF COMPONENTS FOR 1 ERECTION TANK & ERECTION FITTINGS.

NO. REQUIRED PER TOWING TRAIN.

UNIT MARK.	DESCRIPTION.	A1	B1	C1	D1	E1	F1	G1	H1	J1	K1	L1	M	A2	B2	C2	D2	E2	F2	G2	H2	J2	K2	L2
W.74A	Steering Vanes	-	16	16	16	-	16	16	-	16	-	-	-	-	16	16	16	-	16	16	-	16	-	-
W.75A	Stirrups	-	32	32	32	-	32	32	-	32	-	-	-	-	32	32	32	-	32	32	-	32	-	-
W.76A	1"dia.Pin	-	16	16	16	-	16	16	-	16	-	-	-	-	16	16	16	-	16	16	-	16	-	-
W.77A	3"circ.Racking spring	20	24	24	24	20	24	8	4	8	4	4	-	20	24	24	24	20	24	8	4	8	4	4
W.85	Holding plate	-	2	2	2	-	2	2	2	2	2	-	-	-	2	2	2	-	2	2	2	2	2	-
W.86	Top saddle bracket	-	4	4	8	-	4	4	4	4	4	8	-	-	4	4	8	-	4	4	4	4	4	8
W.86A	Saddle pin	-	4	4	8	-	4	4	4	4	4	8	-	-	4	4	8	-	4	4	4	4	4	8
W.87	Bottom saddle bracket	-	2	2	4	-	2	2	2	2	2	4	-	-	2	2	4	-	2	2	2	2	2	4
W.88	Clamps	-	4	4	12	-	4	4	4	4	4	8	-	-	4	4	12	-	4	4	4	4	4	8
W.89	Eye bolt 7'0" long	-	4	4	12	-	4	4	4	4	4	8	-	-	4	4	12	-	4	4	4	4	4	8
W.90	Eye bolt 8'3" long	-	4	4	12	-	4	4	4	4	4	8	-	-	4	4	12	-	4	4	4	4	4	8
W.91	3" S.W.R.with 4 ton shackle	-	4	4	8	-	4	4	4	4	4	8	-	-	4	4	8	-	4	4	4	4	4	8
W.92	Erection tank	-	1	1	2	-	1	1	1	1	1	2	-	-	1	1	2	-	1	1	1	1	1	2
W.120	Screwed rods for W.85	-	8	8	8	-	8	8	8	8	8	-	-	-	8	8	8	-	8	8	8	8	8	-
W.130	Timber Transom	-	1	1	1	-	1	1	1	1	1	-	-	-	1	1	1	-	1	1	1	1	1	-
W.142	10ft. Endless strop	2	3	3	4	2	3	3	1	3	1	-	-	2	3	3	4	2	3	3	1	3	1	-
W.144	Timber pack for erection tank	-	2	2	4	-	2	2	2	2	2	4	-	-	2	2	4	-	2	2	2	2	2	4
W.145	Timber pack on top of saddle	-	-	-	2	-	-	-	-	-	-	4	-	-	-	-	2	-	-	-	-	-	-	4
W.146	Stirrup extension	-	-	-	16	-	-	-	-	-	-	24	-	-	-	-	16	-	-	-	-	-	-	24
W.148	Shuttle skid	1	1	1	-	1	1	1	1	1	1	-	-	1	1	1	-	1	1	1	1	1	1	-
WH.168	Timber pack on top of saddle	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	-	2	2	2	2	2	-
	3"circ.Manilla fall-600ft.lg.	-	1	1	1	-	1	1	1	1	1	-	-	-	1	1	1	-	1	1	1	1	1	-
	Snatch block for 3"circ.cordage	2	3	3	1	2	3	3	1	3	1	-	-	2	3	3	1	2	3	3	1	3	1	-
	2.1/2"circ.Manilla cordage x 30 ft. long	-	16	16	16	-	16	16	-	16	-	-	-	-	16	16	16	-	16	16	-	16	-	-
	7.1/2 Ton shackle	20	24	24	24	20	24	8	4	8	4	4	-	20	24	24	24	20	24	8	4	8	4	4
	10.1/4 Ton turnbuckle	20	24	24	24	20	24	8	4	8	4	4	-	20	24	24	24	20	24	8	4	8	4	4
	Bulldog clips for 3" circ.S.W.R.	20	24	24	24	20	24	8	4	8	4	4	-	20	24	24	24	20	24	8	4	8	4	4
	1" circ.Throwing line 100ft.lg with weight	-	1	1	1	-	1	1	1	1	1	-	-	-	1	1	1	-	1	1	1	1	1	-
W.149	Tool Box Complete	-	1	1	1	-	1	1	1	1	1	-	-	-	1	1	1	-	1	1	1	1	1	-

TABLE 13.

PAGE 38.

SCHEDULE OF COMPONENTS FOR 1 SET OF TRUMPET EQUIPMENT.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.84	1	Trumpet)
W.84A	1	Trumpet) To pair.
W.129	4	Timber Packs
W.153	2	1.1/2" circ.S.W.R.16ft. long with thimbles,strainer and 4 bulldog clips each.
W.164	4	2" circ.S.W.R. grommet strops 2'6" long with thimble each end.
V.2	2	Column units 8ft. long.
	10	3 Ton shackles.
	4	3 sheave blocks for 3" circ.cordage with hooks for 3 ton shackles.
	2	Single sheave snatch blocks.
	20	3/4" dia.H.R.H.Bolts x 4" long.
	30	3/4" dia.H.R.H.Bolts x 4.1/2" long.
	2	3" circ. Manilla falls x 100ft. long.
	2	2" circ.Manilla cordage x 35ft. long.
	2	2" circ.Manilla Cordage x 10 ft. long.
	2	2" circ. Manilla cordage x 50 ft. long.

NOTE:- No. of Bolts are not requirements.

SCHEDULE OF COMPONENTS FOR 1 PIVOT PLATE & RAMP.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.80	1	Pivot Plate
W.83	1	5ft. Ramp
W.97	2	Keeper covers for outer bearing
W.121	1	Pivot bed plate
	1	Bolt gun
		Refills
	30	5/8" Dia.special bolts suitable for bolt gun.
	30	5/8" Round Washer
	1	5/8" Spanner to B.S.S. 916.
	30	3/4" dia. C.S.K.R.H. Bolts x 2.1/2" long.
W.81	1	Pivot bed plate (used only where pivot plate rests on a V-type trestle approach)

NOTE:- Only one bolt gun per telescopic End span.

No. of bolts are net requirements.

SCHEDULE OF SMALL TOOLS CARRIED IN 1 TOOL BOX, W.149

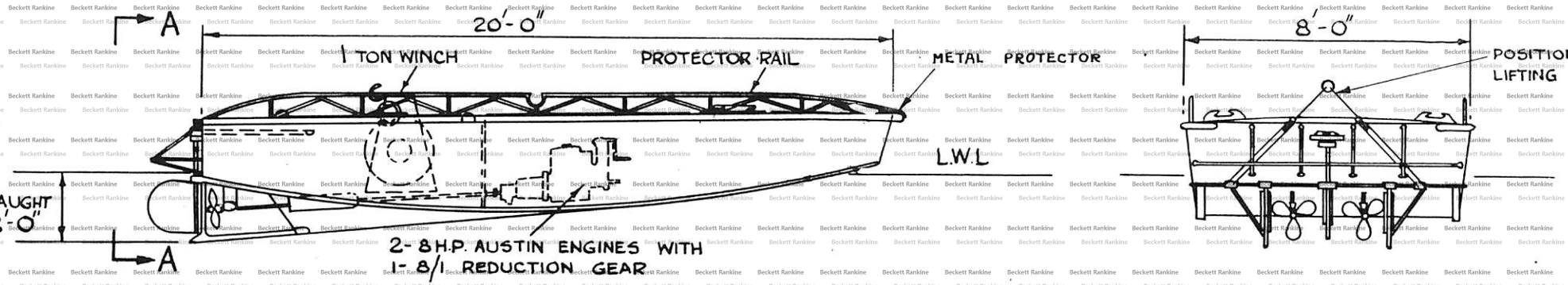
NOTE:- Tool box is fastened to outside of Main girder at rear of link. It contains equipment for coupling operation.

UNIT MARK	NO. OFF.	DESCRIPTION
W.23	14	7/8" dia. H.R.H. Bolts x 4.1/4" lg.
W.24	14	Spring Washer
W.25	24	Hemispherical Washer
W.31	6	7/8" dia. H.R.H. Bolts x 2.3/4" lg. with 3/16" split pin
W.33	24	7/8" dia. H.R.H. Bolts x 3" lg. with 3/16" split pin
W.34	6	Ferrules
W.51A	3	3/4" bore tubular hand spikes
W.52	8	Lifting hooks
W.64	1	3/4" box spanner with handle
W.65	1	3/4" box spanner
W.66	2	Tommy bars
W.93	80	Spring Washer
W.94	12	7/8" dia. H.R.H. Bolts x 2" lg. with 3/16" split pin
W.95	1	Box spanner for 2.1/2" dia. Nut
W.137	2	Relief wedges
	1	7/8" Rat tailed spanner to B.S.S. 916
	20	3/16" Split pins
	4	1.1/2" circ. lashings - 15 ft. lg.
	2	Hand axes
	1	Rocket pistol with lines and refills
	1	7/8" cold chisel
	1	Grease gun Type "4H"
	1	Grease gun Type "4SD/H"
	1 tin	14 lb. grease
	1	Sheath knife
	2 lbs.	Spun yarn
	2 lbs	Copper wire
	26	7/8" H.R.H. Bolts x 3" lg.) For connection of
	10	7/8" C.S.K. Bolts x 3" lg.) Keeper W.28 to W.29
	40	7/8" H.R.H. Bolts x 2.1/4" lg.) For connection of
	15	7/8" C.S.K. Bolts x 2.1/4" lg.) Keeper W.27 to W.2
	100	7/8" Round washer
		Extra units to be carried in tool box on Rock Insertion Links -
V.33A	1	Capstan Head
V.34	2	Capston Bars
		Equipment to be carried in free W.1 box ends of links in greasy sandbags, lashed securely -
W.38	5	Machined pins
W.39	10	Half Washers
	12	3/8" Copper rivets x 2.1/2" lg.
W.119	2	3/8" cup-head rivet snaps
W.147	2	Pin lever
	2	3 lb Hammer
	1	7/8" Rat tailed spanner to B.S.S. 916.

NOTE:- Use spare trumpet tackles for lateral control when coupling links.

SCHEDULE OF TOOLS ETC. CARRIED ON 1 S.L.U.G. BOAT.

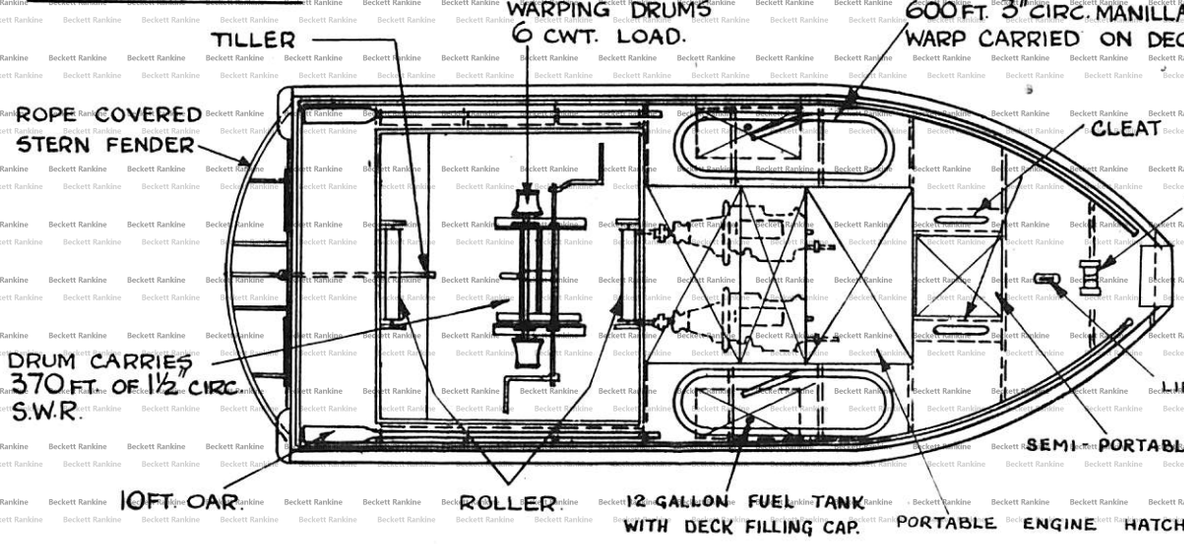
UNIT MARK.	NO. OFF.	DESCRIPTION.
	2	10 ft. Oars
	1	Winch rope 1.1/2" circ. 370 ft. long.
	1	Bailer 9"
	2	80 lbs. C.Q.R. Anchor
	2	3" Circ. Manilla Warp 600 ft. long.
	1	Set engine accessories(plug,spanner etc..)
	1	Petrol filler
	1	Spare winch handle
	1	Lifting strop
	1	14 lb. Hammer
	1	Boat hook
	1	8" Shifting spanner for bulldog clips.



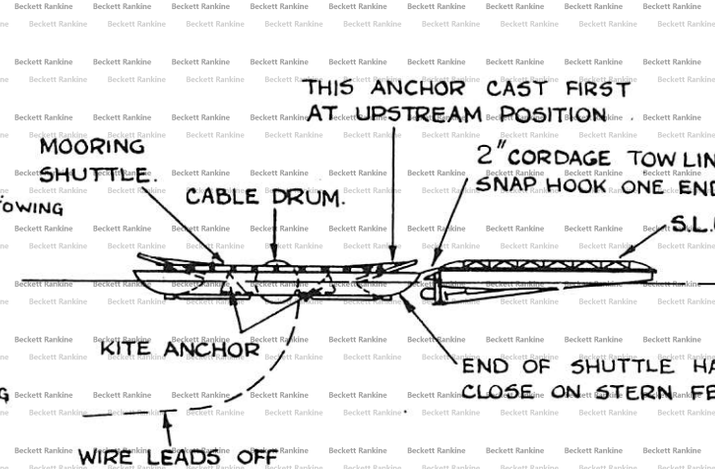
OUTBOARD ELEVATION

VIEW ON A-A

CONSTRUCTION IN 3/8" RESIN BONDED 3 PLY WOOD



PLAN



ARRANGEMENT FOR TOWING MOORING SHUTTLE.
(NOTE CLOSE TOW POSITION.)

GENERAL ARRANGEMENT OF S.L.U.G. BOAT. W165.

SKETCH 21.

PAGE 43.

TABLE 18. PAGE 44.

SCHEDULE OF EQUIPMENT CARRIED ON ONE MOORING SHUTTLE.

UNIT MARK.	NO. OFF.	DESCRIPTION.
W.115A	1	Cable drum with mooring W.70A or W.71A
W.124B	2	Kite Anchors
W.126B	4	1.3/4" dia. Machined Pin
W.127B	6	Soft iron keeper
W.157	2	Mooring links
	1	Sheath knife
	2	10ft. Oars
	4	1" circ.Manilla lashing - 10ft. long
	1	3 lb. Hammer
	1	1.1/2"circ. Manilla lashing 100ft. long.(used for lashing shuttles to towing links).

NOTE:-
RELEASE THIS ANCHOR FIRST WHEN SHUTTLE MUST BE MOVING DOWNSTREAM OVER THE ANCHOR POSITION.

NOTE:- DRUM LOADED SO THAT WIRE LEADS OFF THIS WAY.

UPSTREAM ANCHOR

DOWSTREAM ANCHOR

TOWING DOLLY

STOWED POSITION OF KITE ANCHOR

L.W.L.

1'-2"

HINGE

GUIDE

ANCHOR RELEASING PLATFORM

OUTBOARD ELEVATION

SECTION AMIDSHIPS.

26'-9"

NOTE:- TO RELEASE ANCHORS, CUT LANYARDS WITH A SHARP KNIFE.

FLOAT

HANDRAIL

HAND-BRAKE

REMOVABLE KEEPER FOR DRUM AXLE

TOOL BOX

WIRE SAVE ALL

DECKING

TOW THIS WAY

CABLE DRUM

LAUNCH THIS WAY

6'-1"

4'-3"

6'-1"

TOWING LOOP

NOTE— WHEN STOWED ON DECK OF TOWING LINK, THIS END FACES ASTERN, AND TOWARDS ERECTION TANK

KITE ANCHOR ON ANCHOR RELEASING PLATFORM.

CABLE DRUM SADDLE

BOTTOM FLAP RELEASE LANYARD (LASHED TO HANDRAIL).

FLOAT. (CONSTRUCTED OF 3/8" TH. PLYWOOD)

PLAN

NOTE.- SHUTTLE CANNOT OPERATE IN LESS THAN 6 FT. DEPTH OF WATER, OWING TO CLEARANCE REQUIRED FOR BOTTOM FLAP.

GENERAL ARRANGEMENT OF MOORING SHUTTLE - MARKED W166

23. Shore Ramp Float

This is special shallow draught equipment of very light construction. It is common for both Mark I & Mark II equipment, and allows the inshore end of the bridge pier to be beached high and dry. Sketch 6 shows the general arrangement. The float is formed of four sections, each 80 ft long, and 7'6" wide, each section being completely welded and watertight. Sluice valves are provided in each section at the seaward end, so that it is possible to settle the float on the sea bed in bad weather, and avoid damaging effects due to pounding. The sections are bolted together, using 7/8" bolts W162 and 3/16" split pins.

24.

At the seaward end, provision is made to receive the W1 box end bearings of a standard span. A W2 box end cannot be seated on the float. Cable Springs W37(Painted RED) keep the W1 box end securely located. Flooring connections are made using rocking fillets W122, with the flat side downwards; bolts W123 with 2 hemespherical washers W25, spring washer W24 and split pin are used. As for connections of flooring to transoms, the nut is tightened against the split pin. Dished covers W26, are required at this flooring joint. Special bearing keepers W28A are provided. They are similar to W28, except that the width between the jaws is increased, and liners are supplied. This allows for inequalities in workmanship on the float sections.

25.

The shore ramp float is provided with davits to handle the S.L.U.G. boats, handrail standards as for steel floats, and two 5ton winches with warping drums. These winches assist in warping ashore, and used in conjunction with two 20 ton tackles, are effective when working against the shore anchorages in hauling the endof the bridge up the beach to eliminate "water gap". The weight of shore ramp float complete is 45 tons. The complete list of componenets is given on Table 12.

26.

To assist in mass production, float sections are sometimes supplied in three pieces which must be field welded together, before assembly can commence. Great care should be taken in obtaining correct alignment before welding, and an air pressure test for leaks should be arranged, before launching 3 lb-sq.inch, air pressure should be applied, and a soap solution used over all the welded joints, the leaks being welded up as required. A visual inspection without this test will not be satisfactory.

27 Pivot Plate & Ramp

The use of this feature allows the connection of bridge pier to pier head or any flat decked structure. The arrangement of connection to pier head is shown on Sketch 5.

28

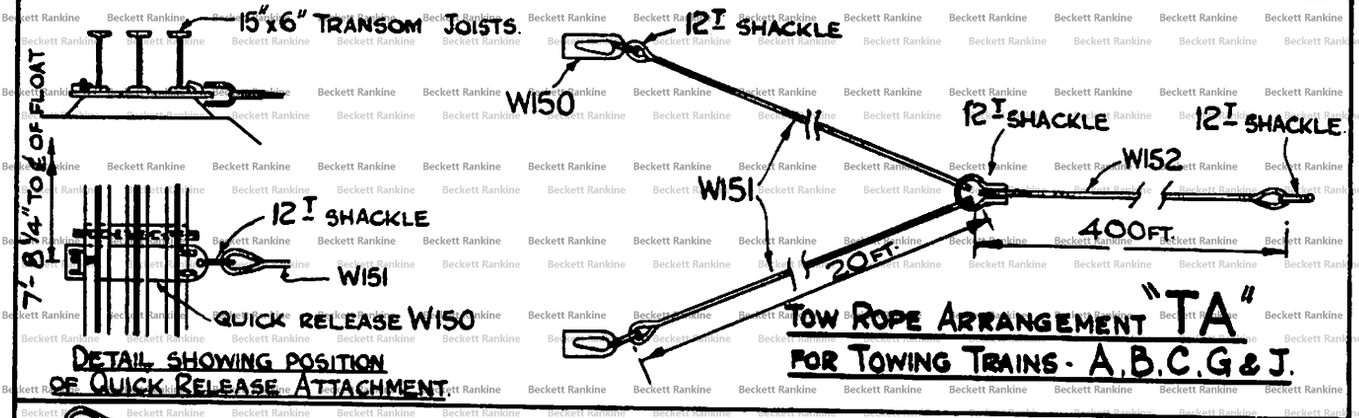
The pivot plate W80 can accommodate W2 box ends of girders, but not the W1 box end, and allows an out of squareness of 6° each side of the mean i.e. The angle of bridge pier to pier head unit, should lie between 84° and 96°. Cable Springs W36 keep the W2 box end securely located in position. Keepers W97 prevent upward displacement and allow the pivot plate to be carried on the end of the bridge span for erection purposes. To locate the pivot plate on a pier head unit, the pivot bed plate W121 is used. It can be fastened down to the deck by means of the bolt gun, or by means of welding if a more permanent attachment is required. It is positioned with one of its 3'6" edges flush, with the side of the pontoon, and the pivot plate is simply dropped in position on top, so that the 3" projection on W121, locates in the rectangular central slot in W.80

29.

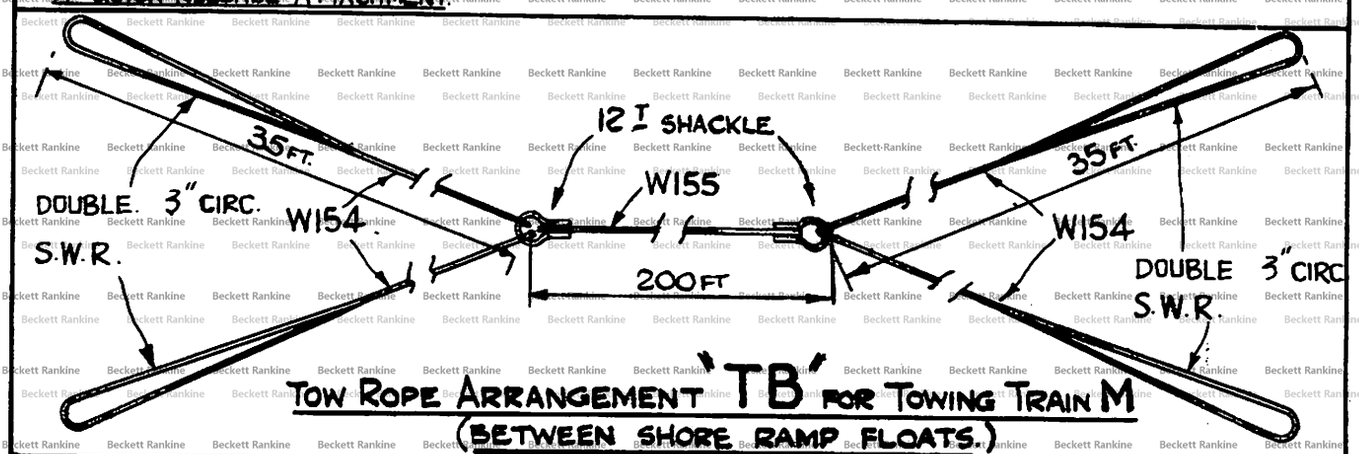
The ramp W83 simply hooks into the end flooring units of the bridge and takes a bearing on pivot plate and pontoon deck. No cover is required at this flooring joint.

30

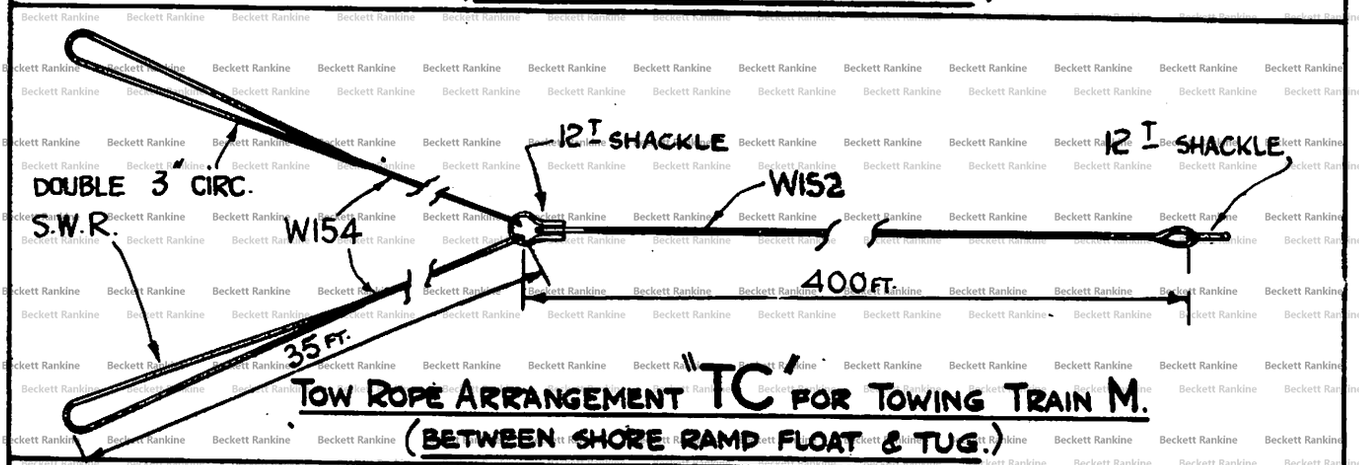
Under certain conditions, it may be desirable to make a connection between floating bridge equipment, and a V-trestle pier. In this case the pivot bed plate W121, is replaced by W81, and trestle transoms W82 are required. The method of forming this connection is shown on Sketch 18



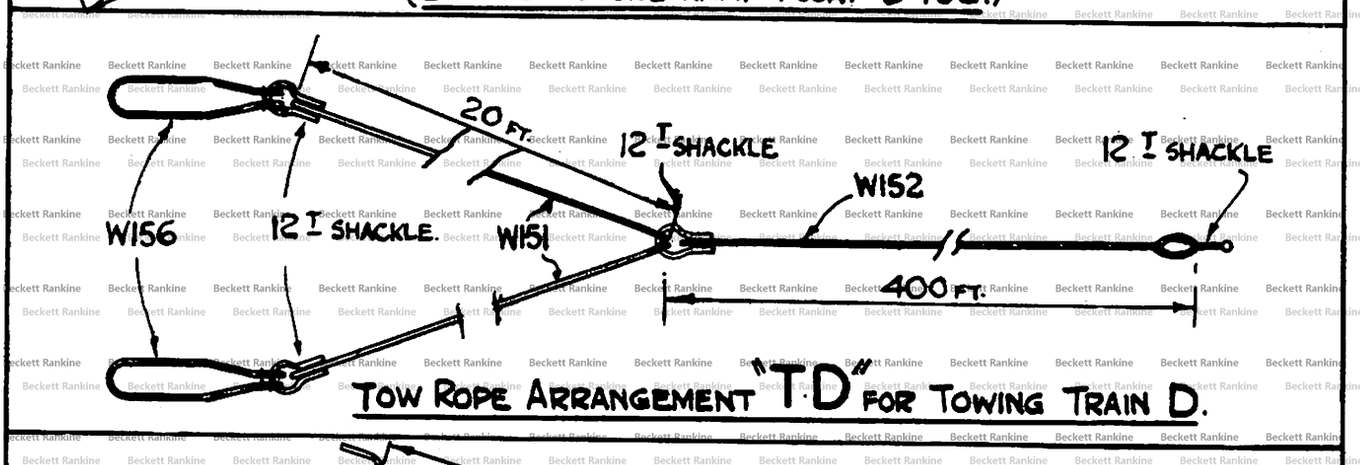
TOW ROPE ARRANGEMENT "TA" FOR TOWING TRAINS - A, B, C, G & J.



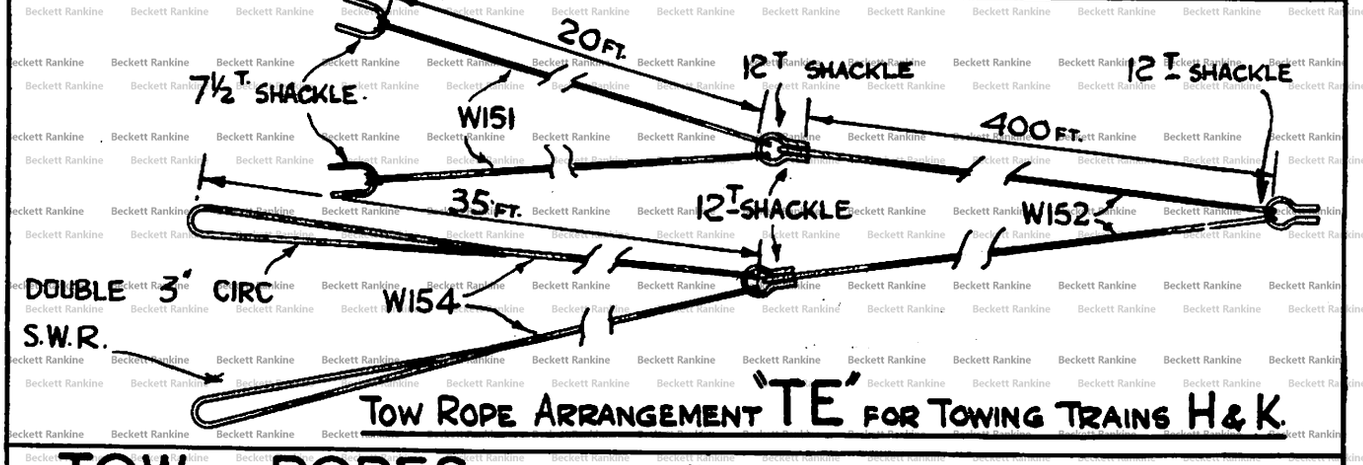
TOW ROPE ARRANGEMENT "TB" FOR TOWING TRAIN M (BETWEEN SHORE RAMP FLOATS.)



TOW ROPE ARRANGEMENT "TC" FOR TOWING TRAIN M. (BETWEEN SHORE RAMP FLOAT & TUG.)



TOW ROPE ARRANGEMENT "TD" FOR TOWING TRAIN D.



TOW ROPE ARRANGEMENT "TE" FOR TOWING TRAINS H & K.

TOW ROPES. ALL 4" CIRC. S.W.R UNLESS NOTED.

The components for pivot plate and ramp are listed on Table 15. For detailed description and application of V-type steel trestle equipment, see "Notes on V-type steel trestle equipment for marine piers, wharfes and repairs to damaged quays".

31. Erection Tank

This unit allows quick coupling of one span to another. It consists of a light steel cylinder with a central watertight bulkhead, forming two compartments each divided in two by a bulkhead open at the bottom only. A large sluice valve with bottom entry is situated towards each end, and air outlets from each of the four compartments ensure efficient control of flooding. Sketch 20 shows the arrangement of this unit which is 8ft dia, and 36 ft. long. It can be transported by sea, road, rail or canal.

32

The erection tank presents an exterior clear of all projections and supports the end of a span by means of two saddles, which allow sufficient movement in a seaway. For the method of operating the erection tank, see Chapt. III, Section 12. The weight of the erection tank is 5½ tons. For list of components, see Table 13.

33. Erection Trumpet Equipment.

This equipment is used in conjunction with the erection tank and allows the bearings of one span, to be quickly located, relative to the bearings of the span, in which they must be seated. i.e. it simplifies the operation of placing the W1 end inside the appropiate W2 end. The trumpets are hinged to allow vertical movement, but exercise a control over relative vertical movement, which becomes increasingly effective as the bearings are drawn closer together. Thus the trumpets automatically bring the bearings to such a position that cable springs are easily attached and then by flooding the erection tank, the bearings drop into their final position. Sketch 8 shows the arrangement of this equipment, and a detail of components, required for one set, is given on Table 14. For details of method of use, see Chapt. III, Section 12.

34 S.L.U.G. BOAT

The surf landing, under girder boat is shown on Sketch 21. This craft is of shallow draught, and is carried on the shore ramp float. The boat incorporates a 1 ton winch, with warping drums housed in the cockpit and is powered by 2-Austin 8 marine engines with reduction gear. It is not fast but capable of running lines ashore, kedging and passing lines from one towing link to another.

35

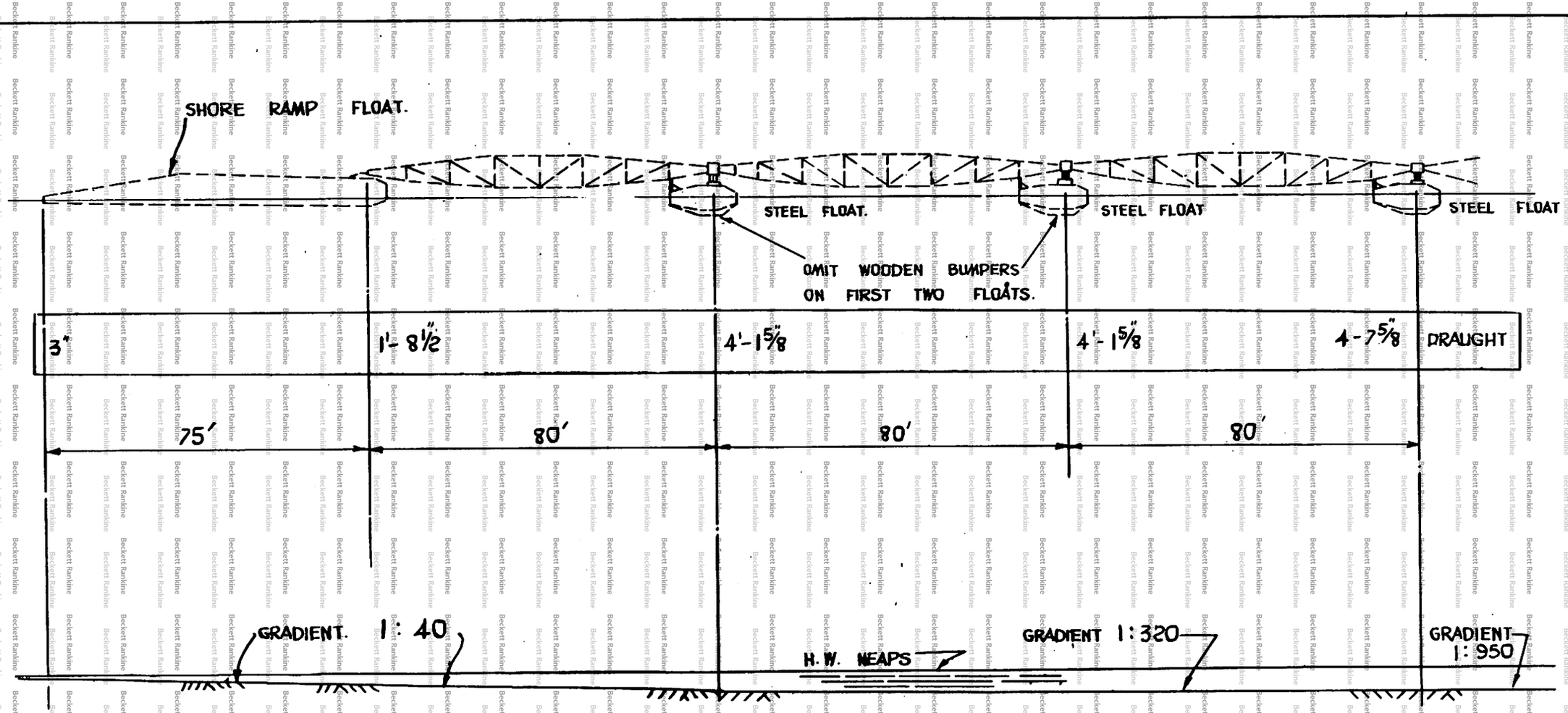
A valuable feature of construction enables the craft to motor under the bridge spans and at the same time, tow the mooring shuttle. The crew of two must of course, keep well down in the cockpit, and the shuttle must be towed "close" astern. The cockpit is watertight, and the boat cannot swamp. The weight of the S.L.U.G. Boat is 2 tons, and the list of accessories is given on Table 17.

36. Mooring Shuttle

The use of this equipment allows the simultaneous mooring of a number of bridge floats, the number depending upon the quantity of loaded shuttles available. The shuttle is illustrated on Sketch 22. It is essentually a dumb raft, formed of two long floats, and supporting between them, a wooden drum on which the mooring wire has been wound. In addition to the drum, the shuttle carries two "kite" anchors, which are housed at either end on a height bottom flap held in position by cordage lashings. The height above water level, including drum and anchors, is sufficiently small to allow easy passage under the bridge spans. Thus it is possible to quickly cast either anchor at any desired position, by simply cutting the lashing, securing the hinged bottom flap. By towing or hauling the shuttle downstream, the mooring wire is automatically unwound from the drum and laid without kinks, on the sea bed. A brake is provided to prevent the drum unwinding too fast, when operating in deep water.

37.

The loaded shuttle is carried on the bridge deck and launched down skids W148, on arrival at the site. The components comprising a loading



NOTE-
FLATTER BEACHES WILL RESULT IN BRIDGE FLOATS GROUNDING BEFORE SHORE RAMP FLOAT, RESULTING IN A LARGE WATER GAP.

LIMITING BEACH GRADIENT.

SKETCH 24.

shuttle, are given on Table 18. The weight of a loaded shuttle complete is 2.3/4 tons. The weight of the empty shuttle is 1 ton. Note the drum should be loaded so that the wire can lead down off the FORWARD side.

38 Moorings

The anchor supplied for use with this equipment, is the "kite" anchor W124B. Its weight is 6.1/2 cwt, and given a flat pull, it will be effective on most sea beds, with the exception of flat rock. This anchor has been tested in average holding ground, and found to resist a pull of 20 tons. The design is such that penetration and good holding power is obtained with a minimum of "drag" no matter which way the anchor falls. A drag of about 20 to 30 feet however, should be allowed and it is therefore essential that mooring should be given an initial H.W.Tension of 5 to 6 tons. Under this tension, the wires will strike the water surface about 20 ft from the end of the float.

39

Mooring wires are 3.1/4" circumference in all cases, and supplied in 1270 ft lengths i.e. Sufficient to completely moor one bridge float. The wire is supplied complete with end thimbles, and wound on a wooden drum W53. The weight of drum and cable is 1.1/4 tons and the buoyancy of the drum will NOT be sufficient to float it in water.

40.

For anchorage in rock anchor W158, is supplied. It is used in a hole blown by the 10 lb.bechive which can be operated underwater, if necessary. The anchor is simply a self grouting eye bolt. It is placed in the hole which should be about half full of water. The outer covering is slowly pulled back using the linen tabs, while the eye bolt is worked up and down, until finally the bolt is forced right home into the rock. A quick setting cement is used, which takes only 10 to 15 mins to harden, and gives full strength after 24 hours.

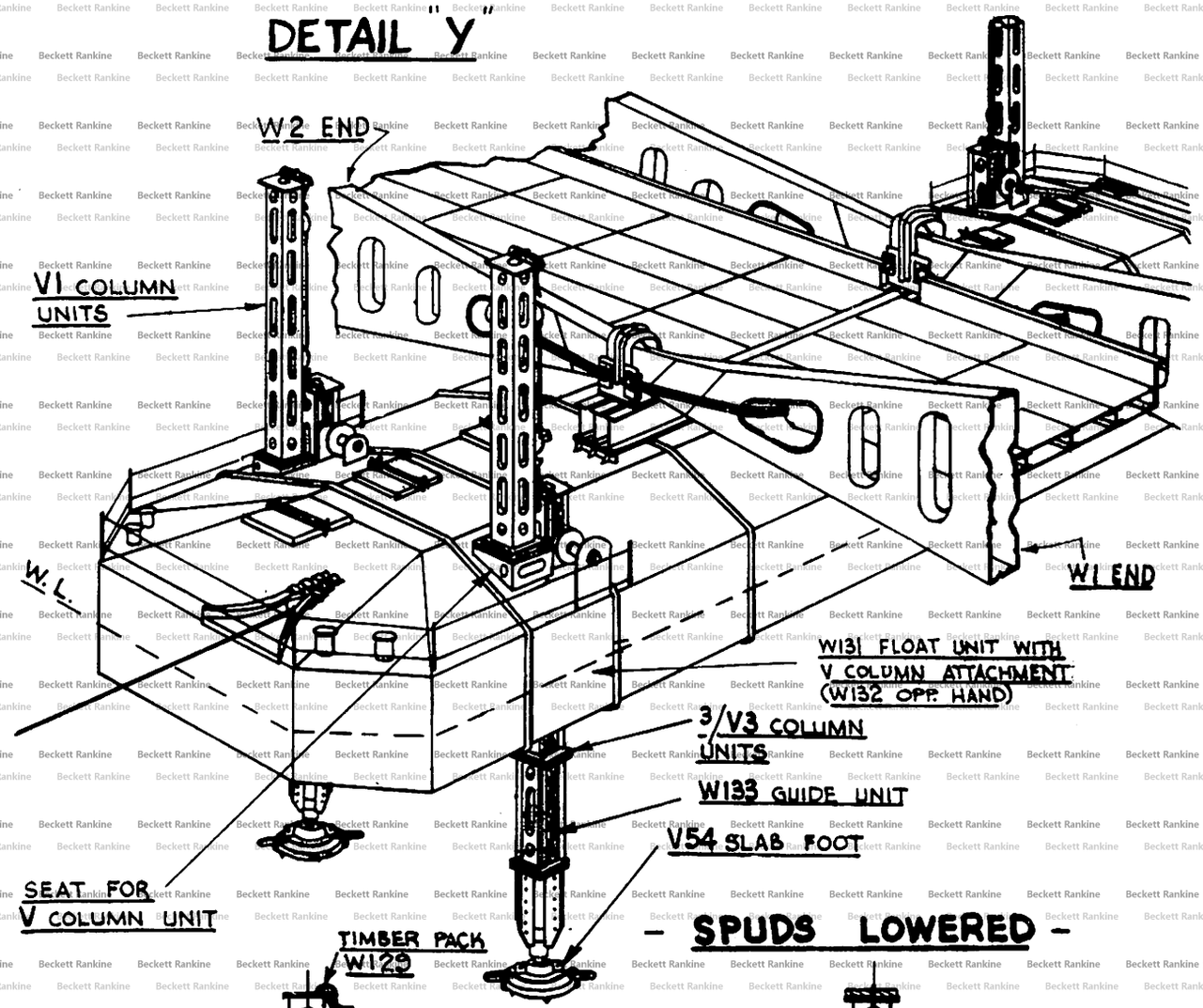
41 Towing Equipment and Accessories

Each Towing Link is provided complete with tow ropes and quick release attachments. This gear is shown in detail on Sheet 23. To give directional stability to the link steering vanes are provided. These are fastened to the main girders on the span, at the rear of the towing link. The arrangement of steering vanes is shown on sketch 8. They can be stowed in the high position, when towing links are to be grounded. When towing, the vanes are lowered only sufficient to give directional stability. On arrival at site, the vanes can be quickly cut loose, and discarded, with resulting ease of manoeuver. List of towing and steering vane equipment are given on Tables 13,19.& 21. Towing Drogues W161 are also provided for use in shallow water.

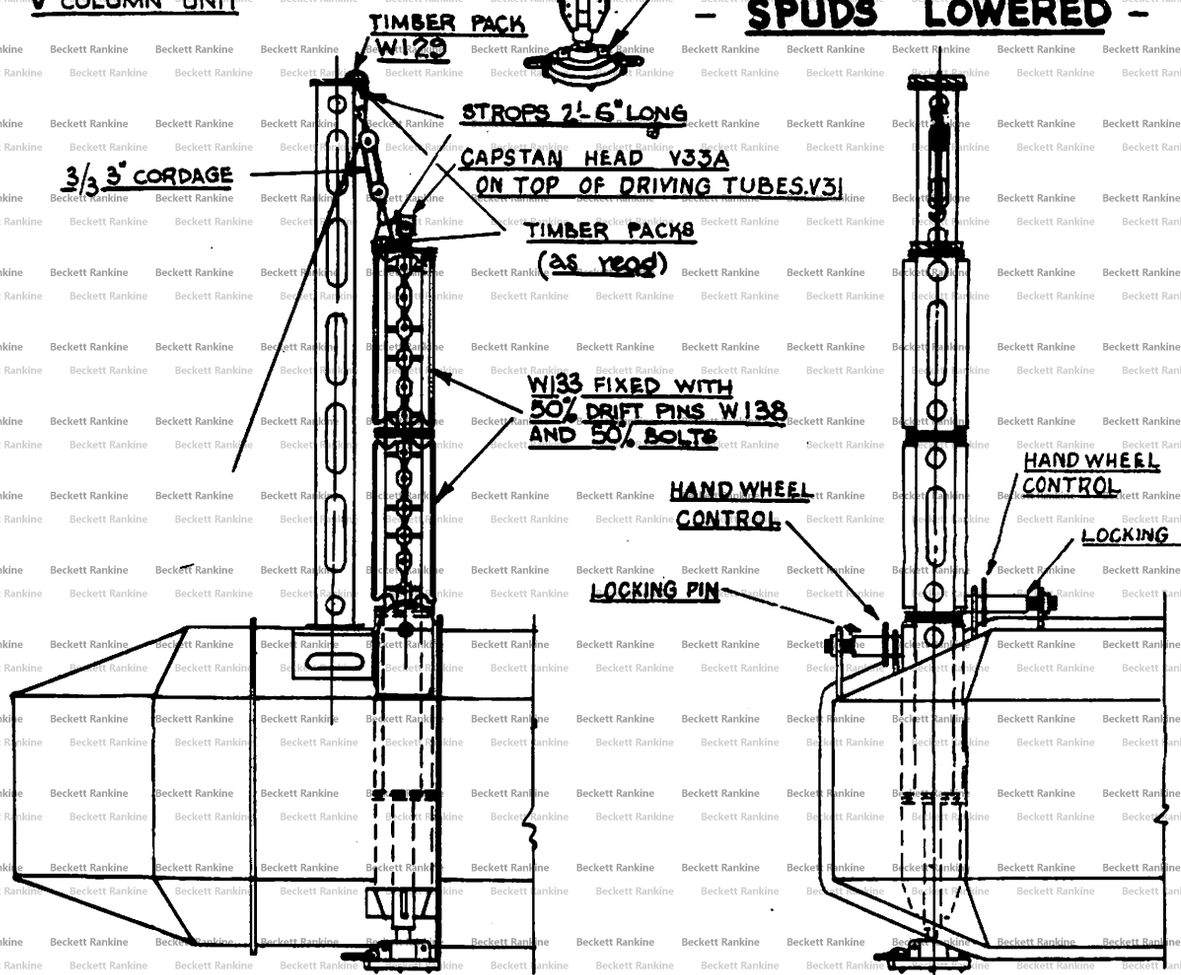
42.

Certain small tools and accessories are carried on each towing link. They are used in connecting and coupling spans etc. To ensure that these accessories are readily available, a tool box W149, is provided and fastened to the outside of the main girders on the rear span of each towing link. The list of tools and accessories for each towing link is given on Table 16.

DETAIL "Y"



– SPUDS LOWERED –



PART ELEVATION

END VIEW

– SPUDS LIFTED WHILST TOWING –

ARRANGEMENT OF ROCK GROUNDING FLOATS.

SECTION 4 ELIMINATION OF WATER GAP

1. Floating bridge equipment is entirely waterborne, and when used on flat beaches, must obviously be positioned on or near high water. Should the draught of any floating equipment be great, it will not be possible to get close inshore, and a "water gap" will remain to be bridged. Towards the inshore end, the bridge pier is therefore arranged with the minimum possible draught, so that it can be drawn well up the beach. A study of beach gradients has shown that generally at H.W. Neaps, a depth of water of 4'-0" can be found within 150 ft. of the waters' edge i.e. close in shore the beach gradient is seldom flatter than 1 in 40, while the gradient between H.W.Springs and H.W.Neaps, is usually considerably steeper, averaging about 1 in 15. On very flat beaches, it is found generally that the really flat section commences 200 to 300 ft from H.W. neap mark, and the gradient may be as slow as 1 in 400.

2. Using the shore ramp floats, and at the inshore end of the bridge pier, steel floats with bumpers omitted, the equipment can satisfy the above beach gradient conditions, and even though the pier be positioned at H.W.Neaps, the shore ramp float can be beached with its shore end in no more than 6" of water. A water gap will however occur between the end of shore ramp float, and the dry beach under the following conditions:-

a) If the pier is beached on H.W. Neaps, a water gap appears on subsequent H.W. Springs, which reach further up the beach.

b) When the pier is beached, before or after H.W., a water gap appears at the high tide, which follows.

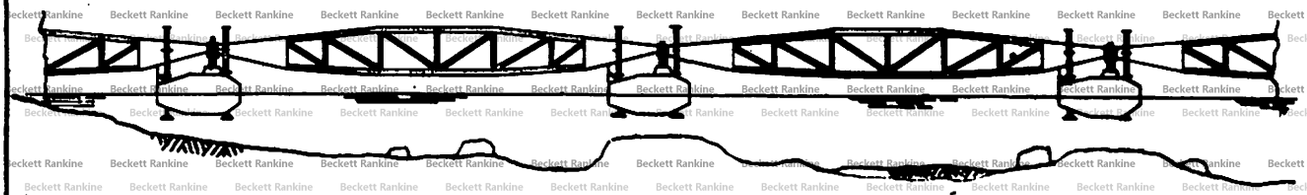
c) When the beach gradient near H.W. mark is flatter than 1 in 40, and first bridge float grounds while shore ramp float is in comparatively deep water. Note if the beach were absolutely flat, the shore ramp float would remain in 4'-1.1/2" of water, the draught of the first steel float without wooden bumpers.

d) A combination of (b) and (c) when the pier is beached before or after H.W. and bridge floats ground on the very flat section of beach well below H.W. Neap mark. This may result in a water gap of considerable length.

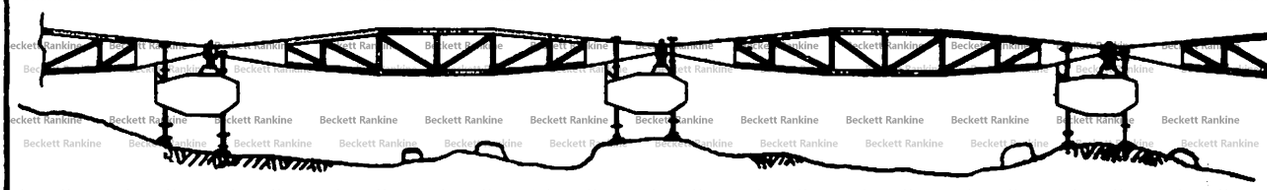
3. Provision is made in the equipment for elimination of water gap, introduced subsequent to placing as outlined in case (a). This provision will be only partially effective for case (b),(c) and (d). Every sixth bridge span is telescopic, and capable of a 9'-0" extension. When forming towing links and previous to erection, these telescopic spans in all cases remain in the "closed" position. Thus after erection, the bridge pier can be stretched out as required, so that although the pierhead remains fixed in position, the shore ramp float can be pulled further and further up the beach, should water gaps appear on successive H.W's. For example, a pier 4000 ft long, would include 8 telescopic spans, and be capable of an extension of 72 feet(about 18%). Therefore if the pier is beached on H.W.Neaps, the difference in water level between H.W.Neaps and H.W.Springs, is 4 ft, and the beach slope between H.W.Neaps and H.W.Springs, is 1 in 15, about 60 ft. of this possible extension in length, will be required to eliminate water gaps as they appear. The shore ramp float will then be well and truly neaped. It should be noted when beaching the inshore link, that shore ramp float, and first and second bridge floats should be relieved as far as possible of all deck loads, also these floats should be pumped quite dry, so that their draught will be a minimum, See Sketch 24, for profile, giving limiting beach gradients.

4. Conditions (b),(c) and (d) outlined in the previous paragraph, can cause water gaps too great to be eliminated, by the use of telescopic spans. These conditions can easily be avoided if: a. erection is timed to commence about 3 to 4 hours before H.W., so that inshore towing links can be drawn further and further up the beach while erection proceeds, and the tide completes its rise.

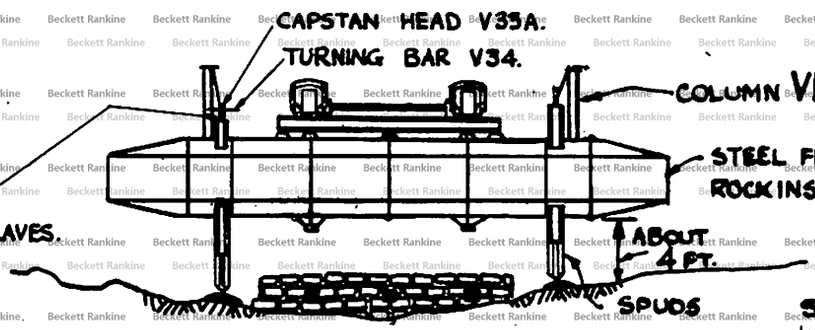
METHOD OF GROUNDING ON ROCK.



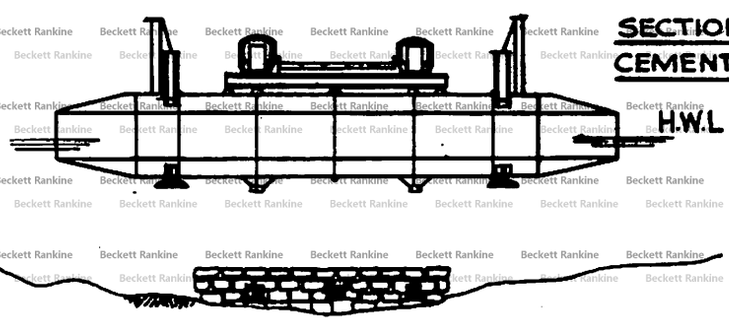
ELEVATION AT HIGH TIDE.
(SHOWING V-TRESTLE SPUDS IN POSITION FOR TOWING)



ELEVATION AT LOW TIDE.
(FLOATS SUPPORTED ON V TRESTLE SPUDS ABOUT 4 FT ABOVE GROUND LEVEL)

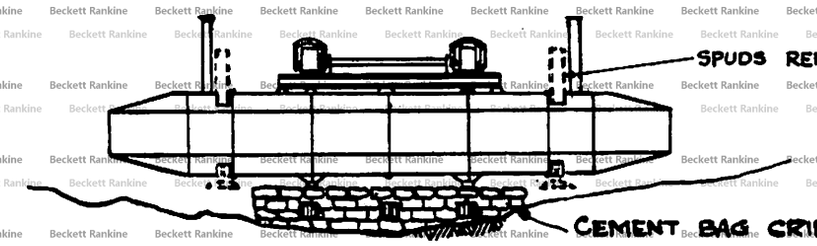


CEMENT SACK SEATINGS ARE PREPARED FOR FLOATS.



SECTION SHOWING CEMENT SACK SEATING.

AT HIGH TIDE FLOATS ARE WATERBORNE AGAIN AND SPUDS ARE WITHDRAWN.



AT NEXT LOW TIDE FLOATS GROUND ON PREPARED CRIBS.

This ensures that the shore ramp float will be beached as far inshore as possible, and all telescopic span extensions will be reserved for elimination of water gaps, introduced on subsequent H.Ws.

b. Selection of sites where beach gradients are NOT FLATTER than those outlined in para.1. This should present no difficulty since beaches which are flat around the H.W.mark, are comparatively unusual.

c. Timing of the erection operation to coincide with H.W.Spring tides. This of course, is desirable, though not essential, but will ensure carrying a good depth of water right inshore.

5. To stretch out the bridge pier, requires a considerable pull (between 10 and 30 tons depending on the maintenance of sliding bearings in telescopic spans). To apply the necessary pull, the shore ramp float is fitted with 2 - 5 ton winches and carries 2 sets of 20 ton blocks, which are connected to substantial shore anchorage. Thus a pull of 40 tons can be exerted, and water gaps eliminated as soon as they appear without interupting the flow of traffic on the bridge.

SECTION 5 Application on Rocky Foreshore

1. Floating bridge equipment is primarily designed for use on flat beaches, where floats ground on sand, mud, gravel or shingle. The equipment can, however, be beached on moderately flat rock providing,

a) Erection weather is reasonable.

b) Steel Floats are used and fitted with rock inserts, carrying spuds.

The arrangement of rock insertions and fitting of spuds, is shown on Sketch 25.

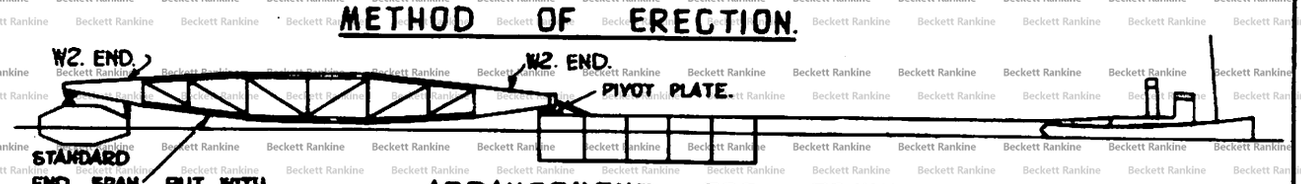
2. The method of placing the bridge pier, is the same as for flat beaches, except that while floats are still waterborne, and in about 8ft of water, the spuds are lowered on to the sea bed, and screwed up level. Thus after the tide has fallen, it is possible to examine and prepare as necessary, the float berth. If the rock upon which the float would seat, is sufficiently flat, and there is no danger of float sections being punctured by jagged projections, no preparation will be necessary. If the berth is obviously bad, or "awkward", the rock must either be trimmed level, or built up level using sand bags, surrounded and kept in position by cement bag work. As soon as float berths are prepared, and floats are waterborne, the "spuds" are completely removed or raised, so that the float cannot ground on them. It is important that float berths are completed before the arrival of bad weather, since a float grounding in a swell, with its spuds down, will probably suffer severe damage. While the bridge floats are supported on spuds, light traffic can be allowed, but should not exceed 10 ton, loaded lorries spaced 80 feet apart.

3. Reference should be made to Sketch 26, which shows the method of grounding on rock, and the preparation of float berths. The rock inserts W131 and W132, are simply small float sections, which are introduced inside the end sections of the standard steel floats. They incopporate spud guides and spud locking gear. The spuds are formed using 3 V-Trestle column units V3 (4ft long), with the guide units W133, fastened on opposite faces, using 3/4" black bolts and drift pins W138. At the lower end of the spud is fastened the cruciform foot V26 and V27 carrying a rock shoe V54. When the bridge pier is towed into place, the spuds are housed in the high position. To control spud, lowering a 3" cordage tackle with 2-3 sheave blocks, is used, and operates from a V1 column unit positioned on a stool, alongside the spud guide.

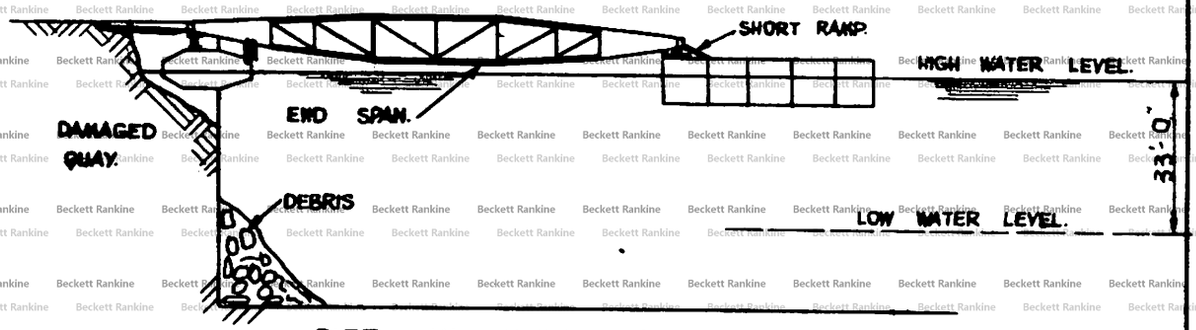
4. In the case of steel floats used for mark II equipment, the rock inserts

UTILISATION OF DAMAGED QUAY.

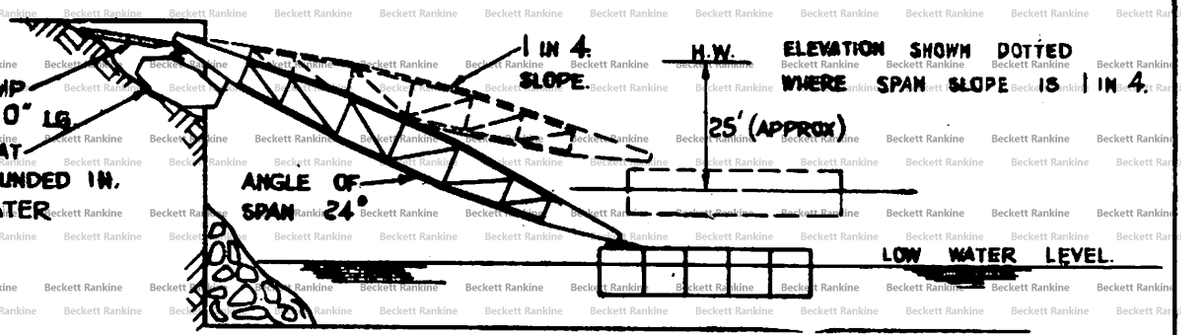
METHOD OF ERECTION.



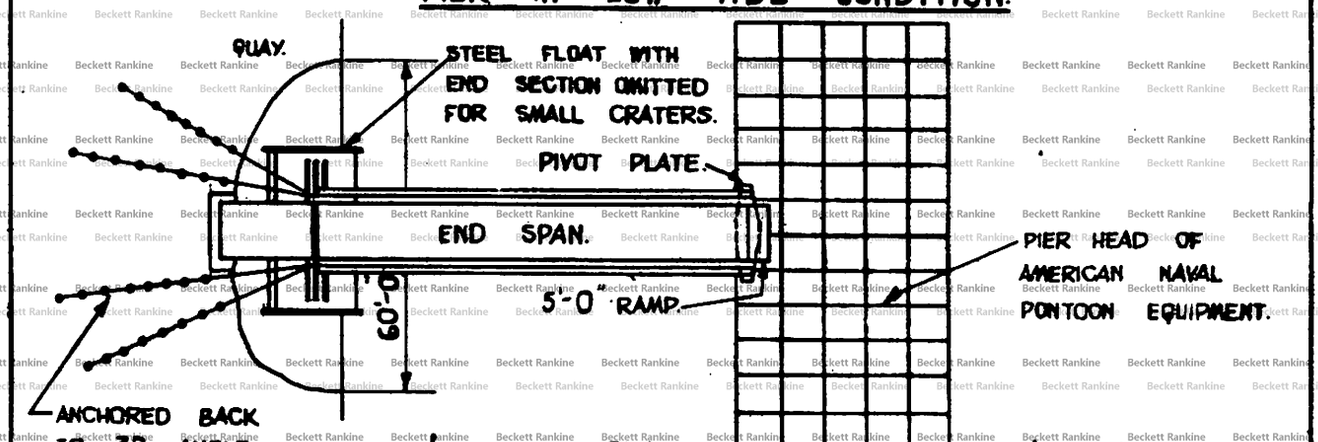
ARRANGEMENT FOR TOWING.



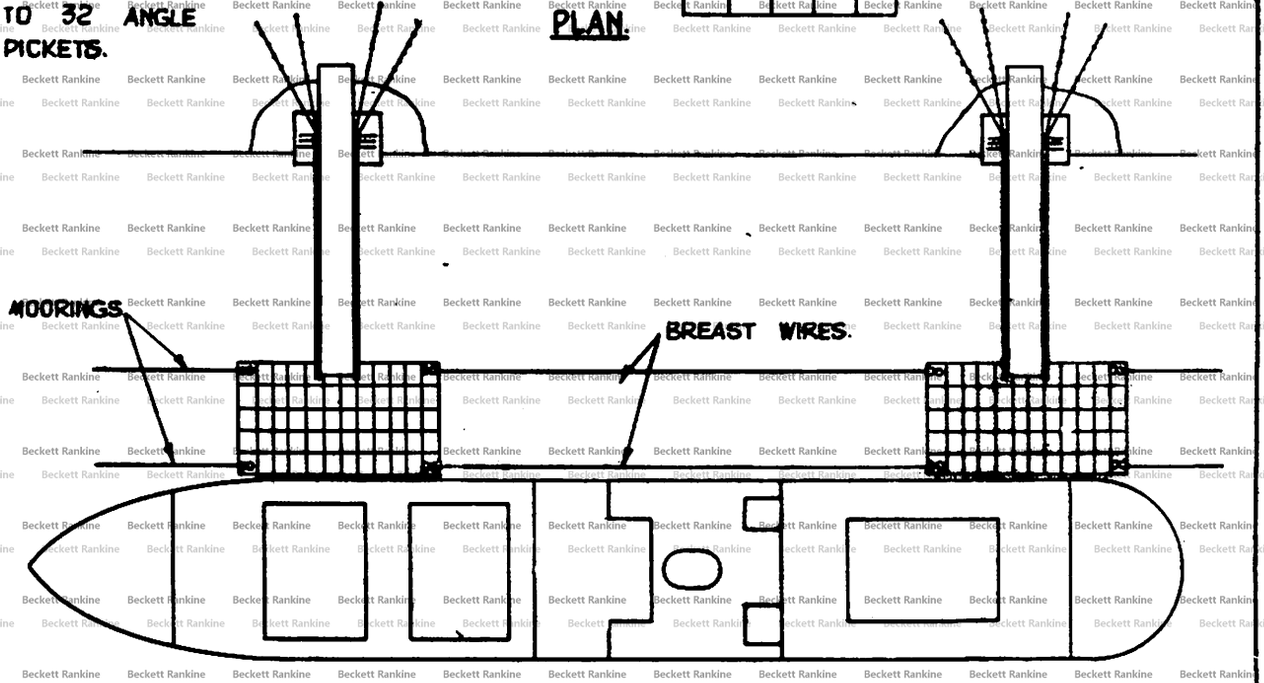
PIER IN HIGH TIDE CONDITION.



PIER IN LOW TIDE CONDITION.



PLAN.



ARRANGEMENT FOR UNLOADING.

W131 & W132 arexalready in use, being required for their extra buoyancy. To prepare this equipment for use on rock, merely involves the addition of the spuds and control gear.

5.

When lowering spuds, a sounding is first taken, to ensure that the depth of water is not more than about 9 ft. The spuds are now fully lowered then hauled u p until the holes in the guide plates W133, coincide with the locking pins which are then screwed home, using the handwheels. Using capstan head V33A and turning bars V34. The camels feet are now adjusted, so that the spuds are loaded evenly. Should the spud feet be found at low water to be seated badly, they can be wire braced as necessary, to allow the passage of light traffic over the bridge. Each spud can carry a safe vertical load of about 20 tons. The reaction from spans and float, is about 14 tons, if levelling is carried out reasonably well.

SECTION 6 Special Applications

1.

Apart from M.T. and L.S.T. piers floating bridge equipment can be applied to the solution of many harbour and beach problems.

2.

Where quays, harbour moles etc., are damaged by frequent cratering and and foul berths prevent vessels being brought alongside, connections with the shore can quickly be established uding floating bridge equipment. A typical scheme is shown on Sketch 27. Small pierhead units are formed, using American naval Pontoon equipment, or "Braithwaite" tank plates. A bridge span with W2 units each end, connects the pierhead to a steel float, which may have the end sections omitted if required. A pivot plate is used at the pierhead end, and a 17ft ramp is used to connect the steel float to the shore. The complete assembly is towed, and positioned at high water with the steel float in the crater, and well anchored back. Lateral control of the pier head is obtained by means of side guys to the quay. Several such landing stages can be positioned to serve one vessel.

3.

A similar short pier scheme, using a pier head from pontoon equipment is shown on Sketch 28. In this scheme, the equipment is usdd to provide a road up a low cliff of height about 46 Ft. In all cases, rapid erection is obtained, since the system can be towed and positioned complete, and work at site is reduced at a minimum.

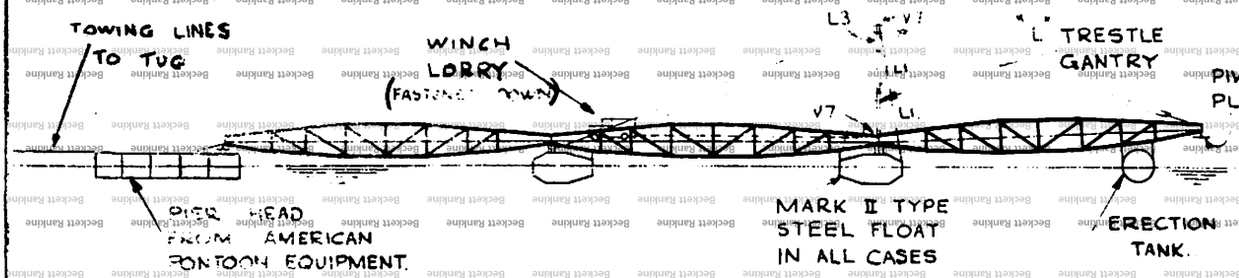
4.

The equipment can, of course, be used without alteration for bridges across estuaries etc., the only limiting condition, being the depth of water which should not exceed about 50 ft at high tide. Navigation openings can be quickly formed, by breaking the bridge at any desired positions, using the erection tanks, and either removing a section, or alternately by means of winches, reducing the length at each side of the gap, the variation being taken up in the telescopic spans.

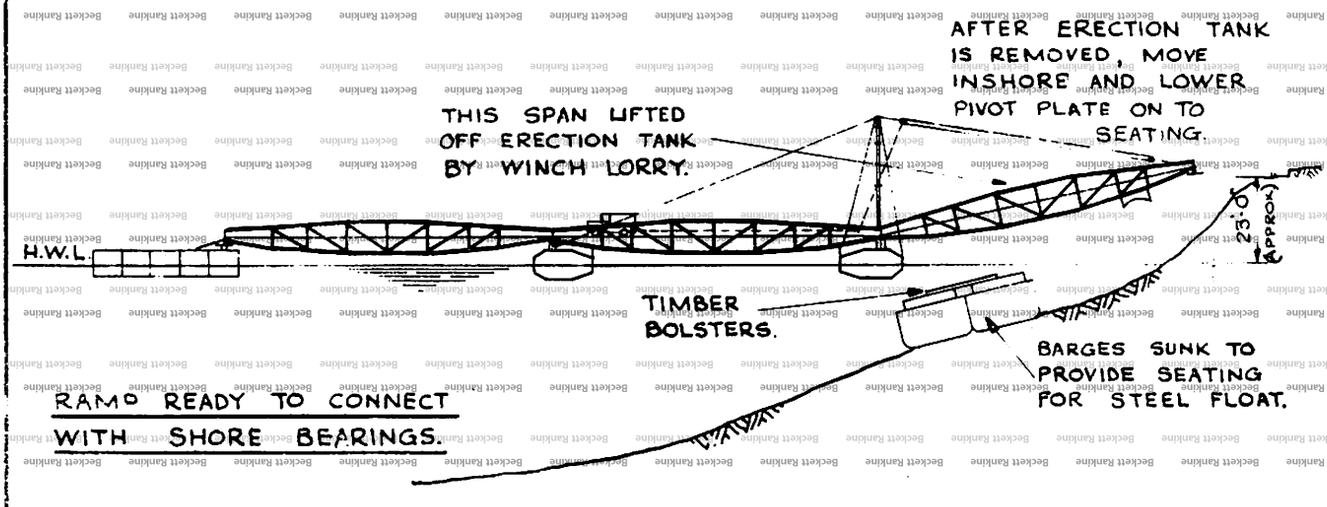
5.

Efficient "Rhinos" or shallow draught ferries, can be formed, using shore ramp floats. The arrangement is shown on Sketch 29, and involves simply the connection of two shore ramp floats by a bridge span. The bridge span is however, slightly different from the standard, in that W1 box ends are used both ends. This equipment can be used for alongside unloading of vessels anchored in deep water, it can be used as a ferry for unloading L.S.Ts., which owing to a rapidly falling tide, must anchor well off, or it can be used directly to bridge the water gap between L.S.T. and the shore, being hauled off with the L.S.T., as she heaves in on her stern anchor, on a falling tide. The length of this improvised "Rhino" is 230 ft, while its draught light is 6" at the ends and 2'-0" towards the centre.

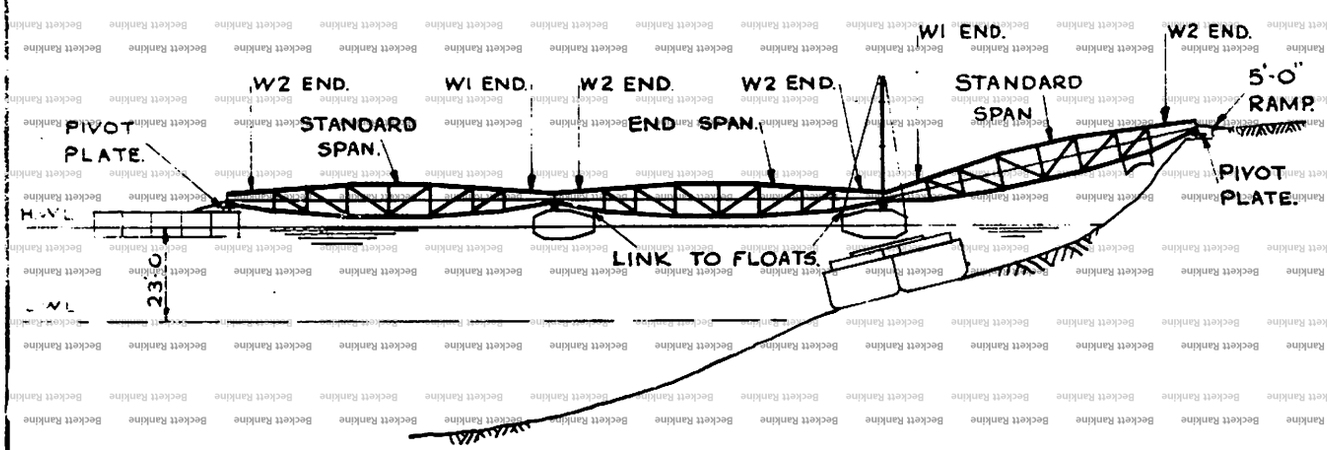
RAMP FOR UNLOADING ON CLIFF IN TIDAL WATER



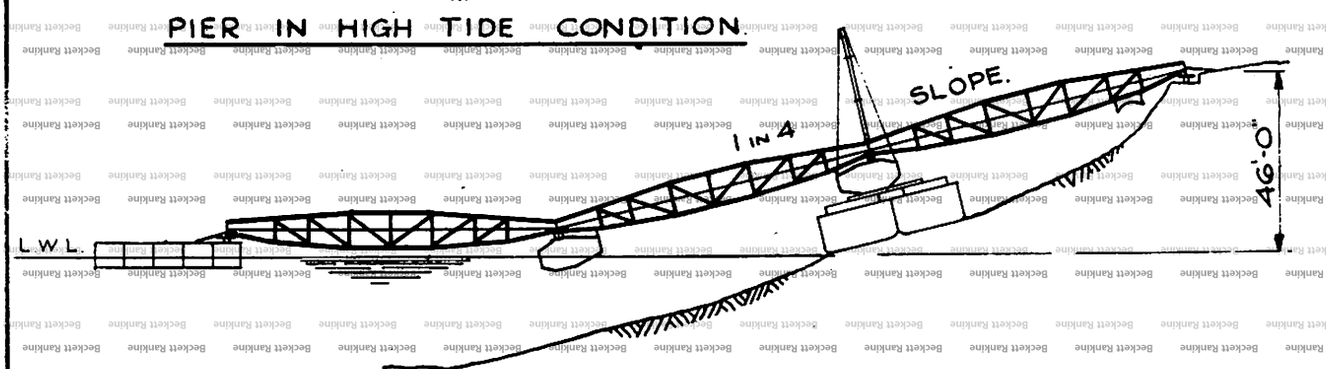
GENERAL ARRANGEMENT SHOWING SPANS BEING FLOATED OUT.



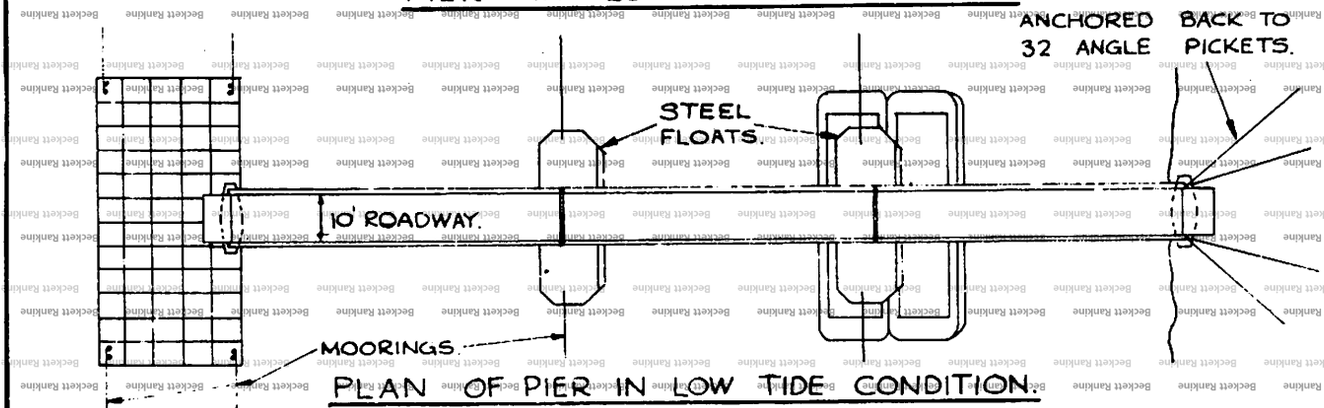
RAMP READY TO CONNECT WITH SHORE BEARINGS.



PIER IN HIGH TIDE CONDITION.



PIER IN LOW TIDE CONDITION.



PLAN OF PIER IN LOW TIDE CONDITION.

6. Under certain conditions, it may be found necessary to simultaneously discharge loaded M.T. tanks etc., from a variety of vessels without providing a continuous return road. The ability of a road to clear traffic, is, of course, much greater than the speed of discharge at a single berth. Sketch 30 shows an arrangement, using intermediate pier heads by which means, many berths with varying L.W.depths, are served by a single road. The intermediate pier heads are formed using "Rhinos" span moored, and allow either end or side unloading. Deep draught vessels are accommodated at the seawardend. The "Rhinos" forming intermediate pier heads, can be quickly detached or recoupled to the spar mooring, the seaward end of which is buoyant(See Sketch 31), so that in the event of damage through enemy action, these Rhinos can be quickly brought into operation as unloading ferry rafts,until damage is repaired, and speedier unloading can be resumed.

CHAPTER II

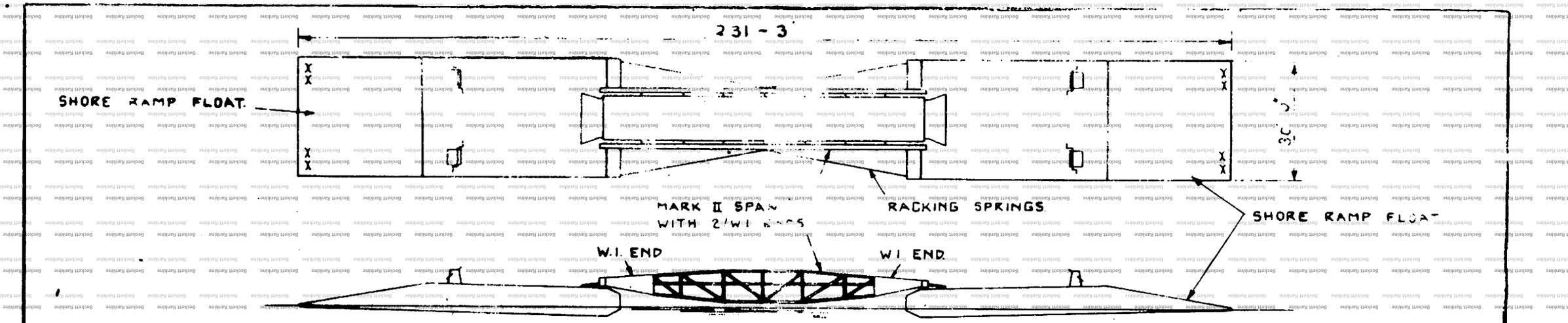
TOWING

SECTION 7 Formation of Towing Links

1. The quick erection of this equipment, depends largely on towing to site sections of the bridge, complete and as large as possible. Sheets 32 to 41, show in detail, all types of towing links. It is most inportant that towing links should be complete in every detail, since it will obviously be most difficult to remedy deficiencies at site. Particular attention is drawn to the necessity of keeping contents of tool boxes intact and generally ensuring, that S.L.U.G. boats and shuttles are in good working order. Complete lists of all units required for each towing links, are given on Tables 19 and 21.

2. Towing Links are formed at the assembly depots, complete with the exception of mooring shuttles and anchor equipment. The towing links are then moved to an assembly base, where they are stored until required for operation purposes. Immediately previous to towing,the links are loaded with mooring shuttles, lashed on deck, this being carried out at a shuttle loading base. The mooring shuttles, after use, are brought back by the tug to the shuttle loading base, for reloading and subsequent use on other towing links.

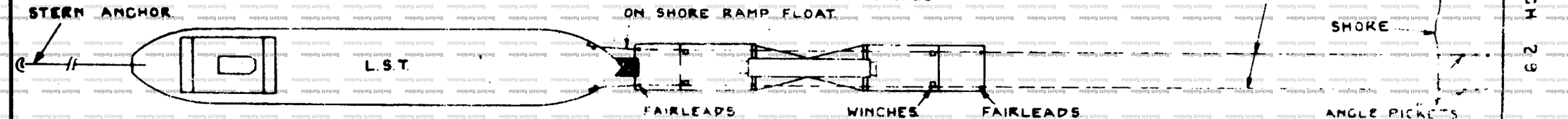
3. It will be noticed that with the exception of the shore end link, all towing links include an erection tank at the rear, immediately proceeded by the steering vanes, fastened to each main girder(See Sketch 8). When constructing the links at depot, a crane capable of a 36 ton lift is required, for span placing. The first span placed is at the rear of the link. It seats on the erection tank, at one end,and a float at the other, so that it should be assembled complete with saddles W87 in position. Assembly proceeds by adding 1 span and 1 float at a time, until the required length is obtained. The spans all face the same way, and in all cases, the W1 end connects to the length already completed,and the W2 end seats on the float, being added. The link connections on the floats all face the erection tank. To the transom of the last, or leading float, the trumpet equipment is fastened(See Sketch 8)



IMPROVISED "RHINO"

WARPS FIXED TO L.S.T & WORKED OVER WARPING DRUMS ON WINCHES ON SHORE RAMP FLOAT

3" MANILLA WARPS 600 FT LONG BENT TOGETHER TO GIVE REQ° LENGTH WORKED OFF GIPSY ON WINCH



APPLICATION FOR UNLOADING L.S.T FOR VERY FLAT BEACHES.

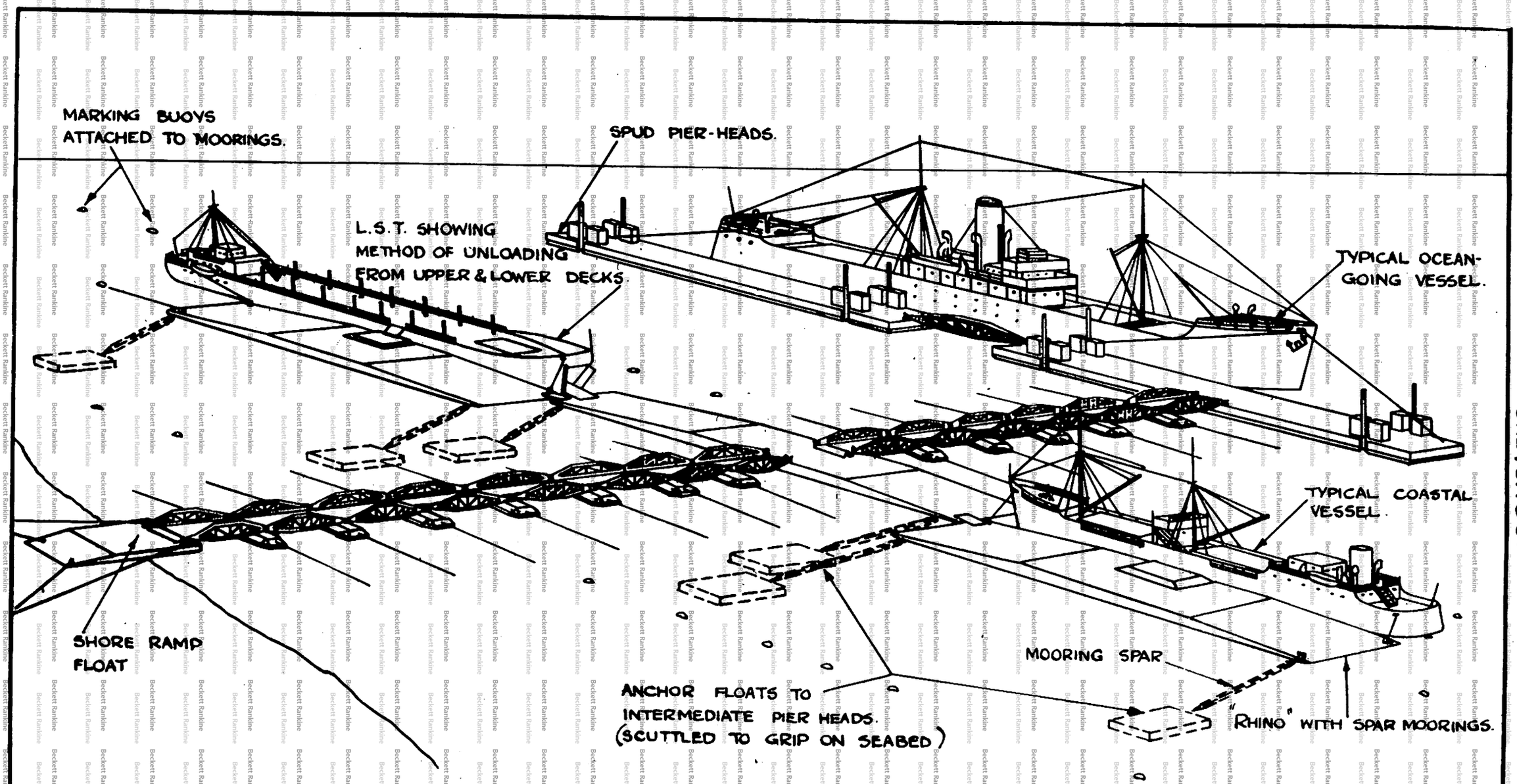
IMPROVISED RHINO USED AS SHUTTLE BETWEEN L.S.T. AND BEACH

APPLICATION ON MODERATE FLAT BEACHES

L.S.T WARPS OFF BY STERN ANCHOR IN FAIRING ORDER

IMPROVISED RHINO USING SHORE RAMP FLOAT

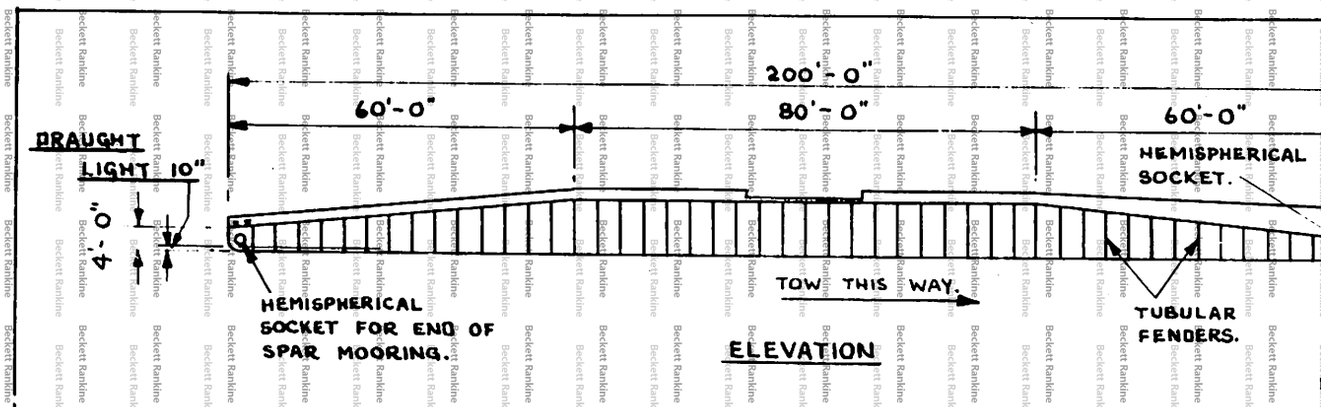
SKETCH 2 56



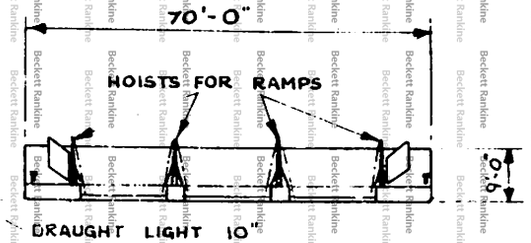
MULTIPLE INTERMEDIATE PIER HEADS FOR RAPID DISCHARGE OF WHEELED & TRACKED VEHICLES.

SKETCH 31.

PAGE 61.

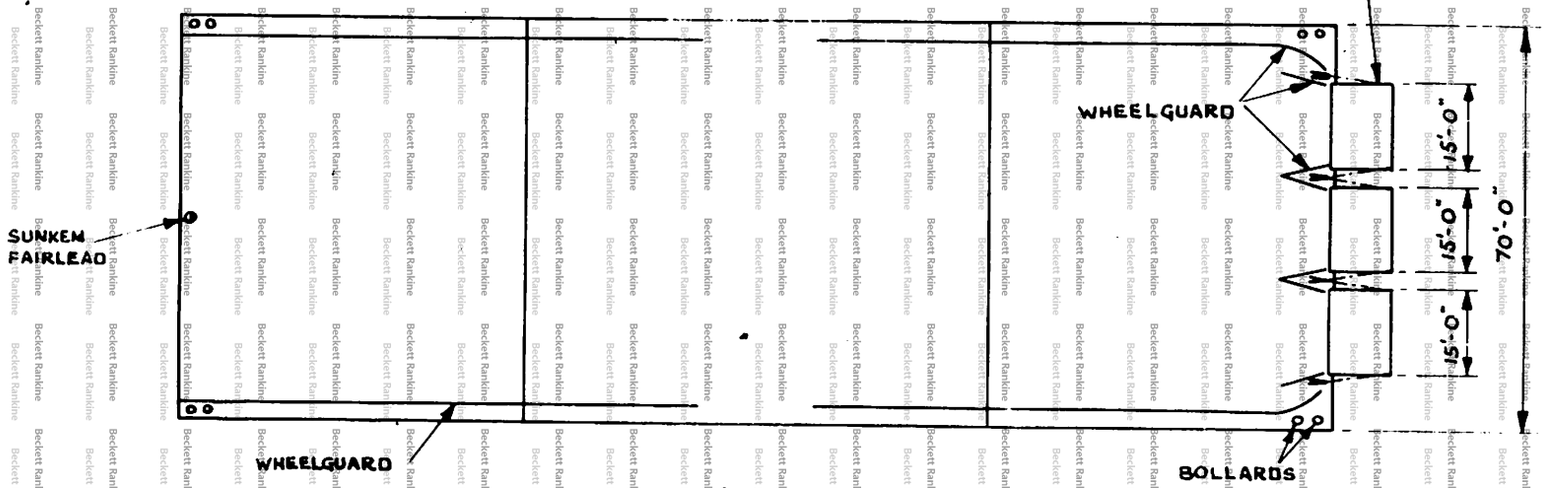


ELEVATION

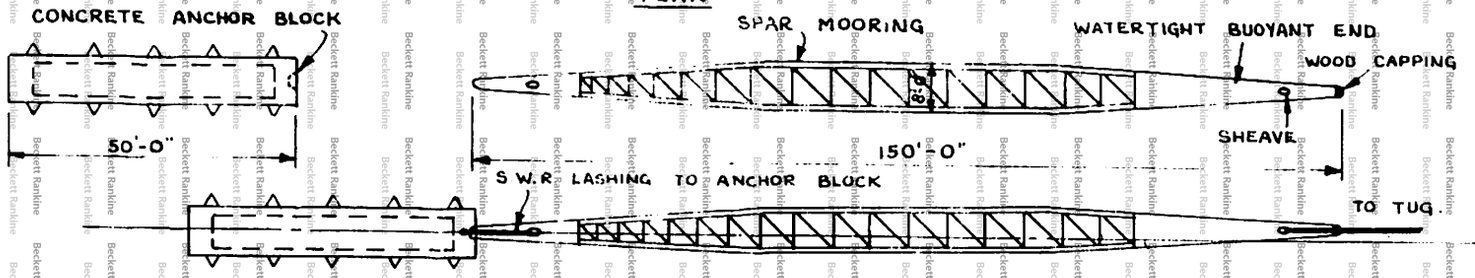


VIEW ON A-A.

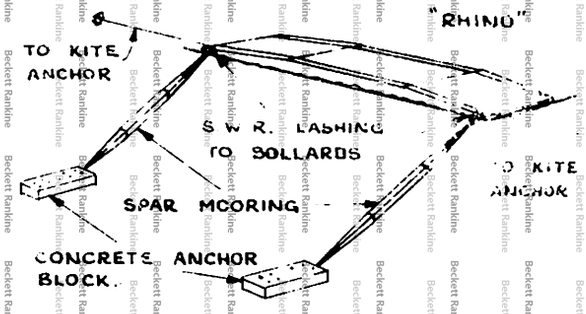
WEIGHT OF "RHINO" 100 TONS.
DRAUGHT UNLOADED - 10".



PLAN



ARRANGEMENT FOR TOWING SPAR MOORING.



METHOD OF MOORING

GENERAL ARRANGEMENT OF "RHINO."

When lashing down the saddles to the erection tank, the groove at ONE SIDE ONLY, should be greased, the S.W.R.Strops W91 are passed down under the tank, and the ends are brought back on top, being lashed together using 1.1/2" circ. cordage OUTSIDE the saddle, and with wood chocks-W144 under the cordage. The cordage lashing should be very tight on the non-greased side, and looser on the side on which the saddle groove is greased. This prevents the erection tank turning round with its controls below water, when towing in a seaway. If the erection tank is lashed correctly, it should be a simple matter to cut the cordage lashings with a hand axe. Sketch 8 shows details of erection tank connections.

4. It should be noted that the erection tank in all cases except for links D1,D2,L1 and L2, connects to the W1 end of the bridge span. On Mk.II equipment only 4" packs are required between saddles & main girders. To this end also, is fastened the timber transom W130, which carries the three centre end flooring units. The transom fits hard up against the 7/8"thick doubling plate on the underside of the bearing on the W1 box end, and is held in position by bolts W120 and plate W85, which must be securely tightened up. At this end of the span, the following units are lashed down on deck. -

a) Two outer flooring units for end panel W19 for Mk.I or WH19 for Mk.II.
b) Two end wheel guide units W21 & W22.
c) Four Cable Springs W37 (Painted RED)
d) One Dished Cover W26.
e) The necessary connecting bolts etc, are kept in the tool box, together with 4 pins W38, 9 half washers W39, and 12 copper rivets 3/8" dia. x 2.1/2" long (For complete contents of tool box, see Table 16).

These units are essential requirements for span coupling. The keepers W28 & W27 for bearings to which this end must connect, are lashed to the deck of their appropriate link.

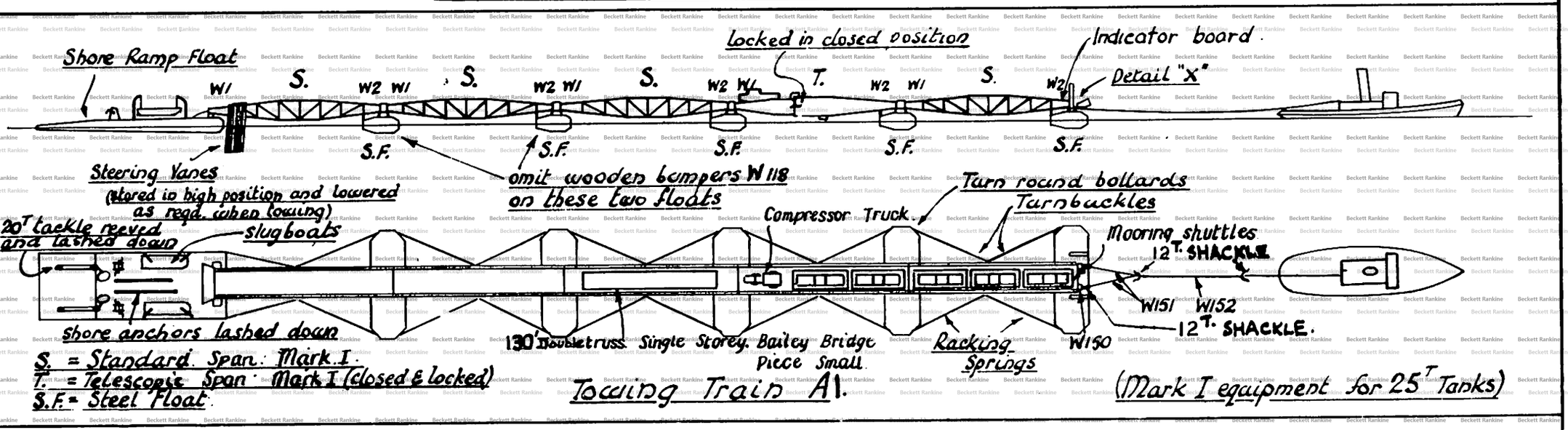
5. Links D1 and D2, have an erection tank at each end, since they must ultimately connect to the pier head. At the rear end, the fastening of the erection tank is by the standard method. At the forward end, additional 18" wood packs W145, are used between saddle and span, to give the extra height to meet the freeboard of the spud pontoons. Stirrups W89 and W90, will need to be extended by the use of one shackle W146(See Sketch 42). This is the W2 end of the span, and carries the pivot plate. All flooring, wheel guards and cable springs are in position. The keeper on the pivot plate bearing must be lashed back to the sheave in the W2 end, so that it cannot be displaced, and allow the pivot plate to fall off. 2" circ. cordage 8 returns is sufficient. The 5ft ramp and pivot bed plate W121, should be carried on the pier head units.

6. When lowering spans on to floats, they should be held with the bearings, about 6" clear. It will now be easy to attach cable springs, after which the span can be lowered away, the link connection formed, and end panels of flooring positioned. Care should be exercised, to fit Cable Springs correctly (See Chapter I, Sec.4 para 4) Cable springs should be well greased.

7. Placing of Telescopic Spans is similar to placing standard spans. They should be looked in the CLOSED position, using 4 pins W.106A, and top and botton chords of inner boxes, should be well greased, especially under the bearing blocks. This initial greasing is very much easier if carried out before placing the span, and is essential for easy operation. The penalty for neglect of this item, is time loss in the field of operations.

8. To complete the towing link,racking springs, and tow ropes are fitted. The racking springs are shackled with a turnbuckle to the centre bracket W15 or ends of inner and outer boxes on telescopic spans. They are taken to the corner bollards on the floats, hauled tight and turned up then clipped with

DETAILS OF TOWING TRAINS A1 & B1.

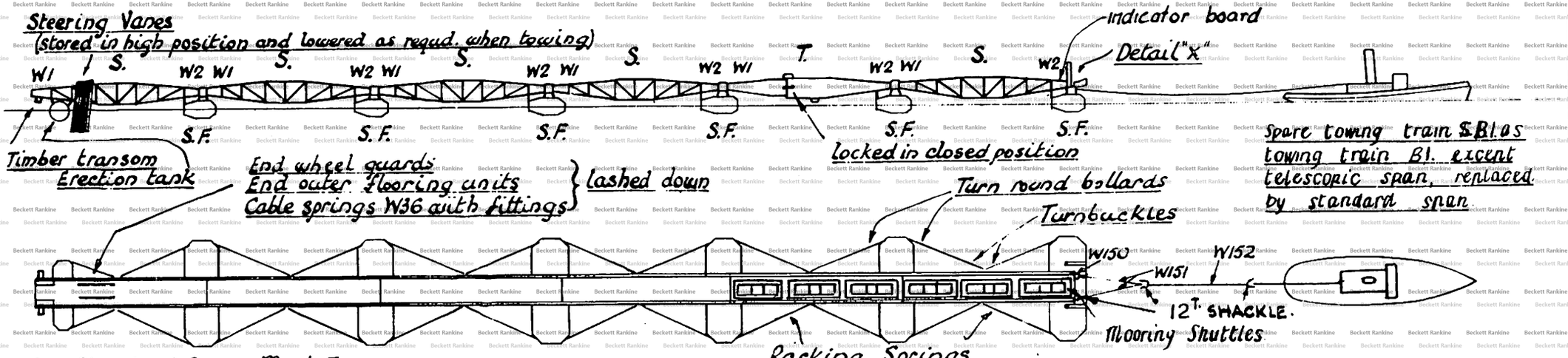


S. = Standard Span Mark I.
T. = Telescopic Span Mark I (closed & locked)
S.F. = Steel Float.

Towing Train A1.

(Mark I equipment for 25T Tanks)

SKETCH 32.



Spare towing train B1 as towing train B1. except telescopic span, replaced by standard span.

S. = Standard Span Mark I.
T. = Telescopic Span Mark I (closed & locked)
S.F. = Steel Float

Towing Train B1.

(Mark I equipment for 25T Tanks)

PAGE 63.

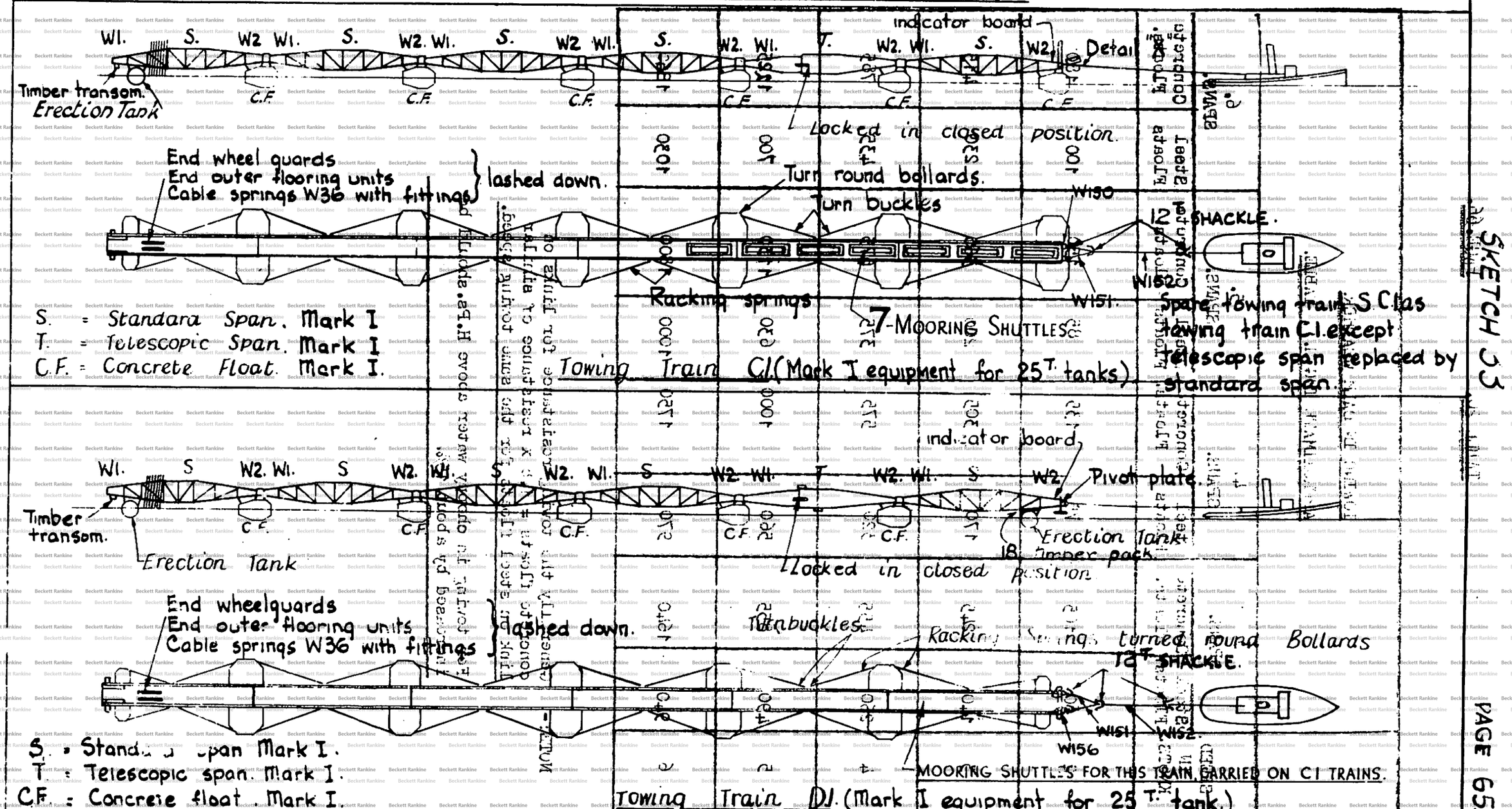
REFERENCE	UNIT.	NO. REQD. PER TOWING TRAIN.												
		A1	B1	C1	D1	E1	F1	G1	H1	J1	K1	L1	L1	
TABLE 1	STANDARD SPAN MARK I.	4	5	5	5	4	5	2	1	2	1	-	-	
" 3	TELESCOPIC SPAN MARK I.	1	1	1	1	1	1	-	-	-	-	-	-	
" 5	TELESCOPIC END SPAN MARK I.	-	-	-	-	-	-	-	-	-	-	1	-	
" 7	TRANSOM SET.	5	6	6	5	5	6	2	1	2	1	-	-	
" 8	STEEL FLOAT MARK I.	5	6	-	-	5	6	2	1	2	1	-	-	
" 10	ROCK INSERTION MARK I.	-	-	-	-	5	6	-	-	2	1	-	-	
" 12	SHORE RAMP FLOAT.	1	-	-	-	1	-	-	-	-	-	-	2	
" 14	TRUMPET EQUIPMENT.	1	1	1	-	1	1	1	1	1	1	-	-	
" 15	PIVOT PLATE & RAMP.	-	-	-	1	-	-	-	-	-	-	2	-	
" 18	MOORING SHUTTLE.	5	6	7	-	5	6	2	1	2	1	-	6	
	CONCRETE FLOAT MARK I.	-	-	6	5	-	-	-	-	-	-	-	-	
	SPUD PIER HEAD.	-	-	-	-	-	-	-	-	-	-	1	-	
	INTERMEDIATE CONCRETE PONTOON.	-	-	-	-	-	-	-	-	-	-	1	-	
SKETCH 23	TOWING BRIDLE.	TA	TA	TA	TD	TA	TA	TA	TE	TA	TE	See Notes on Pierhead Assembly	TB & TC.	
	Compressor Truck (from G.1098) Double-Single Bailey & 125 Sleepers	1	-	-	-	1	-	-	-	-	-		-	
TABLE 13	ERECTION TANK EQUIPMENT.	SEE TABLE 13.												

COMPOSITION OF MARK I TOWING TRAINS.

TABLE 19.

PAGE. 64.

DETAILS OF TOWING TRAINS C1 & D1



TOWING IN CALM WEATHER.

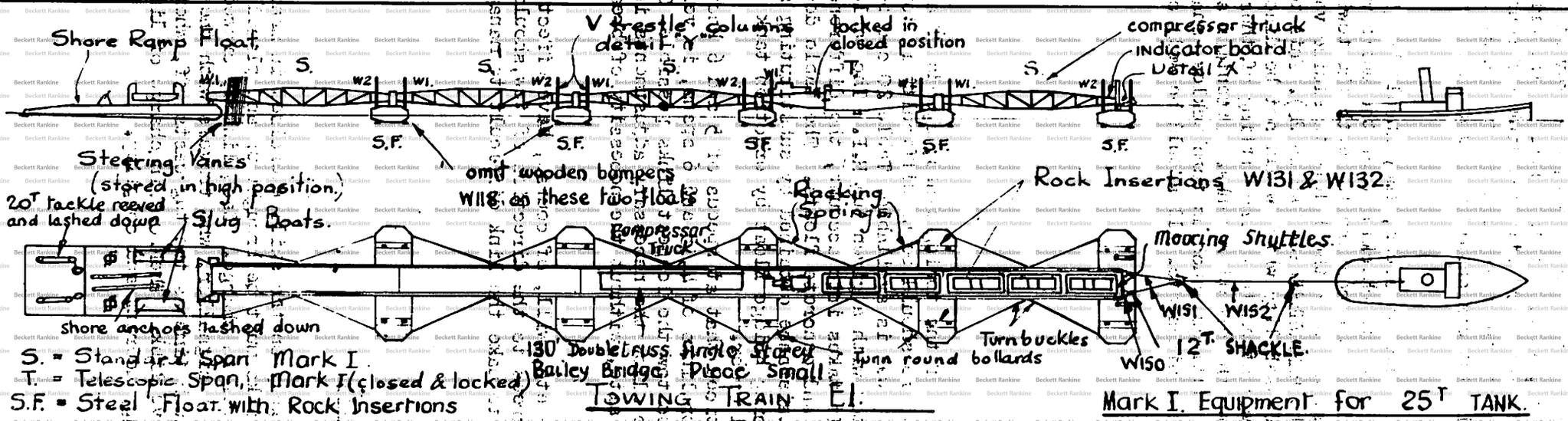
APPROXIMATE TUG H.P. TABLE.

SPEED IN KNOTS.	3. SPANS.		4. SPANS.		5. SPANS.		6. SPANS.	
	Steel Floats.	Concrete Floats.	Steel Floats	Concrete Floats.	Steel Floats	Concrete Floats.	Steel Floats	Concrete Floats.
2	60	105	75	135	85	150	100	180
3	140	245	170	305	200	360	230	415
4	260	455	320	575	375	675	435	785
5	490	855	560	1000	630	1130	700	1225
6	940	1640	970	1750	1000	1800	1030	1860

NOTE:- Generally the towing resistance for links on concrete floats = 1.8 x resistance of similar link on steel floats for the same towing speed.

For towing in choppy water above H.Ps. should be increased by about 15%.

DETAILS OF TOWING TRAINS E1 & F1

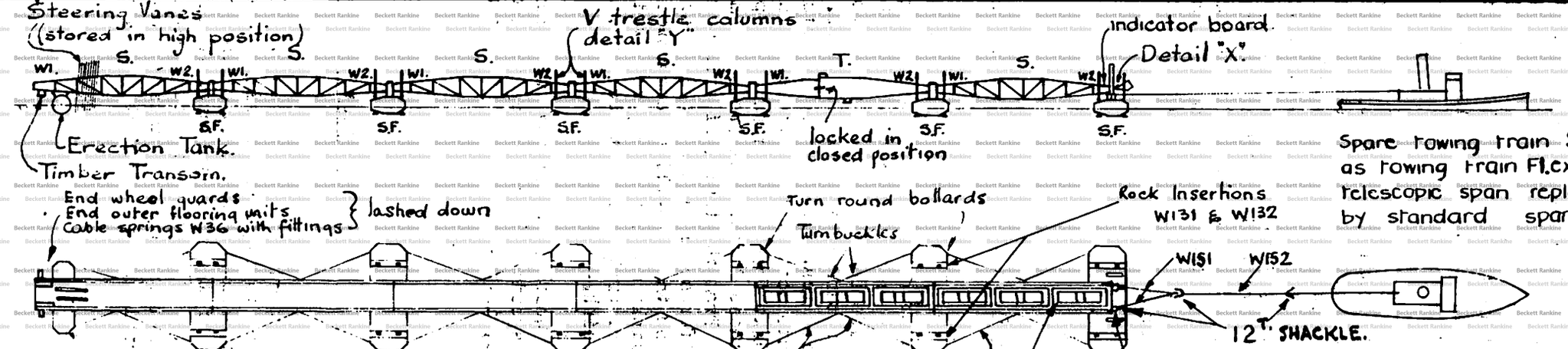


S. = Standard Span Mark I.
T. = Telescopic Span, Mark I (closed & locked)
S.F. = Steel Float with Rock Insertions and Spuds.

130' Double Truss Single Storey Bailey Bridge Piece Small

TOWING TRAIN E1.

Mark I. Equipment for 25T TANK.



S = Standard Span. Mark. I.
T = Telescopic Span Mark I (closed & locked).
S.F. = Steel Float with Rock Insertions & spuds.

TOWING TRAIN TYPE F1.

Spare towing train S.F.1. as towing train F1. except telescopic span replaced by standard span.

Mark I. Equipment for 25T TANK.

SKETCH 34

PAGE 67.

a bulldog clamp. The turnbuckles are now tightened up, so that the racking springs are set up taut. If they are slack, they are quite useless. Their purpose is to reduce latteral float surge, in a cross sea, and prevent wrenching of girders bearings and floats; in effect they replace the bridge moorings to a certain degree. An indicator board with the link reference in letters 18" high, should be fastened to the main girders at each side of the leading span, in each towing link. The letters should be coloured amber on a black background.

2. Before links are towed away to assembly areas, they should be given a detail examination and special care given to checking over the units which will be required on operation. Should it be necessary to berth the towing links on mud covers W43 should be fastened over the inlets to sluice valves on erection tanks, and made fast to the HANDWHEEL(See Sketch 20). This prevents the valve getting choked with mud, a dissability which would not be discovered until the operation of link coupling was attempted. The fitting of these covers, will be easier before launching the erection tanks. Attention should be given to the easy working of small fittings, such as turnbuckles, shackles, bolts, deck clamps on floats, hatch fastenings etc. All should be well oiled and greased.

SECTION 8 Towing Speeds

1. Owing to the size, length etc., of the towing links, speeds of a high order cannot be expected though there should be no difficulty in towing at 5 to 6 knots, providing reasonable power is available. Table 20 can be used as a guide for the speeds to be expected with a given tug H.P. The table is based on tank tests in still water. It takes into account, the difference in towing resistance offered by steel and concrete floats. The table does not take into account the difference in resistance obtained by substituting shore ramp float for erectiontank, or replacing bridge float by erection tank since these differences are of a small order.

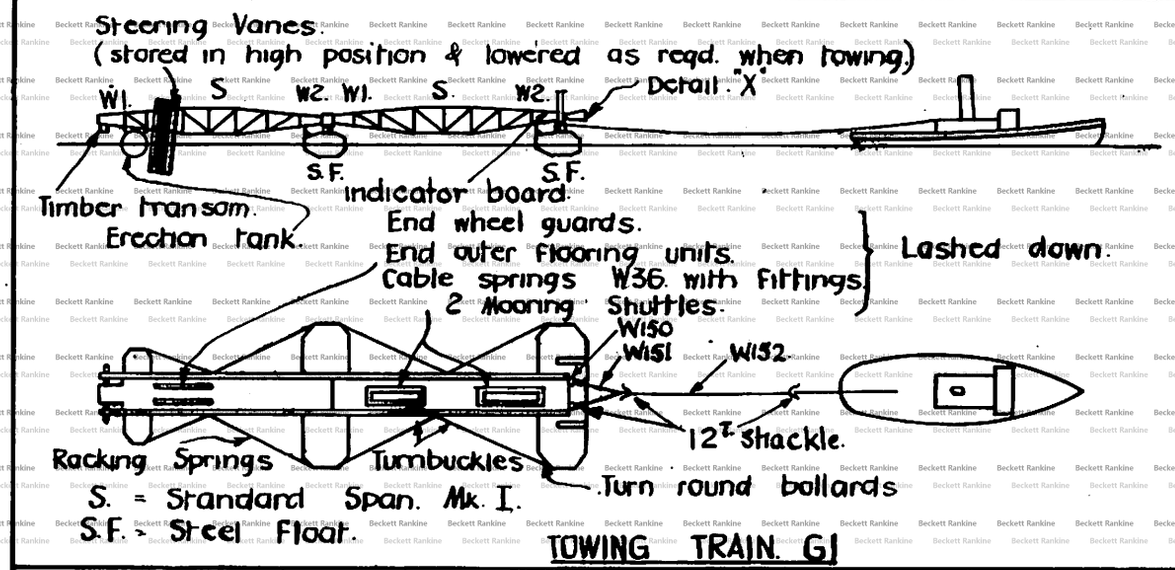
2. From the table, it will be noticed that at speeds of 5 and 6 knots, the difference in towing resistance for links of 4, 5 and 6 spans, is very small, so that it will be economical to tow the longest links possible. Some short links must, however, be towed,to allow the necessary adjustments in length of bridge pier, to be made, at site, without the necessity of breaking a long link.

3. Weather conditions, wind force etc, will, of course, have effect on towing speeds. Seas running at 45 degrees to the direction of tow,should be avoided, if possible, since they tend to make the link difficult to manage.

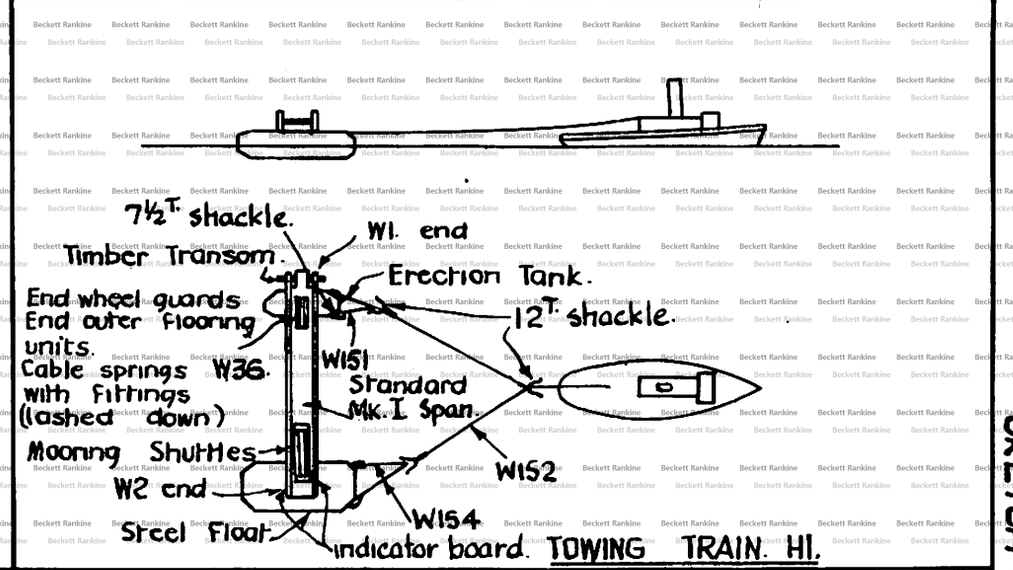
SECTION 9 Manoeuvering at Site

1. Speed on erection, depends largely on the skill exercised in manoeuvering the towing links at site. The links must be brought up and placed in the correct order, as directed by the officer in charge. Each link is crewed by a party of 12. The link crew includes a signaller, who travels with the N.C.O. in charge of link, on the tug, until such time as the tug casts off, when they are both transferred to their respective link. TheN.C.O.in charge of link, is responsible for its correct positioning, mooring and coupling.

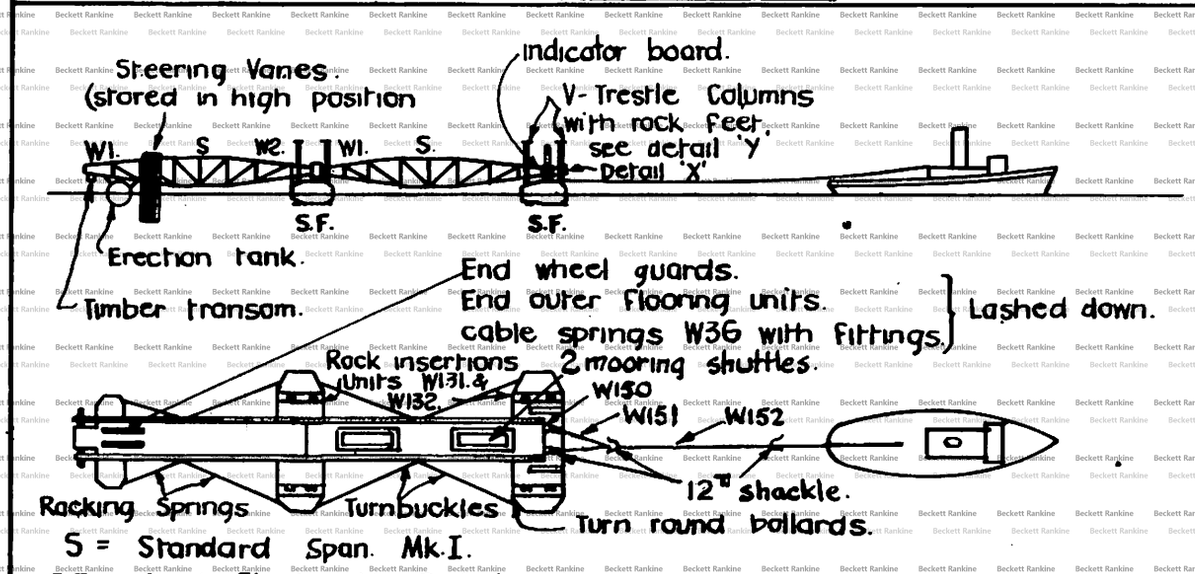
DETAILS OF TOWING TRAINS G1, H1, J1, K1.



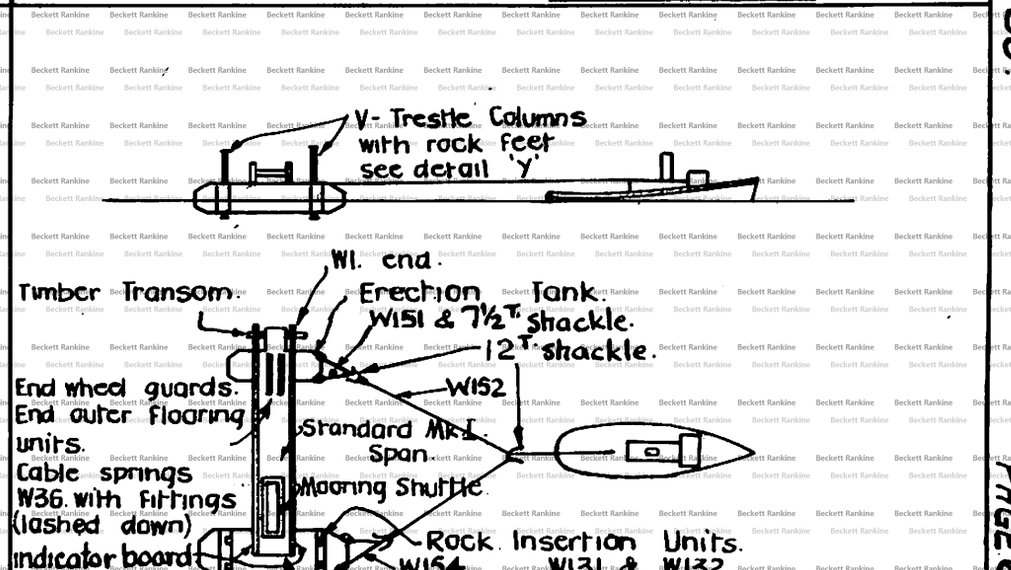
TOWING TRAIN. G1



TOWING TRAIN. H1.



TOWING TRAIN. J1.



TOWING TRAIN K.1.

SKETCH 35

PAGE 69.

2.

The method of positioning and mooring at site, is shown on sketches 43 & 44. Tugs do not have to work too close in shore, and always work to seawards of the completed bridge pier, in an area which should be reasonably clear of all obstructions. The methods of bringing up, will of course, be varied to suit wind, tide, and beach conditions, but generally the tug holds one end of the link against the stream, while the other is hauled towards the end of the completed pier, using the compressor truck, working on the pier roadway. As soon as the seaward end mooring has been laid, and made fast, the tug casts off and returns to base with empty shuttles. The coupling operation is generally carried out after the link is roughly moored in position, since it requires reasonable alignment to be maintained between the link and the pier.

3.

It will be seen that links should arrive at site to time schedule, and that the erection operation will be complicated if non-interchangeable links arrive early and have to stand by, or anchor off. The speed of the operation depends largely on the assistance given by the tug, and co-operation by the tugmaster.

4.

Enemy action may result in anyone or more links being damaged. It is possible, using the spare equipment to replace or reconstruct any link. This is an operation that takes time, however, and a resource which should not be necessary because links arrive at site in the wrong order, or get used in the wrong place.

5.

The links placed towards the inshore end of the bridge pier, are all on steel floats, and are therefore of shallow draught. The towing resistance of these, is little more than 50% of the resistance of Towing Links on concrete floats, which are positioned at the seaward end. It should be possible, therefore, to use small tugs of comparatively small horse power, and shallow draught, for towing the inshore links. This arrangement will considerably simplify manoeuvering when placing links close to the shore. Towing drogues W161 are supplied, and can replace steering vanes. They give extra towing resistance, but have the advantage of drawing considerably less water, and are therefore, less liable to damage by grounding etc. These drogues can be used with advantage on links to be positioned close inshore.

6.

The value of speed and skilful manoeuvering in this operation, cannot be over estimated. The methods of coupling and mooring links, are very rapid, and make it possible to position 4000 ft of pier in one tide. Since the time that water extends right up the beach if brief, and during this time, the pier must be placed, it is obvious that skilful timing and handling are essential.

CHAPTER. III

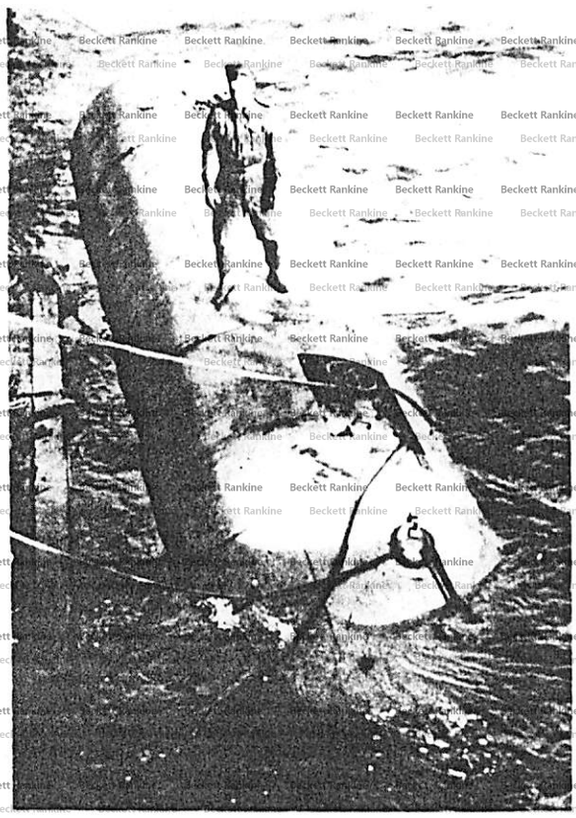
ERECTION AND MOORING

SECTION 10 General Principle of Erection

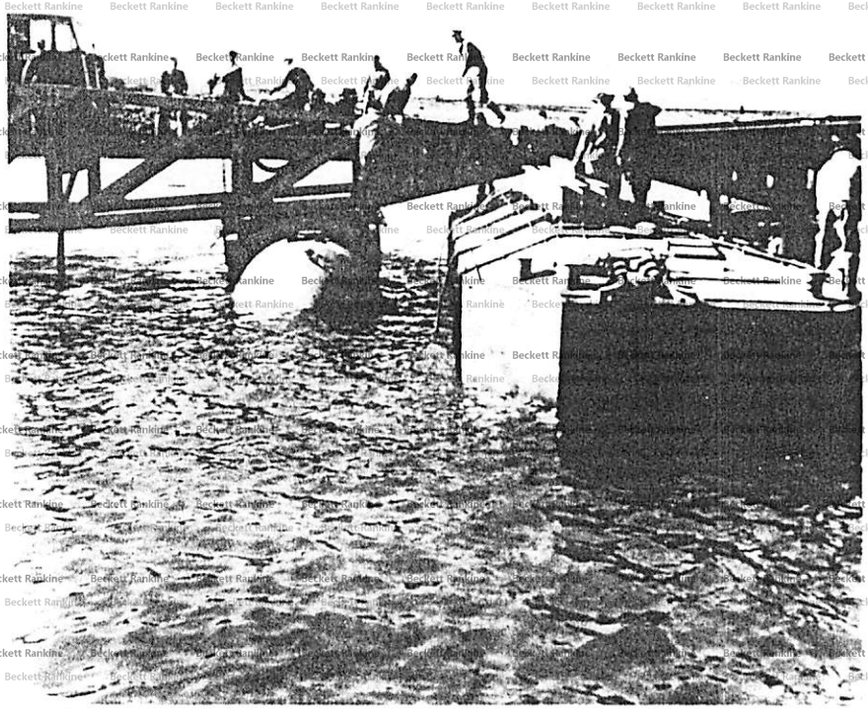
1.

The erection equipment is primarily designed for rapid coupling, and mooring. The general principle involves towing to site sections of the bridge complete and as long as possible. Erection commences from the shore, and works

PLATES B & C



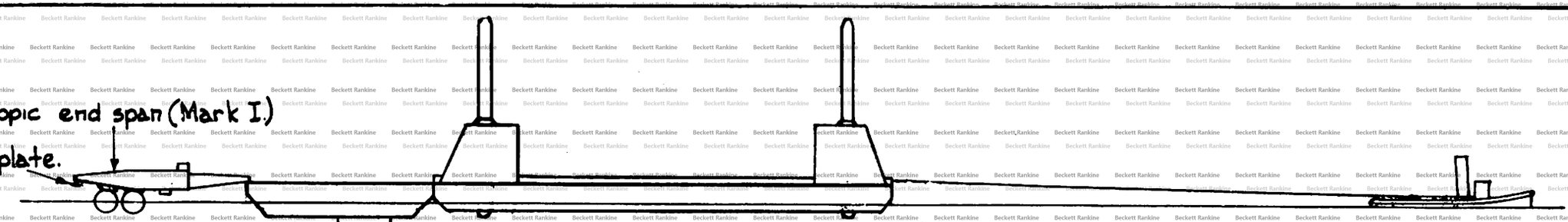
B - ERECTION TANK PARTLY SUBMERGED.



C - REPLACEMENT OF DAMAGED FLOAT AND TRANSOM USING 2 ERECTION TANKS.

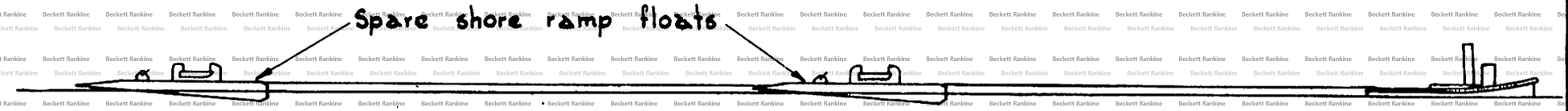
NOTE: THIS OPERATION IS EASIER IF TRANSOM IS INTACT AND NEED NOT BE REMOVED

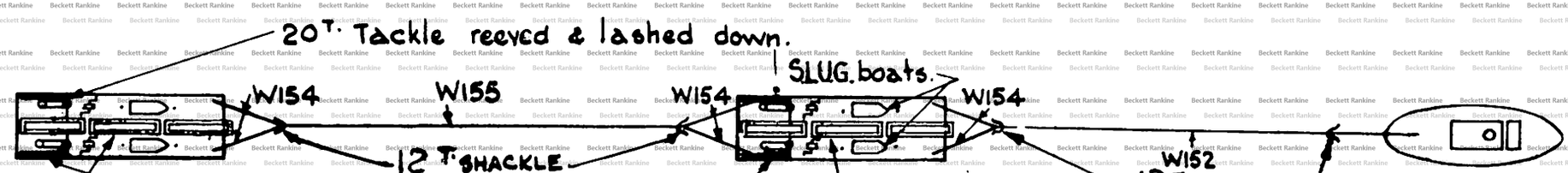
DETAILS OF TOWING TRAINS L1 & M.



TOWING TRAIN L1. (Mark I equipment for 25 T. tanks.)

SKETCH 36





TOWING TRAIN M.
For both Mark I & II Bridges

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seaward, so that tugs have a clear space to manoeuver. Flags are set up ashore to mark the lines of bridge pier and anchor positions. Permanent moorings are laid simultaneous with the erection operation, so that should bad weather follow close after erection, no undue concern need be felt for the safety of the equipment. Special mooring vessels are not required particularly, as their work in shallow water would be hazardous. Generally, the towing links are brought to site in the correct order, commencing about 3 or 4 hours before H.W. The links are roughly moored in their respective positions, and coupled using the erection tank and trumpets. It should be possible to rough moor and couple 3 or 4 links, before H.W. at which time this section of the pier completed, will be hauled as far up the beach as possible. On inshore links erection tanks should be removed before H.W.

2. This length of pier will be approximately of sufficient length to reach down to L.W.mark, so that although the remainder of the pier is positioned, on a falling tide, there should be no danger of tugs etc, running aground, since they will be working in at least 20ft of water. Obviously the success of erection depends on speed and careful timing.

3. Providing links are waterborne, they can be coupled or uncoupled at any time, and it is not necessary for this operation to be complete before positioning the next link. Thus the time of operation depends only on manoeuvering and rough mooring of one link in front of the other. Sketches 43 and 44, show the method of positioning towing links.

4. The bridge pier should be in position and complete, by L.W. when the pier head links can be brought into position. These units can be towed direct to as near as possible their final position, when the spuds on the spud pontoons are lowered to the sea bed. The tug now casts off, and returns to base. The use of telescopic spans, pivot plates,etc., allows easy connection to pier head units providing they are placed within about 5ft of their correct position. Should this not be the case, however, the pier heads can easily be warped into position,since they are fitted with the necessary gear.

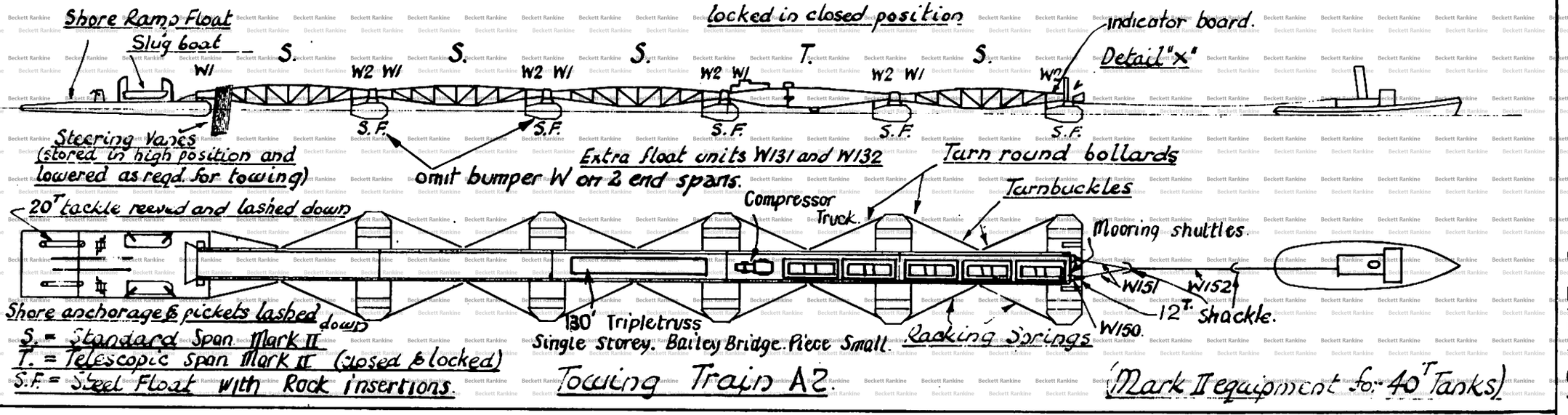
SECTION II.

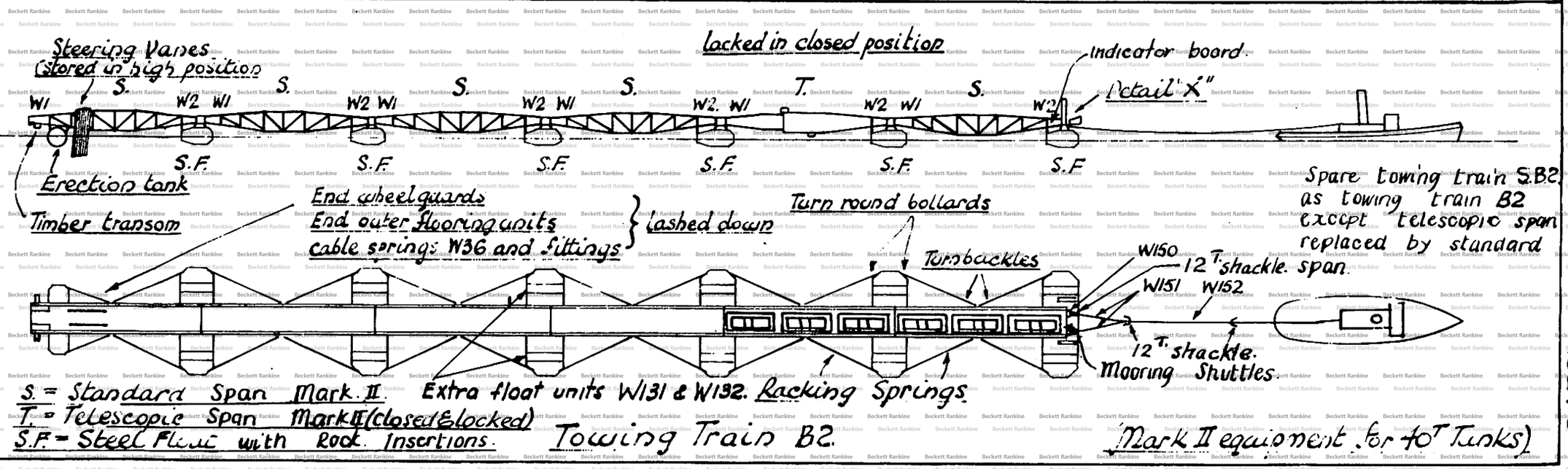
Method of Mooring, using Shuttles and S.L.U.G. Boats.

1. Every bridge float will require moorings, both up stream, and down stream. The minimum length for moorings measured from float to anchor, is 14 times the H.W.depth. It is appreciated that these moorings are considerably longer than is usual, but the reasons are important, and result because the bridge, when moored, must be usable by traffic and fore and aft float surge must be kept to a minimum. These moorings must be set up taut both up and down stream, the correct tension will be obtained when at H.W. the mooring wire strikes the water surface about 20ft from the end of the float. The load in the wire under this condition is about 5 ton and a force of this order is necessary to bed the "Kite" anchors properly. With moorings correctly tensioned, and of the required length, it will be found that float surge even under the worst sea conditions, will be kept within reasonable limits (about 10") through all states of the tide, without adjustment. Should moorings be left slack they will be quite inoperative, there will be serious danger of span wrenching, and the bridge will be unusable in bad weather.

2. To standardize on Moorings they are supplied all the same length (1270ft) wound on wooden drums, this length being sufficient for the greatest depth of water in which the equipment is to be used i.e. 43ft. The mooring wire is supplied with a thimble at each end, and is sufficient to completely

DETAILS OF TOWING TRAINS A2 & B2.





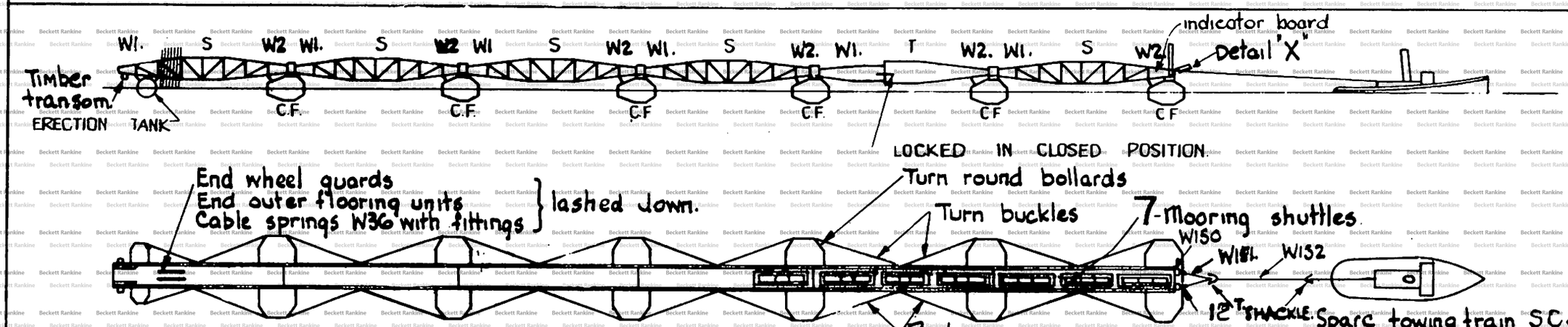
SKETCH 37

PAGE 73.

REFERENCES.	UNIT.	NO. REQD. PER TOWING TRAIN.											
		A2	B2	C2	D2	E2	F2	G2	H2	J2	K2	L2	M
TABLE 2	STANDARD SPAN MK. II	4	5	5	5	4	5	2	1	2	1	-	-
" 4	TELESCOPIC SPAN MK. II	1	1	1	1	1	1	-	-	-	-	-	-
" 6	TELESCOPIC END SPAN MK. II	-	-	-	-	-	-	-	-	-	-	1	-
" 7	TRANSOM SET	5	6	6	5	5	5	2	1	2	1	-	-
" 9	STEEL FLOAT MK. II	5	6	-	-	5	6	2	1	2	1	-	-
" 10	ROCK INSERTION MK. II	-	-	-	-	5	6	-	-	2	1	-	-
" 12	SHORE RAMP FLOAT	1	-	-	-	1	-	-	-	-	-	-	2
" 14	TRUMPET EQUIPMENT	1	1	1	-	1	1	1	1	1	1	-	-
" 15	PIVOT PLATE & RAMP	-	-	-	1	-	-	-	-	-	-	2	-
" 18	MOORING SHUTTLE	5	6	7	-	5	6	2	1	2	1	-	6
—	CONCRETE FLOAT MK. II	-	-	6	5	-	-	-	-	-	-	-	-
—	SPUD PIER HEAD	-	-	-	-	-	-	-	-	-	-	1	-
SKETCH 23	TOWING BRIDLE	TA	TA	TA	TD	TA	TA	TA	TE	TA	TE	See Notes on Pier-head Assembly.	TB & TC
—	Compressor Truck from (G1098) Treble-Single Bailey &125 Sleepers	1	-	-	-	1	-	-	-	-	-		-
TABLE 13	ERECTION TANK EQUIPMENT	SEE TABLE 13.											

COMPOSITION OF MARK II TOWING TRAINS.

DETAILS OF TOWING TRAINS C2 & D2

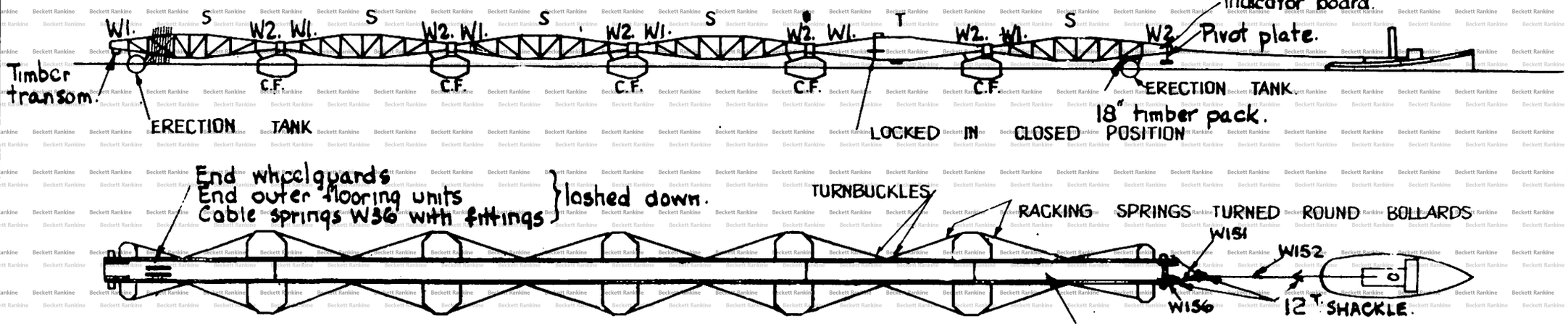


S = STANDARD SPAN Mark II
T = TELESCOPIC SPAN Mark II
C.F. = CONCRETE FLOAT. Mark II

TOWING TRAIN C2. (Mark II equipment for 40 T. tanks)

Spare towing train SC2. as towing train C2 except telescopic span replaced by standard span.

SKETCH. 38



S = Standard span. Mark II
T = Telescopic span. Mark II
C.F. = Concrete float. Mark II

TOWING TRAIN D2. (Mark II equipment for 40 T. tank.)

moor one float with one anchor at each end, and the centre of the bight made fast to the float. Mooring wires are 3.1/4 circ. in all cases, and when wound on the drum, the inside end about 20 ft from the thimble is seized to the drum, with a lashing that can be cut with a knife.

3.

Some half moorings are supplied. Their length is half that of the standard mooring, but they are wound on the same size drum. These half moorings, have thimbles on the inside end only, and are used for two purposes;

a) Supplementing a faulty mooring at any float as required.
b) Use as surge wires. These wires are taken from every sixth, eigth, or tenth float in a seawards direction. and roughly parallel to the bridge road. They are used to prevent excessive load being thrown on the pivot plate connection, when wind and swell drive in from seawards.

4.

Moorings are laid, using the mooring shuttle shown on Sheet 22. The draught of the loaded shuttle is 2'-6". It consist of two decked floats, connected together at a distance apart which allows the loaded mooring drum W115A, to be carried between. A 3" dia. tubular axle W53A, carries the drum and rests in flared sockets. Slings W49A can be used when lifting the drum and plug in to the ends of the axle tube. The axle sockets on the shuttle are fitted with hinged caps, so that the axle can be retained in position. The shuttle carries in addition to the mooring drum, two "Kite" anchors, stowed one at each end on a hinged bottom flap, which can be released by cutting two lanyards. A handbrake is fitted, to prevent the drum revolving too fast. On the deck of the shuttle, is a small tool box, in which are kept link pins W126B, D.Washers, W127B, Links W157, a 3lb hammer, a knife, rowlocks, and spare lanyards. Two oars are also carried on the shuttle.

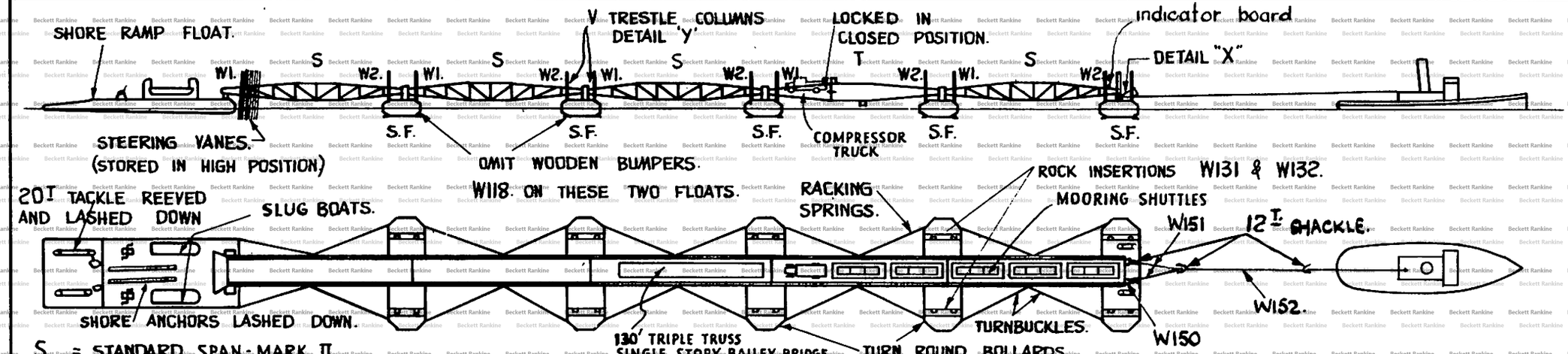
5.

When laying moorings, the shuttle is towed by the S.L.U.G. boat. Both can pass under the bridge span. The upstream anchor is laid first, and the correct position is found by lining up anchor flags ashore, and the appropiate bridge float. In this position, the shuttle should be about 630 ft from the bridge pier. The outside thimble end of the mooring is shackled to the forward anchor, using Pin W126B, and D.Washer 127B. After insertion of the pin through anchor links, and mooring thimble, the D.Washer is slid into the groove on the pin. The upstanding side of the D.Washer is now hammered down flat. After casting the forward anchor by cutting the lashings to the hinged flap, the shuttle is towed towards the opening at the seaward side of the appropiate bridge float. Care should be exercised, that the shuttle is passing <u>downstream</u> when the first anchor is dropped, and that this is the <u>forward</u> anchor. This will ensure that the hinged flaps are not damaged by water pressure. Generally the direction of movement of the shuttle should be <u>against</u> a flap that is being opened and tending to close it. The speed of rotation of the drum must be controlled by the hand brake, so that a length of mooring wire is <u>not</u> dropped on the sea bed in a heap. Note, the drum should be placed so that the wire leads down off the FORWARD side. A guide to correct laying can be found by observing the lead of the wire which should be slightly backwards, and resisting the pull by the S.L.U.G. boat. Using the brake, the speed of the S.L.U.G. boat can be controlled, and it can be stopped instantly if desired. On the approach of the shuttle, the racking springs across the appropiate bridge opening, should be well slacked away, but not cast off, altogether, so that the S.L.U.G. boat and shuttle can pass over them without a pause. Thus the racking springs will pick up the mooring wire when the shuttle has passed.

6.

Providing the S.L.U.G. boat crew keep well down in the cockpit, and the shuttle is "close" towed, there should be no difficulty in passing under the bridge in quite choppy water. The S.L.U.G. boat is specially designed to withstand violent contact with the bridge, when lifting on a swell.

DETAILS OF TOWING TRAINS E2 & F2.

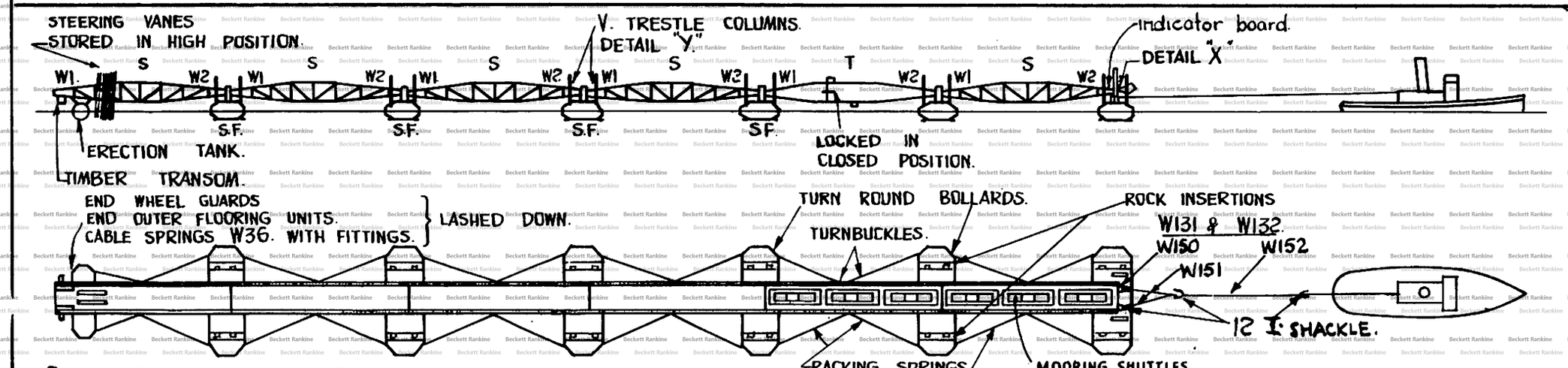


S = STANDARD SPAN - MARK II.
T = TELESCOPIC SPAN - MARK II. (CLOSED & LOCKED)
S.F. = STEEL FLOAT. WITH ROCK INSERTION UNITS & SPUDS.

TOWING TRAIN. E.2.

MARK II EQUIPMENT FOR 40 TON TANKS

SKETCH 39



S = STANDARD SPAN - MARK II.
T = TELESCOPIC SPAN - MARK II. (CLOSED & LOCKED.)
S.F. = STEEL FLOAT. WITH ROCK INSERTION UNITS & SPUDS.

TOWING TRAIN. F.2.

MARK II EQUIPMENT FOR 40 TON TANKS.

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7.

The S.L.U.G. boat and shuttle now proceed downstream until the mooring wire is almost completely unwound, and progress is halted by the lashing, securing the wire to the drum. The inside thimble end is now completely unwound off the drum, passed underneath and connected to the kite anchor in the stern. After cutting the lashing, securing the wire to the drum, the remaining and downstream anchor is let go. The bottom flaps are now relashed in position and the shuttle delivered to the next tug returning to base.

8.

When two or more bridge piers are used, and the distance between is less than about 900 ft, breast wires should be used. The drill for laying moorings is, however, the same, except that all the piers are moored at the same time. The first anchor is laid outside and upstream of the bridge piers about 630 ft away from the nearest float. The shuttle now threads its wire through one pier after another, until the wire is unwound. A loaded shuttle is now brought alongside and the free end of its mooring wire is taken down through its centre well and up through the centre well of the first shuttle, finally being connected to the inside thimble end of the first shuttle's mooring wire. The wire is cut free from the first shuttle, and the laying of moorings continues as before. Alternatively, breast wires need not be coupled to work in one length, but can be lapped at a float as convenient. This method involves a careful estimation of distance between bridge piers to avoid a short mooring for the downstream anchor, but will result in a saving of time.

9.

When the shuttle has passed under the bridge, the mooring wire is picked up, by hauling on the racking springs from the centre of the bridge float. This will cause the mooring wire to ride down close to the bridge float and from there, it can easily be transferred to the deck stoppers. By hauling the mooring wires, the bridge is now lined up straight. To tension the moorings, the following equipment is required.

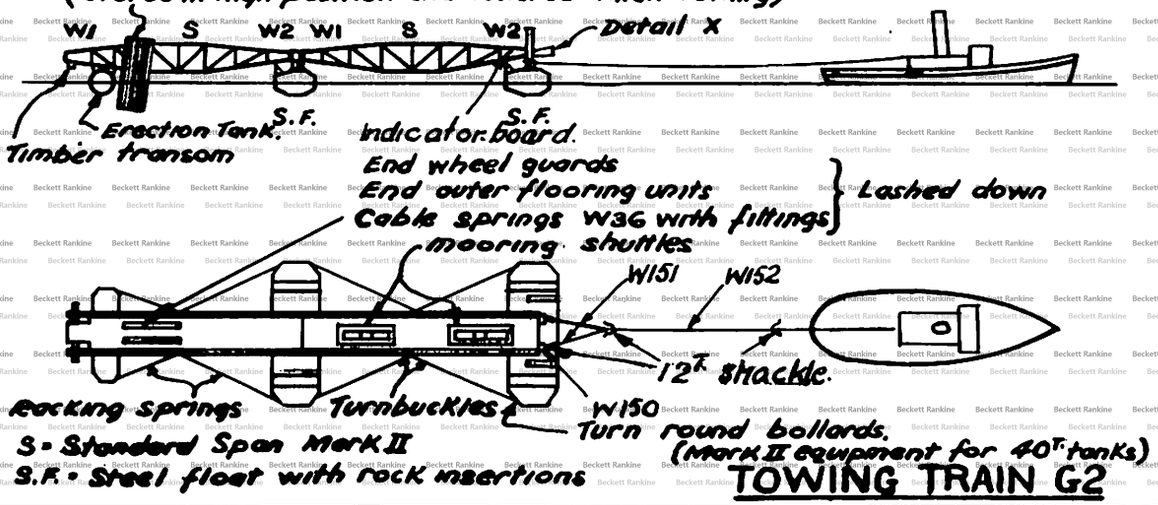
a) 2-3ton Yale Pull Lifts.
b) Rope stopper W63

It is kept either in the link tool box, or the end compartment of the float. The "pull lifts" are overhauled and hooked in the holes at the end of the float transom. The stopper W63, is clamped to the mooring wire, close down to the deck stopper. After hooking the pull lifts into W63, the deck stoppers are slacked off, and the wire hauled in by means of the pull lifts. By stopping down and repeating the operation, the correct tension can be obtained. If moorings are laid properly about 30 ft will need to be hauled in this way, requiring the above operation repeated 3 times. The moorings are correctly tensioned when at H.W., the wire strikes water surface about 20 ft. from the end of the float. This distance may of course, be considerably greater in the case of breast wires.

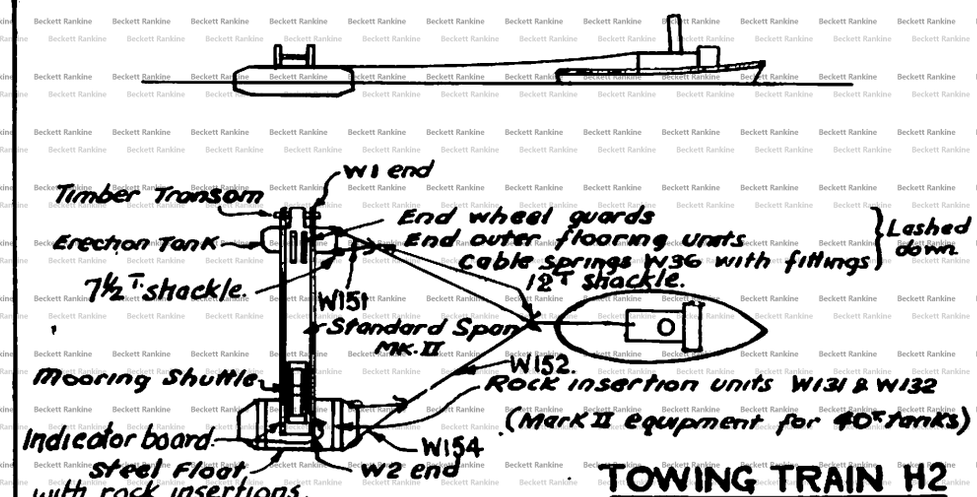
10

The loaded shuttles are brought to site on the deck of the link for which they are to be used. They can be rolled along the deck using the cable drum as a wheel. On arrival at site, the shuttles are launched down skids W148, which are fitted in position immediately previous to use. A check rope is advisable when launching, and care should be exercised that the cheeks of the drum are properly engaged in the grooves of the skids. After launching, the shuttles are taken in tow by the S.L.U.G. boats, and immediately carry out their respective mooring operations.

DETAILS OF TOWING TRAINS G2, H2, J2, K2.

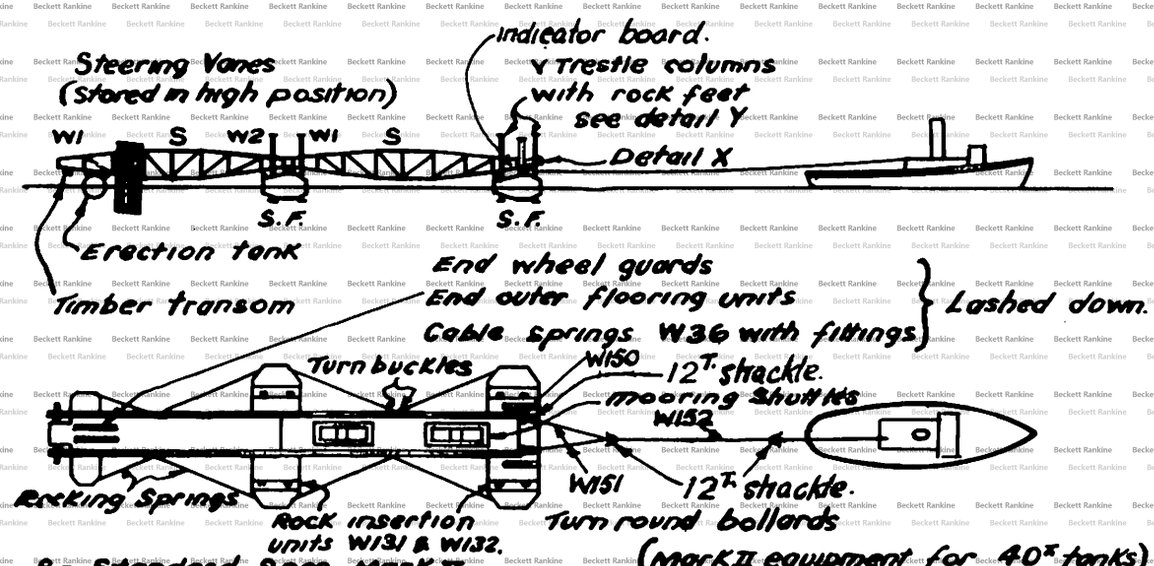


TOWING TRAIN G2

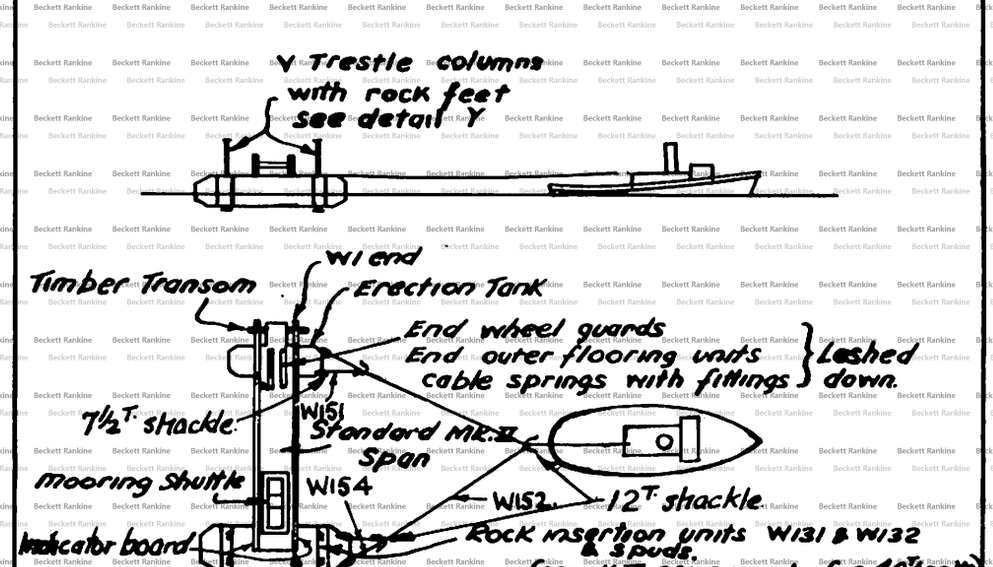


TOWING TRAIN H2

SKETCH 40



TOWING TRAIN J2



TOWING TRAIN K2

SECTION 12 Method of Span Coupling

1.

This operation is carried out, using erection tank and trumpet equipment (See Sketches 7,8 and 42). The end of the rear span on each link is carried on an erection tank, which drained of water, supports the Wl box end bearing about 2'-0" higher than its final position. See Tables 22 and 24, for relative clearances between bearings when coupling. This span end can be quickly lowered by flooding the erection tank. To flood the erection tank, turn the two handwheels fully to the open position. Now open the 4'2" air cocks, commencing with the inside pair. Opening the sluice valve alone, will not flood the tank, because the air is trapped. Complete control of the lowering operation is obtained, by simply operating the air cocks, and leaving the sluice valve fully open. Providing only the 2" air cocks are opened when flooding, it will not be possible to fill the tank so full, that it cannot support its own weight. The reason for the provision of 4-2" air cocks, is that the tank is divided into four compartments, thus ensuring adequate and controlled stability when flooding.

2.

To each compartment, is connected also, a 3/4" air cock to which a hose connection from air compressor, can be made. This is used when dewatering or lifting the span end. When using the 3/4" air cocks the 2" air cocks must be closed and the sluice valve must be OPEN. When dewatering,blow first the outside compartments,and then the inside compartments,thus ensuring stability. When the tank is empty of water, air bubbles appear from the bottom opening. The air discharge from an empty tank is violent, and unmistakeable, it should not be mistaken for intermittent air spilling which sometimes occurrs previous to the tank being completely empty.

3.

If the tank is flooded by the use of the 3/4" cocks, there is the danger of overflooding and complete sinkage under its own weight, therefore flooding by these cocks should only be used in salvage operations, requiring the tank to be completely submerged. They should <u>not</u> be used in bridge coupling.

4.

When towing,all valves and air cocks on the erection tank, will be closed. Immediately to the rear of the erection and fastendd, to the main girders is the timber transon, which acts as a form of fender, and in the coupling operation is engaged in the trumpets of the next link(See Sketch 8). The trumpets are rigged as shown in the upper view of sketch, and when coupling in rough weather,considerable load will be thrown on this gear. Attention should be given to the bottom lashing of the trumpet, which should be stout and of sufficient length to allow an upward tilt on the trumpet, of about 30°. The trumpet lifting tackle can be brought back through a snatch block and operated from the bridge deck, being made fast to one of the main girder web verticals. The trumpets must be fully bolted down to the float transons.

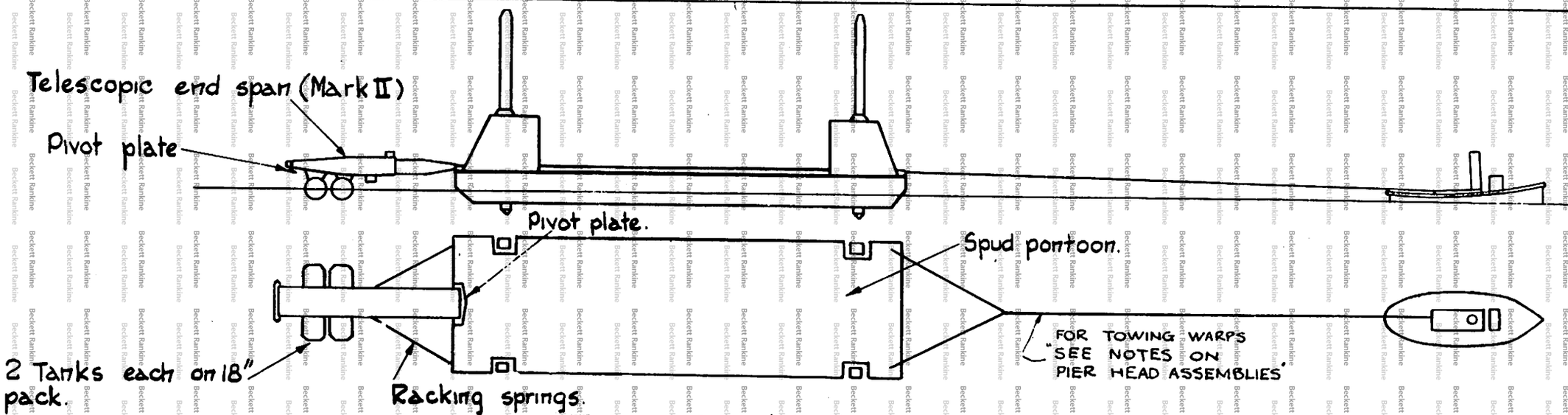
5.

As soon as the girder ends are brought close enough for the coupling operation to be undertaken, tackles should be set up from the corner bollards on the float to the end rings on the erection tank. These tackles control the latteral position of one link relative to the other. The sluice valves on the erection tank are now opened, and by drawing the links together, the timber transon is engaged in the trumpets. A lifting line from bottom of trumpet, hauled across the top of the timber transon will help the engagement in bad weather.

6.

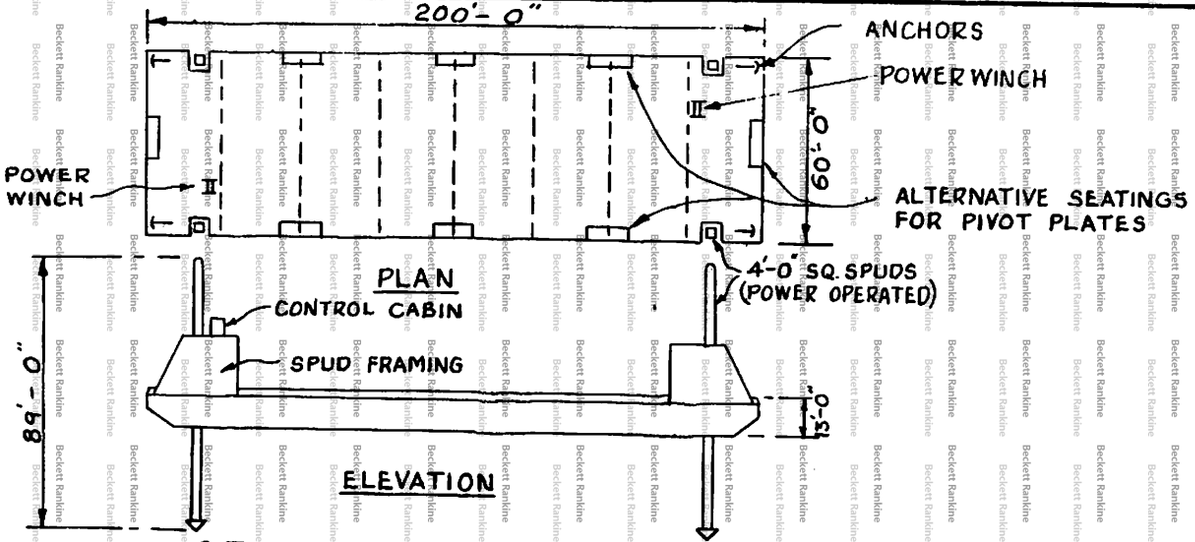
The timber transon is now hauled right home to the fullest extent in the trumpet, the bottom of which should be level. It will probably be found necessary to adjust trumpet lifting tackle, and slightly flood the erection tank, using the 2" air cocks. If overflooding occurrs at this stage, use can be made of the compressor truck, used for link hauling and carried on the inshore links. Overflooding causes loss of time, and should be avoided.

TOWING TRAIN MARK L2. & PIER HEAD UNITS.

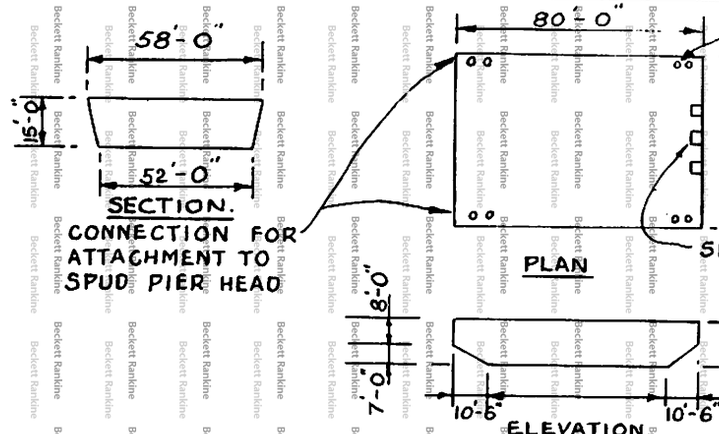


TOWING TRAIN L2 (Mark II equipment for 40 T. Tanks.)

SKETCH 41



SPUD PIER HEAD.



INTERMEDIATE CONCRETE PIER HEAD.

PIER HEAD UNITS.

The bearings will now be in the best relative positions for attachment of cable springs W37. Enter the pins W38 from INSIDE the bearings, with one thimble end of the cables on the pin. Make sure the cables are correctly arranged so that the long legs will be outside in the girder sheave, and in each case, one thimble of each cable is inside the bearing, and the other end outside. Hold the machined pin in position, with pin lever W147 and using a rat tail spanner, position outside cable thimbles on the machined pins. Now complete cable spring connections, using half washers and copper rivets. Hammer over copper rivets, using snaps W119.

7.

The bearings can now be lowered into their final position, by slacking off trumpet lifting tackle, and flooding the erection tank. To complete the connection flooring is fastened to moving leaf W35B, using bolts W23, hemespherical washers W25, spring Washers W24, and 3/16 split pins. These are kept in the tool box. Outside flooring units, end wheel guards, dished cover, and bearing keepers are now fastened in position.

8.

Before bad weather arrives the timber transon and erection tank must be removed. To remove the transon, simply undo the supporting bolts, allowing it to fall into the sea. It can then be towed away until required for further use. To remove the erection tank, open sluice valves and 2" air cocks until air ceases to escape, then close both sluice valves and air cocks. Remove racking springs and latteral control tackles. Make fast to S.L.U.G. boat hauling downstream. Using hand axes or sharp knives, cut the cordage lashing securing wire straps W91. The tank will drop clear, about 9", and must be immediately towed away. If this operation is smartly carried out, even in choppy water, no damage will result, since the saddles are hinged and can only strike a glancing blow. The erection tank can now be beached as convenient, and drained at H.W.

9.

Where inlet mud covers W143, have been used, care should be exercised previous to the operation to see that these are cast off, and do not obstruct the sluice valve inlets.

SECTION 13 Method of Positioning Shore Link

1.

Shore links should arrive at site 3 to 4 hours, before H.W. On the shore ramp float, are carried two S.L.U.G. boats, which are immediately launched, and proceed to the shore, each with a long 3" manilla warp. These warps are hauled up the beach above H.W. and made fast to angle pickets E343 driven in by means of a 7lb hammer. The crew of one S.L.U.G. boat, positions the shore flag marks indicating the line of the bridge pier, and upstream anchors.

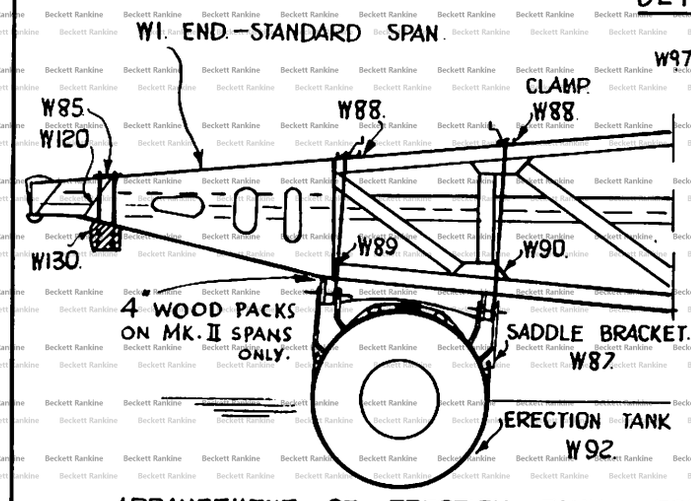
2.

The shore link is positioned roughly square, with the beach (see Sheet 43) using temporary erection anchors laid by the S.L.U.G. boats. Each S.L.U.G. boat carries two 80lb C.Q.R. temp. erection anchors, with two 600 ft 3" circ. manilla anchor warps. As the tide rises, the link is hauled further and further up the beach using the winches and warping drums, fitted to the shore ramp float. The erection anchor warps are passed from float, working seawards additional erection anchors being laid inshore as required.

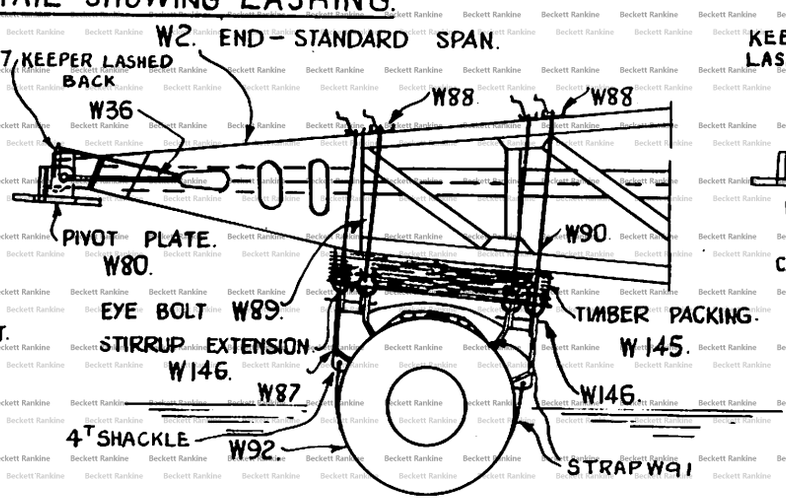
3.

The second and third links are brought up, temporarily moored and coupled, by which time H.W. should be reached. At this stage it can be reasonably expected that the shore link will have been hauled up the beach, to somewhere near H.W. mark, and permanent moorings can now be laid, using S.L.U.G. boat and shuttle

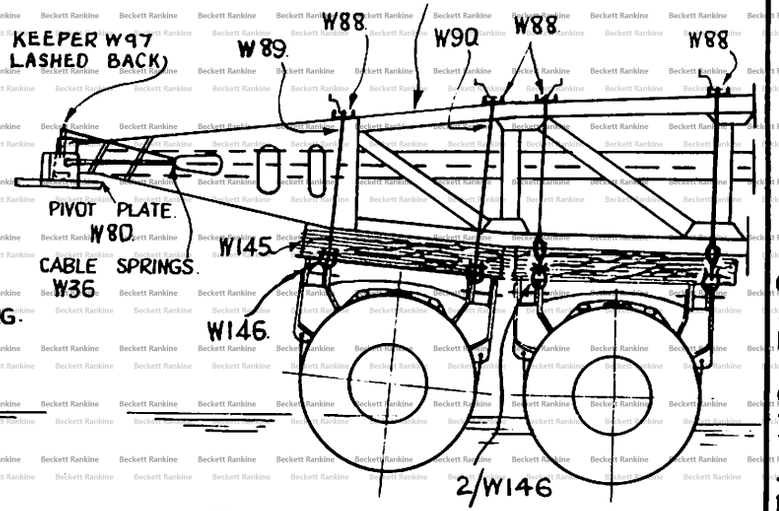
DETAIL SHOWING LASHING.



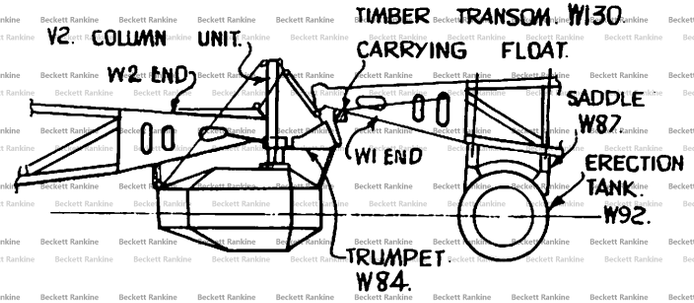
ARRANGEMENT OF ERECTION TANK FOR NORMAL LINK COUPLING.



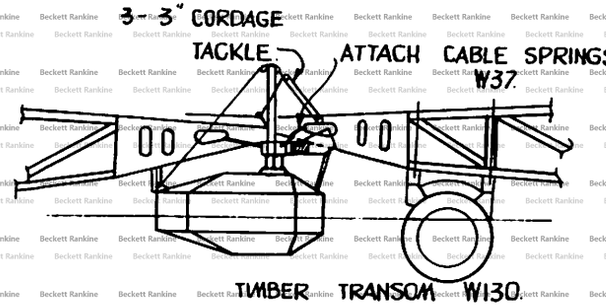
ARRANGEMENT OF ERECTION TANK FOR BRIDGE COUPLING TO PIER HEAD UNITS.



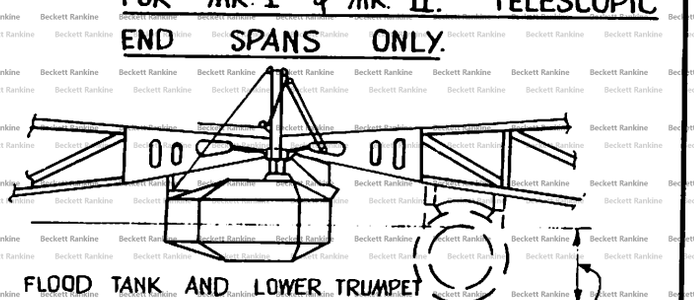
ARRANGEMENT OF ERECTION TANKS ON PIER HEAD TOWING FOR MK. I & MK. II. TELESCOPIC END SPANS ONLY.



STAGE 1.



STAGE 2.



STAGE 3.

METHODS OF FASTENING ERECTION TANKS.

SKETCH 42

PAGE 82

as described in section 11. It will be of little use to attempt laying permanent moorings previous to about 1 hour before H.W., since the shore link will not be far enough up the beach. The inshore links must therefore, be held by temporary erection anchors, on 3" circ.manilla cables which can easily be transferred from float to float, as the links are hauled inshore. Thus it will only be necessary for tugs to work near the shore, on a rising tide. After H.W. a considerable length of the pier should be in a position, and remaining links can be brought up, and permanently moored immediately.

3. It is obvious that two S.L.U.G. boats will be insufficient for mooring purposes, at least six being required. It is therefore necessary for towing links arriving early, to include type M, i.e. spare shore ramp floats, the S. L.U.G. boats from which will be available for operation purposes.

4. The shore links carry on the deck, a compressor truck, facing towards the shore ramp float. This truck is used for hauling the links together and is available, should an erection tank be overflooded during the coupling operation. After the connection of the first link,the truck backs seawards along the bridge,ready for the next coupling operation.

5. After H.W, and when the shore link has dried out,the remaining road up the beach,is made good, using concrete mats, or Somerveld track. The shore anchors are laid out, and connected up with 20 ton tackle, to the shore ramp float, and 5 ton winches. The shore anchorages are shown on Sketch 45. Where necessary, in bad holding ground, the anchorages must be supplemented by laying additional anchorages in tender.

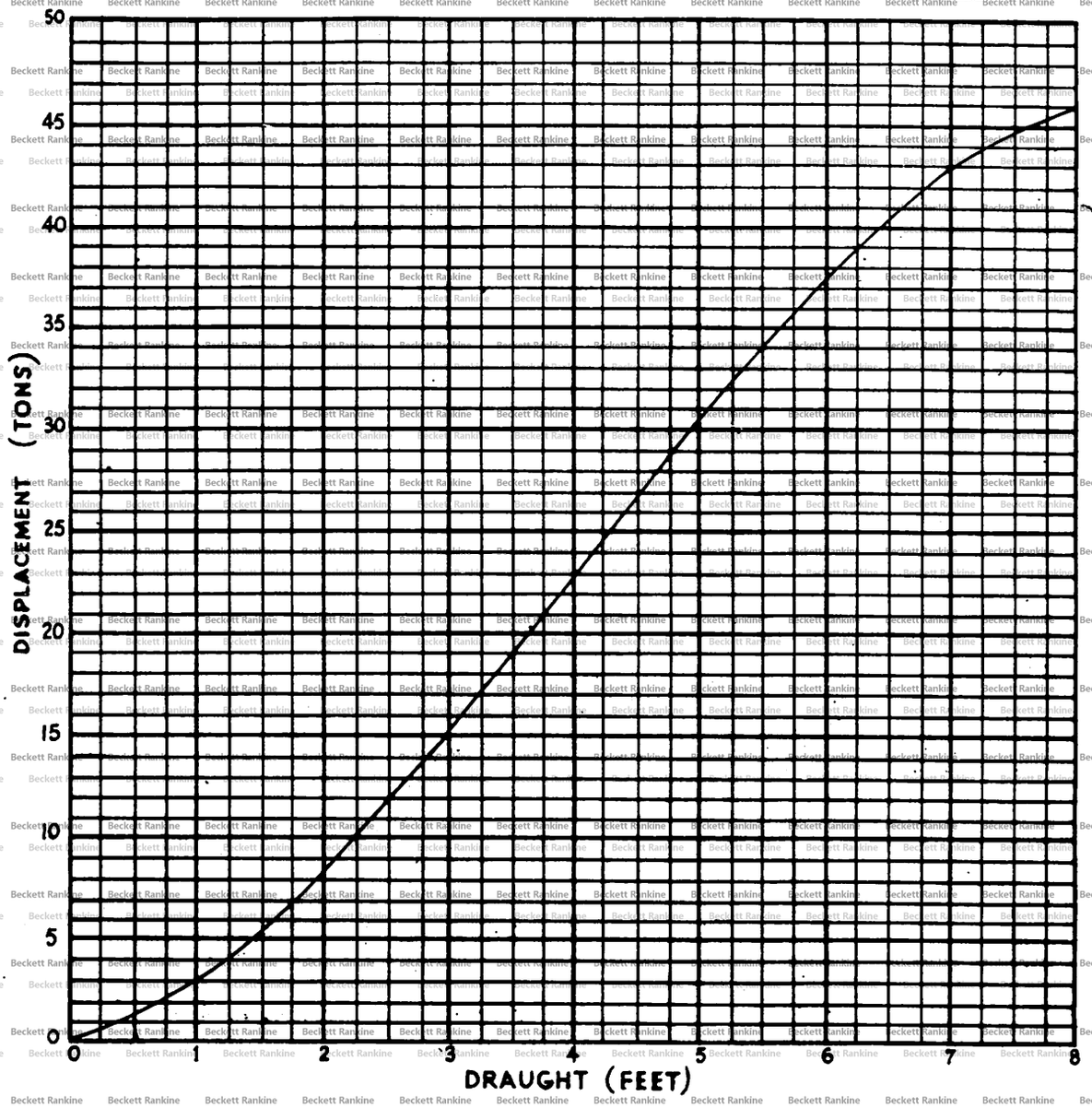
6. In all cases steering vanes must be cut adrift on arrival at site and before manoeuvering of the link commences.

SECTION 14. Method of Positioning Intermediate Links

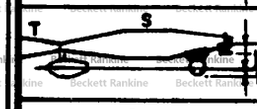
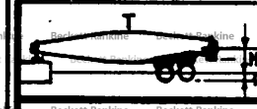
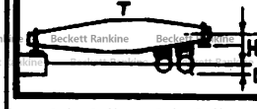
1. Generally for those links, there will be sufficient water for the tug to tow them close to the pier end, so that a handline can be thrown across. Should this not be possible, a line can be passed, using the S.L.U.G.boats, or failing this, a line can be fired from the rocket pistols, carried in the tool box. Having passed a line from the rear end of the link, to the pier end, a 600 ft. 3" circ. warp is hauled across. This is passed through a snatch block, fastened to the W2 box end on the upstream side, and attached to the rear of the compressor truck, which motors shorewards, along the bridge road, thus hauling the link into position. Spare snatch blocks are supplied, so that a purchase can be set up if necessary. The 600 ft warp is attached to the downstream W1 box end, at the rear of the towed link.

2. Meanwhile, on the link the steering vanes have been cut loose, and the loaded shuttles launched. The tug allows the link to swing broadside to the stream,keeping the seaward end as far as possible lined up with the pier. The mooring shuttles towed by the S.L.U.G.boats, having cast upstream anchors, now work downstream, appropiate mooring springs are slacked off, and the shuttles pass under the bridge to the seaward side of their respective floats. The tug must momentarily slack off its towing warp, to allow the shuttle laying the seaward mooring to pass over. Thus the mooring wire is picked up by the tow line, and can be hauled aboard the end float. When the moorings are picked up, the tug casts off, the shuttle launching skids are thrown clear, and the next link is brought up. The coupling operation can take place independantly, and the next link should not hang about waiting for its completion. The tug takes in tow, the empty shuttles, and returns to base. Whilst the coupling operation is going forward, moorings should be correctly tensioned, and the spans lined up. Sketch 44 shows the general outline of this operation.

ERECTION TANK DISPLACEMENT CURVE



WEIGHT OF ERECTION TANK AND SADDLES = 8·8 TONS.

TABLE OF REACTIONS ON ERECTION TANK.	TONS	H.	D.	h.
 REACTION FROM MK.I STANDARD SPAN.	17·8	7'-8⅛"	4'-7½"	—
 REACTION FROM MK.I STANDARD SPAN & PIVOT PLATE. 18" WOOD PACK ON TOP OF SADDLES.	18·9	9'-4⅛"	4'-9"	9¾
 REACTION FROM TELESCOPIC END SPAN MK.I AND PIVOT PLATE. 18" WOOD PACK ON TOP OF SADDLES.	23·2	10'-2⅛"	4'-1½" MAX.	9¾
 REACTION FROM MK.II STANDARD SPAN. 4" WOOD PACK ON TOP OF SADDLES.	19·0	7'-9⅜"	4'-9⅛"	—
 REACTION FROM MK.II STANDARD SPAN, & PIVOT PLATE. 18" WOOD PACK ON TOP OF SADDLES.	20·1	9'-1⅛"	4'-11½"	9¾
 REACTION FROM TELESCOPIC END SPAN MK II AND PIVOT PLATE. 18" WOOD PACK ON TOP OF SADDLES.	25·0	10'-5⅛"	4'-3½"	9¾

H = DISTANCE FROM WATER SURFACE TO UNDERSIDE OF FLOORING.

D = LOADED DRAUGHT OF ERECTION TANK ALLOWING 6" RESIDUE WATER INSIDE.

h = DISTANCE UNDERSIDE FLOORING TO UNDERSIDE PIVOT PLATE.

SECTION 15 Method of Connection to Pier Head Units

1.

The seaward end link is positioned in the same way as the intermediate links, except that the erection tank at the leading end, is held by temporary erection anchors. At this stage the pier should be complete, and with all telescopic spans in the closed position. Sketch 42(centre view) shows the arrangement of the erection tank, at the seaward end of this link. It will be seen that the girders are packed up higher than normal, by 18" wood packs on top of the saddles, also that the W2 girder ends support a pivot plate complete.

2.

The spud pontoon pier head unit is towed as near as possible into position, and lowers its spuds. It will be found that the side of the pontoon is about 5 to 10ft away from the pier end. Handlines are thrown across, and four returns of 3" S.W.R. are passed through each sheave, on the W2 box ends of the span,carrying the pivot plate. 20 ton tackles are set up to each girder end, and the falls taken to the power capstans on the spud pontoon.

3.

The bridge pier is now stretched out, until the pivot plate comes close to the pontoon side. The pivot bed plate W121, is now positioned, so that its centre lines through, with the centre of the pivot plate W80,and one of its 3'6" edges lies along the pontoon edge. The unit W121 is now fastened to the pontoon deck, using the bolt gun. Care should be exercised when firing the bolts, that they do not project more than 1" above the top of the base plate, otherwise the pivot plate will not seat correctly.

4.

Having fastened the pivot bed plate to the pontoon deck, the pivot plate is hauled over the deck, and when set fairly to engage the W121 unit, the erection tank is flooded and cut free. The 5 ft ramp W83, is now positioned. It hooks in the end flooring units of the bridge. Hauling tackles are disconnected, and the pier is ready for use.

SECTION 16 Alternative Methods of Mooring when no Shuttles are available.

1.

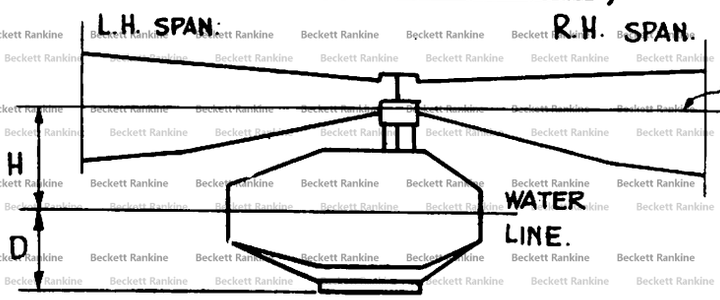
If craft suitable for laying anchors and mooring wires, are available, the links can be positioned on temporary erection anchors and moorings, laid and connected up as a subsequent operation. To simplify this subsequent operation, the anchors can be cast with a short length of mooring rope, to which a light buoy is attached. The buoys are then connected to the bridge floats by small boat work. It should be noted that the deck grips on the bridge floats are made to suite the standard mooring 3.1/4" circ.S.W.R. The grips will not work satisfactorily on other sizes of wire, so that if several light wires are used to connect up to the anchor buoy,some other method of fixing to the bridge float must be improvised.

2.

Where the erection site is clear of obstruction, the following method of mooring can be used but involves the tugs working close inshore. The kite anchors are lashed down,one at each end of each bridge float. On the bridge deck and over the float, the mooring drum is carried in its cradle W48A, with the axle in the direction of the length of the pier. The outside thimble on the mooring wire is connected to what will be the upstream kite anchor. This attachment is made for every cable on the towed link, and while the link is under tow. The tug now manoeuvers the link upstream, to a position such that

TABLE OF BRIDGE FLOAT DRAUGHTS

(TWO SPANS IN POSITION)



	L.H. SPAN	R.H. SPAN.	FLOAT.	H	D	REMARKS.
MK. I	STANDARD	STANDARD	STEEL	6'-0 1/8"	4'-7 5/8"	
	STANDARD	STANDARD	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS	6'-2 1/8"	4'-5 5/8"	D REDUCED
	STANDARD	STANDARD	CONCRETE.	5'-8 1/4"	6'-0 1/2"	BY 6" IF
	STANDARD	TELESCOPIC	STEEL	5'-10 11/16"	4'-9 1/16"	WOOD BUMPERS
	STANDARD	TELESCOPIC	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS.	6'-0 15/16"	4'-6 13/16"	OMITTED
	STANDARD	TELESCOPIC	CONCRETE	5'-6 13/16"	6'-1 15/16"	APPLIES ONLY
	TELESCOPIC	TELESCOPIC	STEEL	5'-9 1/4"	4'-10 1/2"	TO STEEL FLOATS.
	TELESCOPIC.	TELESCOPIC.	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS	5'-11 3/4"	4'-8"	
	TELESCOPIC.	TELESCOPIC	CONCRETE	5'-5 3/4"	6'-3 3/8"	
MK. II	STANDARD	STANDARD.	STEEL WITH ROCK INSERTIONS BUT NO SPUDS	6'-2 3/4"	4'-5"	
	STANDARD	STANDARD	STEEL. WITH ROCK INSERTIONS INCLUDING SPUDS.	6'-0 3/8"	4'-7 3/8"	
	STANDARD	STANDARD	CONCRETE MK II	5'-10 3/16"	6'-1 9/16"	
	STANDARD	TELESCOPIC	STEEL WITH ROCK INSERTIONS BUT NO SPUDS	6'-1 9/16"	4'-6 3/16"	
	STANDARD	TELESCOPIC	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS.	5'-11 3/16"	4'-8 9/16"	
	STANDARD	TELESCOPIC	CONCRETE MK. II	5'-8 1/2"	6'-3 1/4"	
	TELESCOPIC	TELESCOPIC	STEEL WITH ROCK INSERTIONS BUT NO SPUDS.	6'-0 3/8"	4'-7 3/8"	
	TELESCOPIC	TELESCOPIC.	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS.	5'-10"	4'-9 3/8"	
	TELESCOPIC	TELESCOPIC	CONCRETE MK. II	5'-6 13/16"	6'-4 15/16"	

H = DISTANCE FROM WATER SURFACE TO UNDERSIDE OF FLOORING.

D = EXTREME DRAUGHT OVER BUMPERS.

NOTE: DRAUGHT OF FLOATS FOR 1 TON. LOAD ON TRANSOM IS INCREASED AS FOLLOWS:

	MK. I STEEL FLOAT.	MK. II STEEL FLOAT OR MK. I. WITH ROCK INSERTIONS.	MK. I CONCRETE FLOAT.	MK. II. CONCRETE FLOAT.
INCREMENT IN EXTREME DRAUGHT (INS.)	11/16	9/16	11/16	9/16

the rear float is over its upstream anchor position. The steering vanes are cut loose, and the upstream anchor for the rear float only, is cast, by cutting its securing lashing. The tug now swings the leading end of the link out to seawards, so that the link lies athwart the stream. As each float passes the anchor flag line, its upstream anchor is cast.

3. The tug casts off, anchors on the upstream side of the bridge anchors, and pays out two long warps to the link which is dropped right downstream to the extremity of the mooring wires. The mooring wires are stopped down and the inner thimble end is taken under the bridge span, and attached to the downstream anchor, which is then cast, by cutting its securing lashings. After slacking the deck stoppers, the tug using its winches, hauls on the long warps, pulling the link up over the tide, to its final position, where the moorings can be properly set up, and permanently made fast while the link is coupled to the pier end in the usual way.

4. This method cannot be used, unless there is plenty of clear sea room, and in any case, for the inshore links, there will be insufficient water for the tug to manoeuver. The inshore links can however, be kedged into position, and moored with temporary erection anchors, until the tide falls. The permanent moorings for the inshore link can then be laid, using lorries operating on the beach itself. If the beach is too soft for vehicles to operate, the mooring drums can be rolled by hand from one anchor position to the other the wire being unwound as they go. These will obviously be tedious processes. and the use of the mooring shuttle in all cases, is strongly recommended.

SECTION 17 Erection on Rock

1. On rocky shores all links are fitted with steel floats, and rock inserts with spuds(See Sketch 25). On the bridge deck, a good supply of sand bags and half filled cement sacks, is kept for use in preparing float berths.

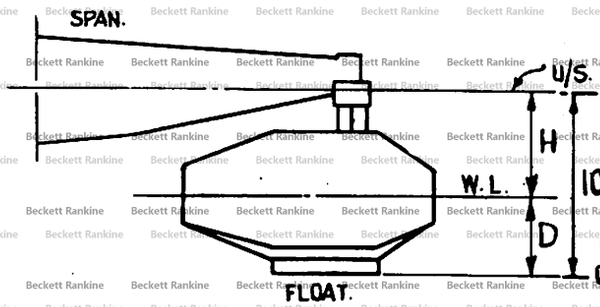
2. The links are positioned as described in sections 13 and 14, but before the tide falls, the spud legs are lowered, pinned in position, and adjusted with the driving tubes. The float should, in all cases, be grounded on the spuds, in about 8ft of water. Reasonably good weather is essential, for this operation, and every effort should be made to complete the prepared float berths before the arrival of bad weather(See Ch.I, Section 5).

3. The floats are moored in the usual way, using shuttles and kite anchors. It will probably be found that many of the "kite" anchors will not grip satisfactorily, but this will not matter, for the first tide, since the floats will soon be supported on their spuds. As the tide reaches from the beach, the "kite" anchors should be inspected, and where necessary, rock anchors inserted and coupled to the moorings. Sketch 84 shows the rock anchors. Holes for rock anchors are made using the 10 lb beehives. The hole should be about half filled with water before inserting the rock anchor, which is self grouting. After inserting the rock anchor, the waterproof outer covering is gradually removed, by pulling on the four linen loops, the anchor bolt being worked up and down all the time, until the covering is completely removed. The anchor bolt is now forced right home, and connected with the thimble on the mooring using two 7½ ton shackles taken from the racking spring equipment. The cement grout hardens in 15 minutes, and sets to full working strength in 24 hours.

4. For ineffective anchorages below L.W. level, the beehive and rock anchor can still be used, but must be placed by divers, and will therefore be slow.

TABLE OF BRIDGE FLOAT DRAUGHTS

(ONE SPAN IN POSITION.)



	SPAN	FLOAT.	H	D	REMARKS.
MK. I	STANDARD	STEEL.	6'-10 1/8"	3'-9 5/8"	D REDUCED BY 6" IF WOOD BUMPERS OMITTED APPLIES ONLY TO STEEL FLOATS.
	STANDARD	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS.	6'-10 3/8"	3'-9 3/8"	
	STANDARD	CONCRETE.	6'-6 1/4"	5'-2 1/2"	
	TELESCOPIC	STEEL	6'-8 11/16"	3'-11 1/16"	
	TELESCOPIC	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS.	6'-9 3/16"	3'-10 9/16"	
	TELESCOPIC	CONCRETE	6'-4 13/16"	5'-3 15/16"	
MK. II	STANDARD	STEEL WITH ROCK INSERTIONS BUT NO SPUDS.	6'-11 9/16"	3'-8 3/16"	
	STANDARD	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS	6'-9 3/16"	3'-10 9/16"	
	STANDARD	CONCRETE-MK II	6'-6 3/16"	5'-5 9/16"	
	TELESCOPIC	STEEL WITH ROCK INSERTIONS BUT NO SPUDS	6'-10 3/8"	3'-9 3/8"	
	TELESCOPIC.	STEEL WITH ROCK INSERTIONS INCLUDING SPUDS	6'-8"	3'-11 3/4"	
	TELESCOPIC	CONCRETE-MK II	6'-4 1/2"	5'-7 1/4"	

H = DISTANCE FROM WATER SURFACE TO UNDERSIDE OF FLOORING.

D = EXTREME DRAUGHT OVER BUMPERS.

H ON TABLE 22 MUST EXCEED H ON ABOVE TABLE BY 6" FOR COUPLING TO BE POSSIBLE OTHERWISE THE END FLOAT MUST BE LOWERED BY FLOODING.

A considerable length of the pier beyond L.W.mark, can,however, be moored, using rock anchors set at L.W.mark. The mooring wires will,of course, be out of square with the bridge.

5.

No spuds are provided for the shore ramp float, which must therefore seat direct on the rock. Should damage result, it will not be serious, providing the shore link has been hauled well up to H.W.mark, since it is unlikely that the deck of this float will be damaged, and the pier road will be intact and usable. It is therefore essential to get the shore link well up the beach on the first H.W. and if possible, this should be a spring tide. Providing the hatches on the shore ramp float are maintained in an airtight condition, it can be floated even though the bottom is holed.

SECTION 18 Provision of Road access over Sea Wall.

1.

The shore ramp float makes provision for discharge on to a flat beach, the surface of which can be reinforced by concrete mats or somervell tracks as may be required. If, however, the beach terminates in a sea wall, a major obstacle is encountered, which since the floating bridge equipment is entirely waterborne, is not readily overcome. The shore ramp float may be beached close to the sea wall, or depending on the form of beach, some distance away.

2.

On the shore link is carried Bailey Bridge equipment piece small and sufficient for a clear span of 120 ft. On Mk.I equipment, a single double construction is used, and on Mark II equipment, single-triple construction is used. After beaching the shore link, the Bailey span is assembled flat on the beach, and with the inshore end close to the seawall. The shore anchorage equipment is laid out on top of the seawall, complete with 20 ton tackles, reeved and connected to the 5 ton winches on the shore ramp float. A 20 rung ladder is carried on the shore link for assistance in scaling the sea wall. On completion,the Bailey span, fully decked, is lifted in stages, from the bottom of the panels, extra panels being introduced under the span, and the block attachment reconnected from time to time,(see Skotches 46,47 and 48). After the inshore end of the span has been lifted sufficiently, extra panels are added to extend over the sea wall, and the span is lowered on to bearings, placed towards the edge of the sea wall. Finally, end ramps are positioned.

3.

It may so happen that the Bailey Span must be constructed partly on the beach, and partly on the shore ramp float. For ease in construction, timber sleepers are carried, and these are used as a crib, where necessary. Where seaward bearing for this span occurs on the shore ramp float, good longitudinal spreaders,formed of sleepers should be introduced before traffic is allowed.

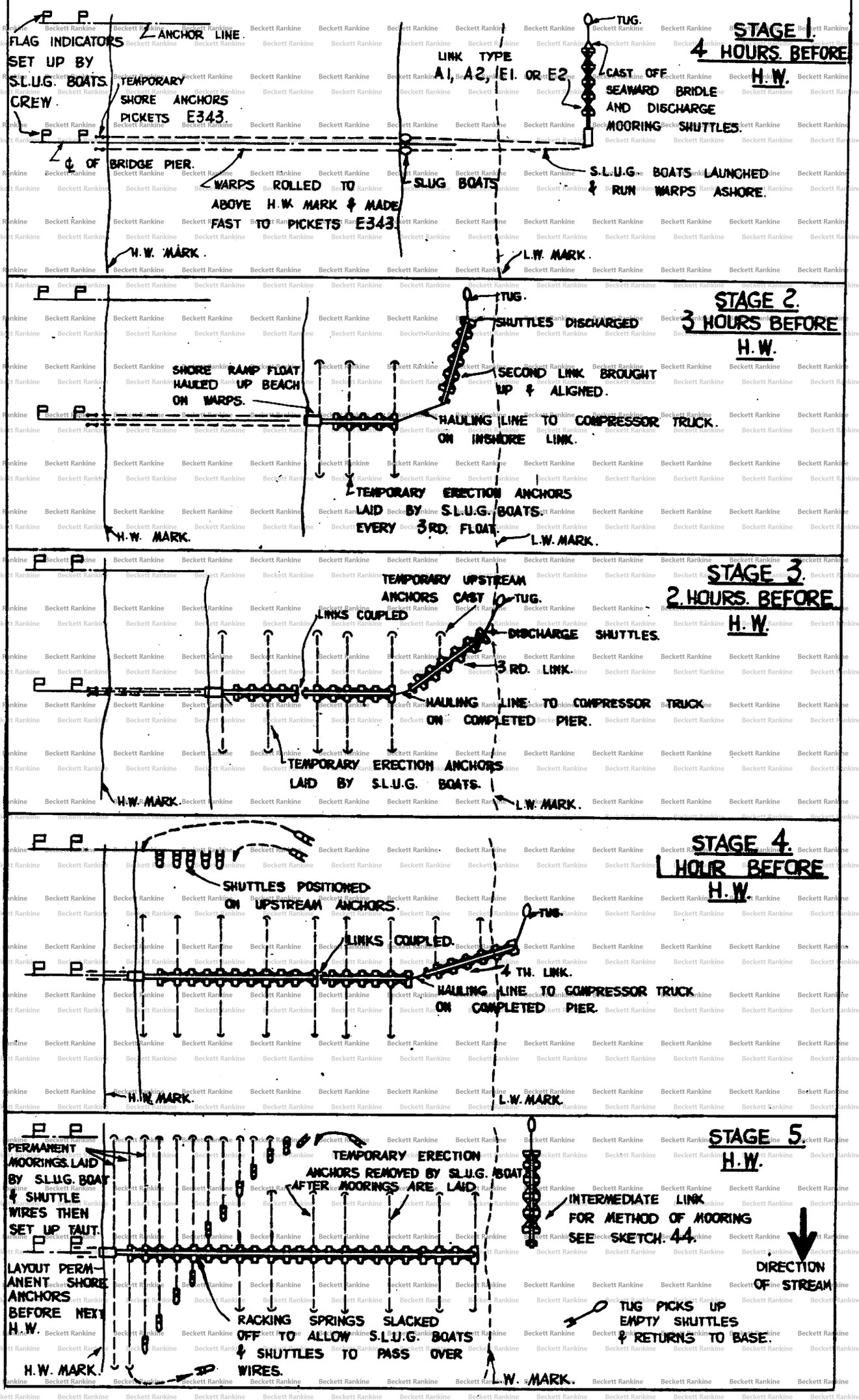
4.

If shore links have not been placed on the top of a good spring tide, provision should be made for extending the bridge pier further up the beach. The shore anchors can be transferred to the beach, or if convenient, used in their existing position. The lower block of the 20 ton tackles must, of course, be made fast to the shore ramp float.If the Bailey span seats on the shore ramp float, it will probably be necessary to jack the girders and insert rocking rollers, when hauling the shore ramp float up the beach on a high tide. (See Sketch 48) If the inshore end of the shore ramp float approaches the sea wall, closer than about 50 ft, the Bailey span must be shortened, since it is not practicable to support its bearings on the floating bridgedeck.

5.

All equipment, including sleepers,necessary for erection of the Bailey bridge, must be carried on the shore link. None of this equipment, except the lightest components, should be placed on the shore ramp float, or shore end

METHOD OF MOORING. SHORE LINKS.



span, but must be disposed towards the seaward end of the link. This is essential, since the draught of this link at the inshore end, must be kept to a minimum.

CHAPTER IV

SECTION 19 General Organization

1.

Assembly depots should be laid out, so that piece small material can be fed in at one end by road or rail, stacked, sorted and transferred to building bays. Span building will be quickest if steam cranes are used so that waggon tracks, crane tracks, stacking areas, crane tracks and assembly tracks, will be required. Sketch 49 shows a typical arrangement. All tracks between span assembly bays and span lifting crane, should be laid level. After assembly, spans are moved by hand on ball bearing diplory trollies to the span stacking area. From the span stacking area, the spans are moved to within reach of a crane capable of a 30 ton lift. The crane must be suitably placed to form towing links, and this will require an arrangement which will allow a complete link length to be moored alongside. The reach of the crane clear of the quayside, must be at least 25 ft. It will not be easy to trolley a completed span round curves, so that the span stacking layout should include a traverser. A suitable simple hand propelled traverser, is shown on Sketch 50.

2.

If the reach of the crane is not sufficient to allow a span complete, to be spun right round when lifted, care should be exercised, to ensure that spans are built the right way round with W2 end, facing seaward allowing for its direction to be reversed, when lifted, and its final position with the W1 end to seaward. Thus the first span will be placed on one float, and one erection tank, the erection tank being to seaward. This span will then be moved along the quay to seaward, a second float introduced at the shoreward end, and the second span placed again, with W1 end to seaward. The operation is completed, until the link is complete.

3.

It will be a convenience if the quay to seaward of the crane is provided with road access, so that small gear, erection fittings etc, can be loaded by mobile crane. It is important that span assembly should be controlled to produce spans of the type required, and in the right order to suit towing links, otherwise a heavy burden will be thrown on the traverser.

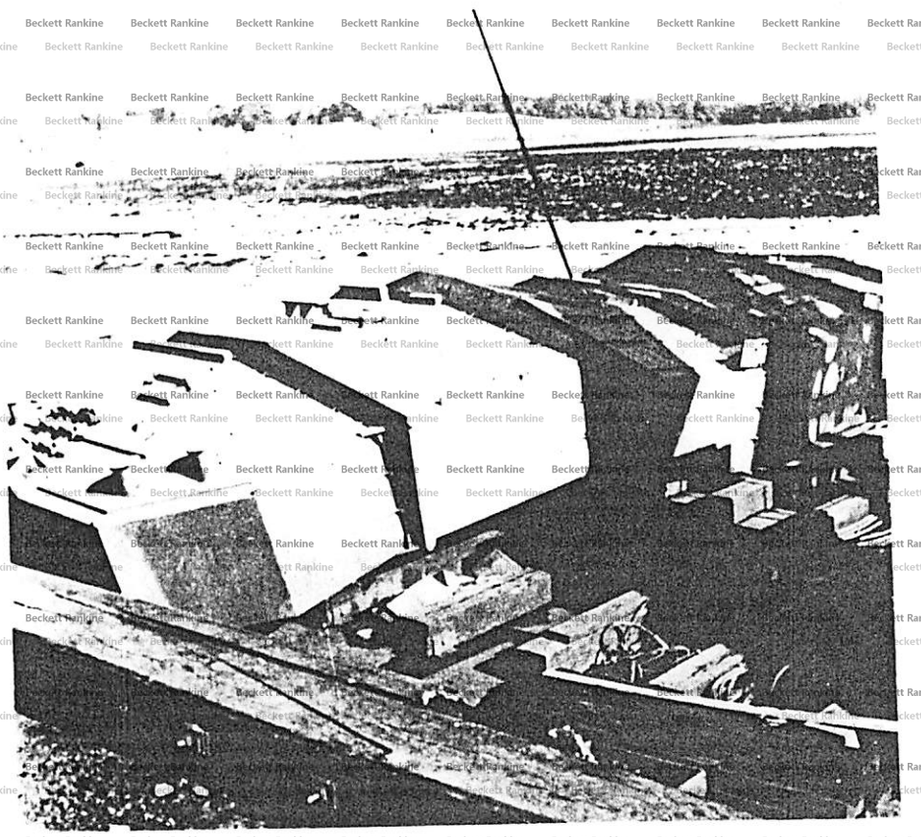
4.

Steel floats can be assembled in the span building bay, and handled in the same way as spans being finally launched by crane. A by pass spur direct to crane will be an advantage for handling and launching the erection tank. Concrete floats will need to be brought to the assembly depot by water if not, constructed and launched close at hand. Shore ramp float sections, weight about 14 tons, they can be launched by crane, but must be subsequently beached on a grid for bolting up between tides. The shore ramp float sections may be delivered in 3 pieces, which will require to be field welded together, and air tested to 3 lb/sq.inch pressure, before launching. This may be carried out in span assembly bays or possibly in span storage areas.

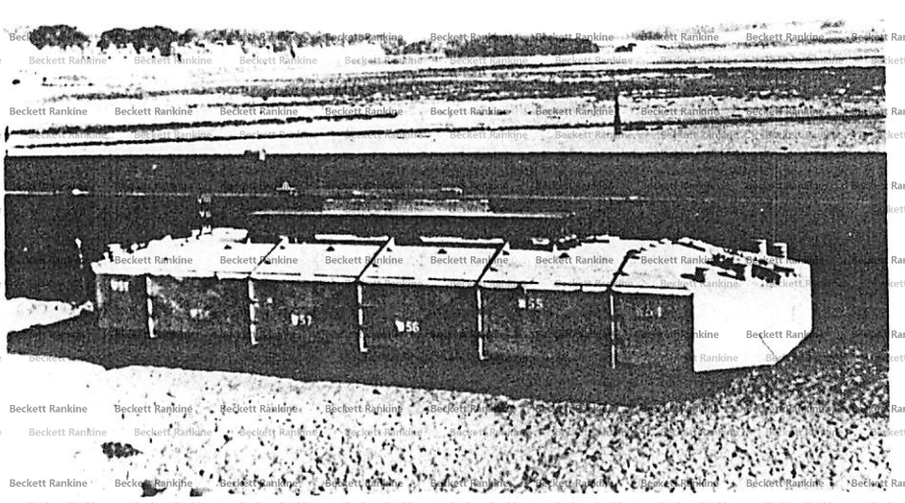
5.

The majority of floating bridge components can be stored in the open. Small components, such as bolts, turnbuckles, shackles, blocks, yale pull lifts, S.W.R. & manilla cordage etc., should however, be given weather proof cover.

PLATES D & E



D. STEEL FLOAT UNITS READY FOR ASSEMBLY.

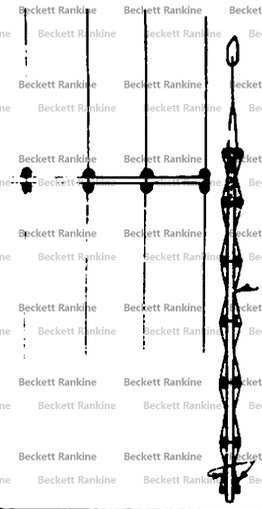


E. STEEL FLOAT ASSEMBLED WITH TRANSOM IN POSITION.

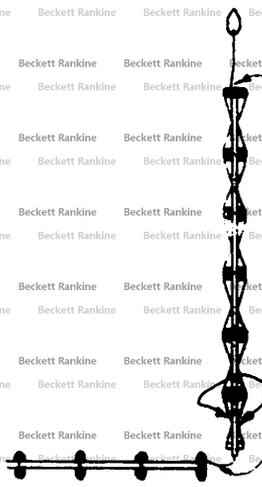
STAGE 1.

TUG STEAMS UP STREAM WITH TOWING TRAIN COMPLETE WITH SIX SHUTTLES ON BOARD THE FIRST TWO SPANS.

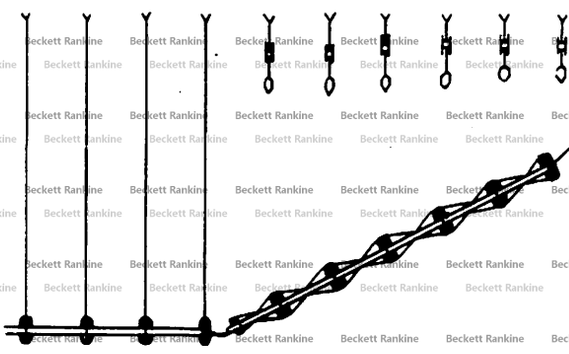
DIRECTION OF STREAM.



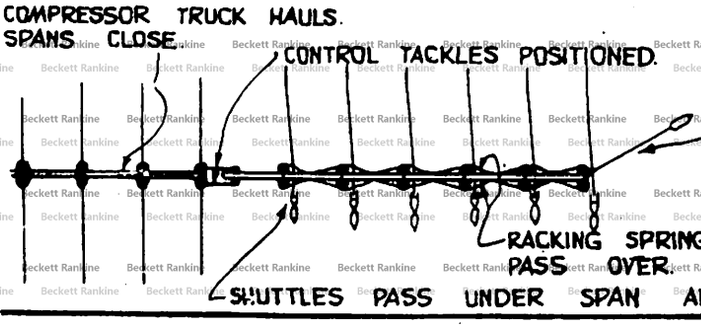
STAGE 2.



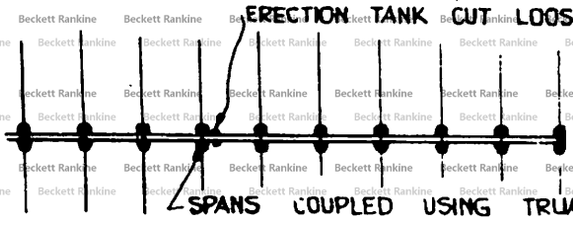
STAGE 3.



STAGE 4.



STAGE 5.



TUG CASTS OFF AFTER MOORINGS ARE CONNECTED, COLLECTS EMPTY SHUTTLES AND RETURNS TO BASE

METHOD OF MOORING INTERMEDIATE LINKS.

SECTION 20 Reconnaissance and Estimation of Requirements

1.

Estimation of requirements is impossible without some knowledge of beach condition. The following must be known:-

a) The L.W.O.S. depth requirement at pier head - depends on size of vessels which will use the pier.

b) The neap and spring tidal ranges - can be obtained from nautical almanack.

c) The rough beach gradients down to L.W. - from aerial photographs, large scale charts etc.

d) To what extent the equipment must ground on rock, and, if so, what kind of rock - from geological reports etc.

e) Whether a sea wall must be negotiated at, if so, what height - from aerial photographs etc.

In addition, the proposed maximum loading must be known to determine whether Mk I or Mk II equipment will be required.

2.

With the above data, and using a large scale chart, it will be possible to determine the length of pier, total number of spans, number of floats etc. To determine the required number of telescopic spans, beaching of shore links on H.W.Neaps is assumed, and that the pier end will be hauled up the beach to the H.W.Spring position. The beach gradient seaward for about 500 ft. from H.W.Springs, is therefore a necessity and can be obtained with sufficient accuracy from aerial photographs taken at known and different states of the tide. From these gradients, it should be ascertained that at H.W.Neaps, the bridge floats will not ground before the shore ramp float (See Sketch 24), also the required pier length extension from H.W.Neap to H.W.Spring mark. The extension per telescopic span is 9ft, so that the total no.of these spans in the pier, can be quickly calculated. They should be well spread throughout the pier length, and not arranged all together, at the inshore end. This gives a better answer to enemy action, and allows local extensions to take place when grounding in hollows etc.

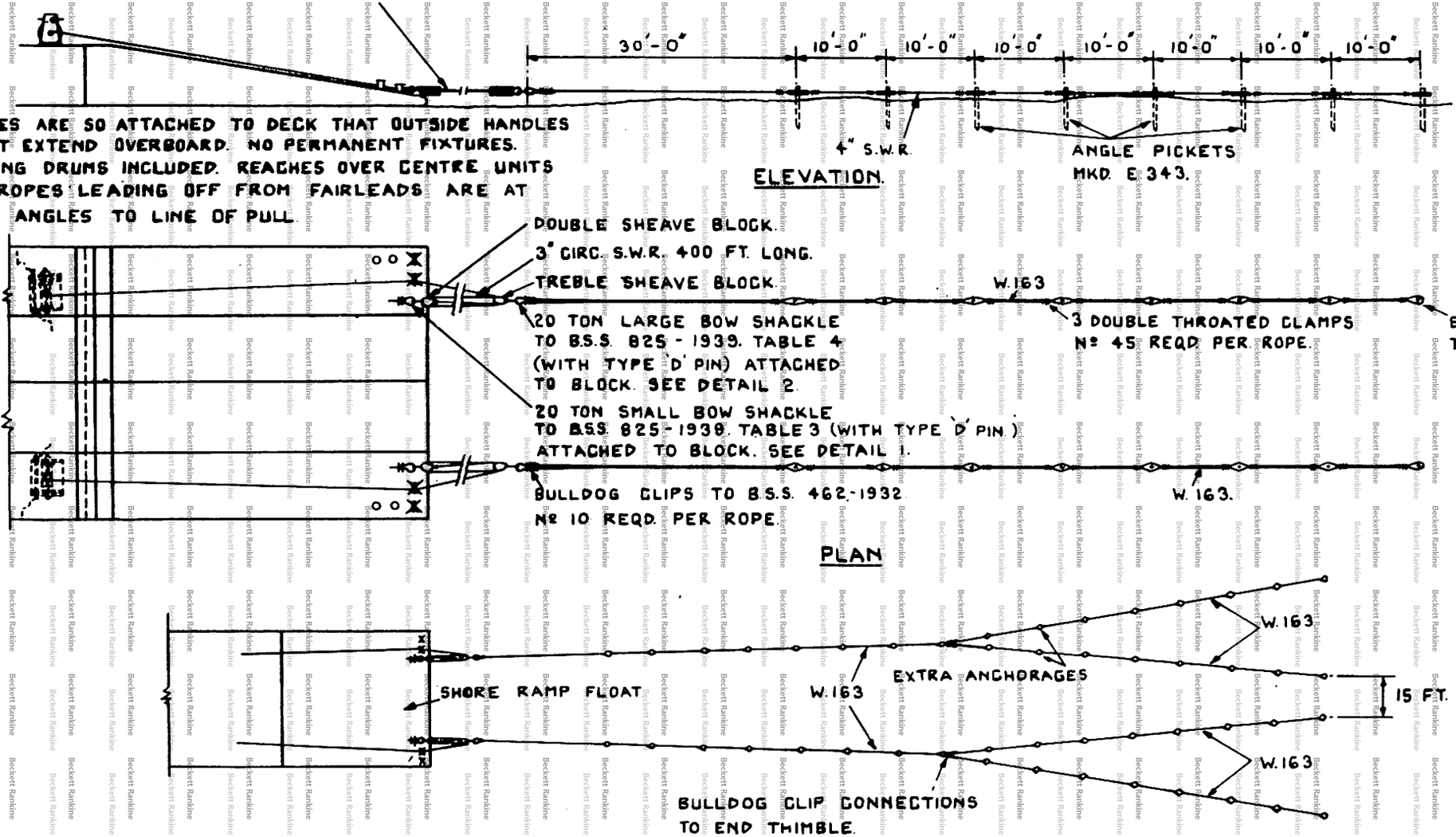
3.

The pier length can now be divided up into its various towing links, making due allowance for spares etc. Tables 19 & 21 give the detail composition of each link. In assessing requirements of S.L.U.G.boats and mooring shuttles, the ideal will probably have to be tempered by the supply position. The ideal supply of shuttles would be one per bridge float, but failing this, arrangements must be made with a view to returning shuttles to base, refilling and towing to site on the last towing links. At least six S.L.U.G.boats will be required for the mooring operation.

SECTION 21 Span building and Float Assembly

1.

Assuming spans are to be built, using 5 ton steam cranes in the assembly, by depots, the general arrangement would be to run the crane track alongside a building track, and on the other side of the crane track, arrange stacking areas of sufficient width, to accommodate materials for 2 spans in the length of one bridge span. Thus, while span assembly proceeds, materials can be unloaded for use on the next days work. Using 12 men, it will be possible to assemble 1 span complete per day. The span assembly parties should each include at least one steel erector. When stacking span material, it will pay to place the units in the correct order, and as near as possible to their final position of assembly i.e.Main Girder materials will be required first, and flooring units last.



ARRANGEMENT OF SHORE ANCHORAGES.

2.

For each Span about 8 transverse baulks (9" x 9" timber is suitable) should be laid across the assembly track and packed as required to give a level top. The length of the baulks should be about 18 or 19ft. On top of the transverse timbers light angle sections can be laid for easy skidding. The two main girders are now assembled flat and side by side with top chords facing away from the crane, only partially bolt the centre web vertical. On completion the main girders are lifted by the crane and set in an upright position with about 15ft. between. The centre cross girder is now fastened in position on one main girder only and packed up. The subsidiary cross girders are now connected to this same cross girder and packed up. The remaining unconnected main girder is now either skidded or lifted with the crane to its correct position the cross girders being threaded into their respective web verticals and connected up. It should be noted when lifting the girders into the upright position that one only will be skidded in to give the final girder centres so that the one that is not to be moved should be placed with its centre 6'.10.1/2" from the centre of the assembly track. This will ensure the span is properly balanced when finally jacked on to trollies for removal.

3.

The steel decking is now fastened in position with the exception of the end panels and end wheel guides. These with cable springs 4-W.36 & 4-W.37 dished covers W.26 bearing keepers, bolts, machined pins, racking springs etc., and all fittings necessary for attachment to floats are laid out on the bridge deck. In the case of spans to be used at the near end of a link the saddles complete and tool boxes with complete contents are also fastened in position. Other spans which will finally seat on erection tanks, i.e. telescopic END spans etc., should also be fitted with saddles, wood packs and pivot plates at this stage.

4.

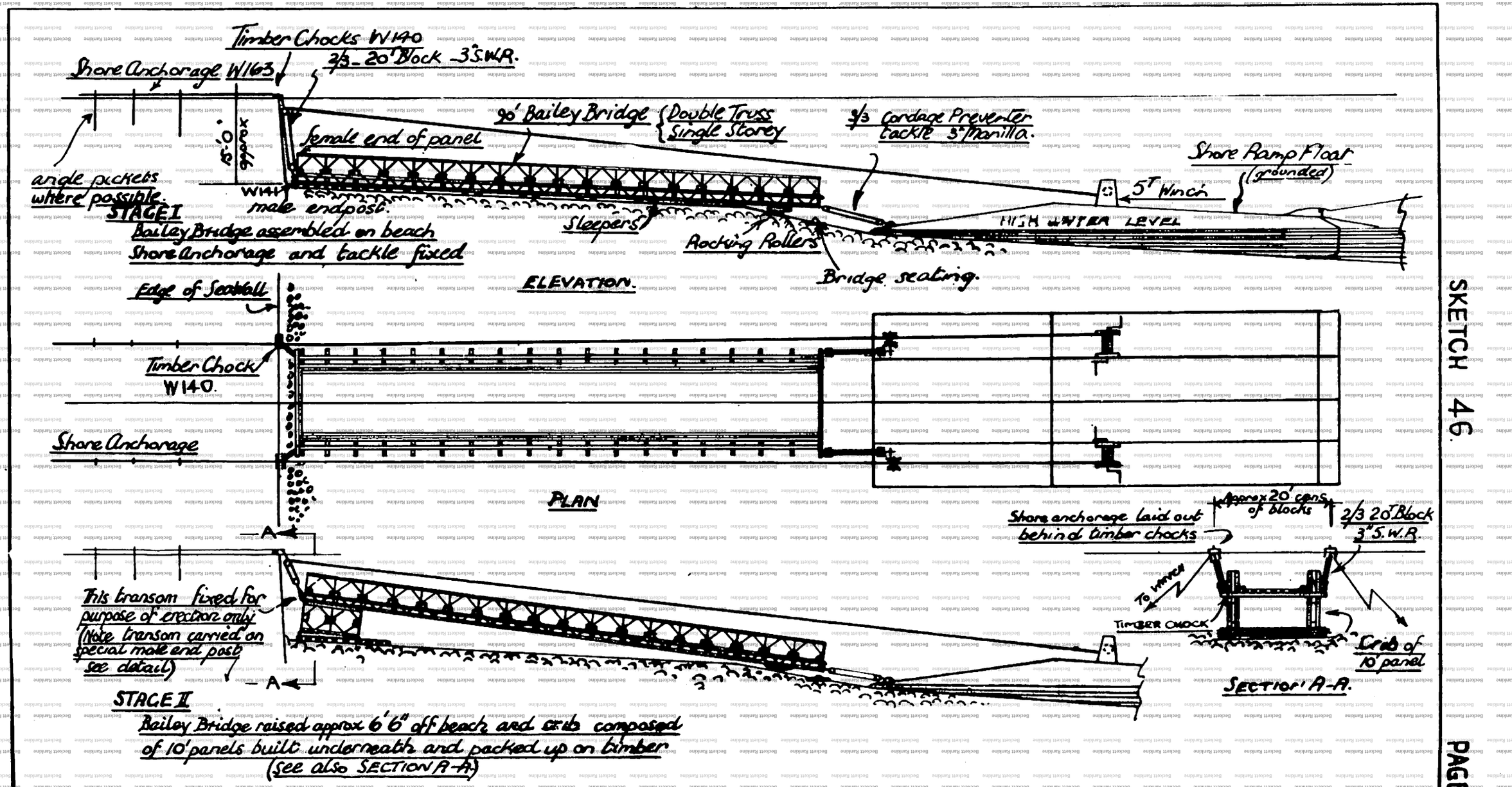
Care should be exercised that correct sizes of bolts are used in span assembly, also that spring washers W.93 and ferrules W.34, split pins etc. are correctly fitted. Reference should be made to the large scale working drawings (see list of Drg. references). After completion, the span is jacked up and the transverse timbers removed. The span is now lowered on to the diplory trollies, which are either manhandled into position, or rolled in from the end of the assembly track. This latter alternative is possible only if all spans on the assembly track are jacked up and ready for the trollies.

5.

In the case of telescopic spans, the sliding boxes should arrive one inside the other. Generally they are assembled as for the standard span, and in the CLOSED position. Before assembling, main girders, sliding boxes W.101 should be inspected, and the top and botton flanges freed from paint and well greased, especially UNDER THE BEARING BLOCKS. The boxes should be locked in the closed position, using 4 sets locking pins W106A. All temporary wood packing etc, must of course be removed. The span complete can be lifted with a four legged sling attached to the end of the two centre subsidiary cross girders, the wires being well protected with timber packing. Special spanners W.69 & W.95 are provided for span assembly with a good supply of 7/8" rat tail spanners.

6.

There is no difficulty in steel float assembly, which can easily be carried out on transverse timbers. These timbers should be large enough to allow access underneath for bolting up. A square washer W.117, must be used under both head and nut of all bolts connection flanges of float sections. These bolts must be complete in number, and thoroughly tightened up. This is particularly important on the underside of the float, which cannot be inspected after launching. Special spanners W.64 & W.65 are provided for float assembly. Steel floats must not be jacked against the plating but against lifting beams positioned close to the bulkheads. When supported on diplories stout timber spreaders should take the load over several frames, and again near the bulkhead.



SKETCH 46.

METHOD OF POSITIONING RAMP BRIDGE ON SEA WALL

The float can be lifted complete with slings round the transoms. It should be sent forward to the crane, complete with bearings,keepers,moving leaf W35B, brackets W35C, 1.1/8" rat tail spanner,rope grip W63,3 Ton yale pull lift handrailing etc.. Note bolts connecting bearings and transoms have no taper washers but spring washers W.93 under head and nut. Note that hardwood bumpers W118 are ommitted on certain floats on shore links and it will be most difficult to remove them when once the float is launched. In float assembly, therefore, steel floats without bumpers should have the words "NO BUMPERS" painted on the deck. The handrail sockets, deck grips, hatch nuts etc. should be well greased.

7. Shore ramp float sections may arrive in three pieces which will require site welding. Great care should be exercised in lining up so that the section remains straight and the bolt lug centres are correct. The joints are arranged for all downhand welding (see large scale working drawings as indicated in drawing references.). After welding the float sections must be air tested for leaks. 3 lb/sq.inch is sufficient and all joints should be painted with a soap and water solution,bubbles indicating leaks which must be sealed by welding. It is possible that some of the shop welded seams may leak so they should be tested at the same time. After launching the sections can be beached on a grid and bolting up all bolt connections must be completed with a 3/16" split pin. Shore anchorages pickets, 5 Ton winches, davits,surf boats, 20 Ton tackles, handrailing etc., must be placed in final position on shore ramp floats.

SECTION 22. Storing of Towing Links.

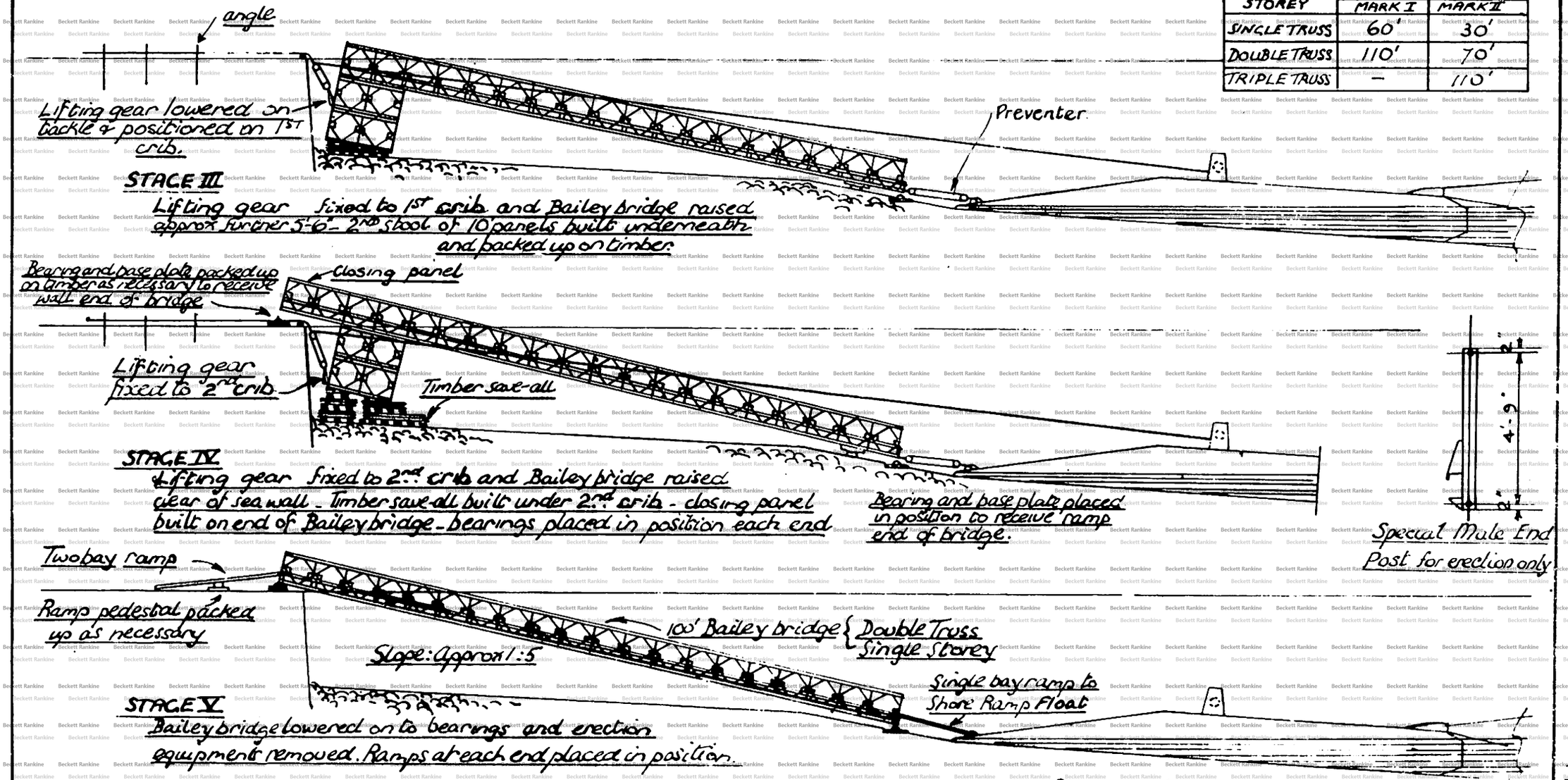
1. As far as possible links should be moored in complete sets each set sufficient for one bridge pier and in water of sufficient depth to give a fathom at L.W. Sketch..51.....shows a suitable mooring arrangement for 3 sets of links. The links should be maintained absolutely complete and ready for operational use with racking springs and towing warps, etc. set up and in position. The mooring arrangements should be such as to allow any one link to be removed without casting the rest adrift. There should be no possibility of floats grounding and holing themselves on anchors etc.

2. As far as possible a storage anchorage sheltered from prevailing winds is preferable. Should it be necessary to berth erection tanks on mud to prevent choking of the sluice inlet covers W143 should be used and fastened in position by lines to the handwheel sluice control. To minimise the risk from enemy action it is well to stagger the disposition of link clusters bearing in mind that any link from any cluster may have to be taken in tow without fouling the remainder. All links will need daily inspection and periodical maintenance.

3. Convenient to the assembly area a shuttle loading base will be required. A quay on which mobile 5 Ton cranes can operate will be suitable. As soon as a link is taken in tow for operational purposes it can then easily load its complement of shuttles complete with anchors and moorings without undue delay. Empty shuttles will have to be returned to the shuttle loading base which must have facilities for storing all anchor equipment.

4. If,however mooring shuttles are available in sufficient numbers to provide one per bridge float the shuttle loading base can be dispensed with and loaded shuttles positioned on the deck of towing links at assembly depots. All links will then be complete and ready for operational uses.

SAFE ALLOWABLE CONSTRUCTION		
SINGLE STOREY	MAXIMUM SPAN	
	MARK I	MARK II
SINGLE TRUSS	60'	30'
DOUBLE TRUSS	110'	70'
TRIPLE TRUSS	–	110'



placing of triple truss single storey Bailey bridge similar.

METHOD OF POSITIONING RAMP BRIDGE ON SEA WALL. (CONTD)

SKETCH 47.

CHAPTER V - Maintenance and Repair.

SECTION 23. General Maintenance of Floating Bridge.

1. Providing moorings are maintained at correct tension little maintenance will be required for the bridge spans. They should be given a day to day examination for loose bolts etc. and a greasing routine practiced for the following parts -

a) cable springs.
b) bearings, pin joints etc.
c) sliding boxes and bearings on telescopic spans.

2. With regard to bridge floats a periodical inspection for leakage will be needed together with a greasing routine for deck stoppers, hatches and handrail sockets. Good attention must be given to moorings so that the bridge pier remains lined straight and fore and aft float surge transverse to the road is kept to a minimum. The length of moorings from float to anchor should be at least 14 times H.W. depth and the correct tension (about 5 Tons) will cause the wire to strike the water surface 20 ft. from the float end at high water. Correct mooring tensioning is most important since on this depends the safety of the bridge road for vehicles travelling at speed. For several tides after erection the mooring wires will work loose due to stretching, anchors bedding in etc. This of course requires the retensioning of mooring wires from time to time. Mooring ropes should be greased or painted for a length of about 6 ft. where they enter the water.

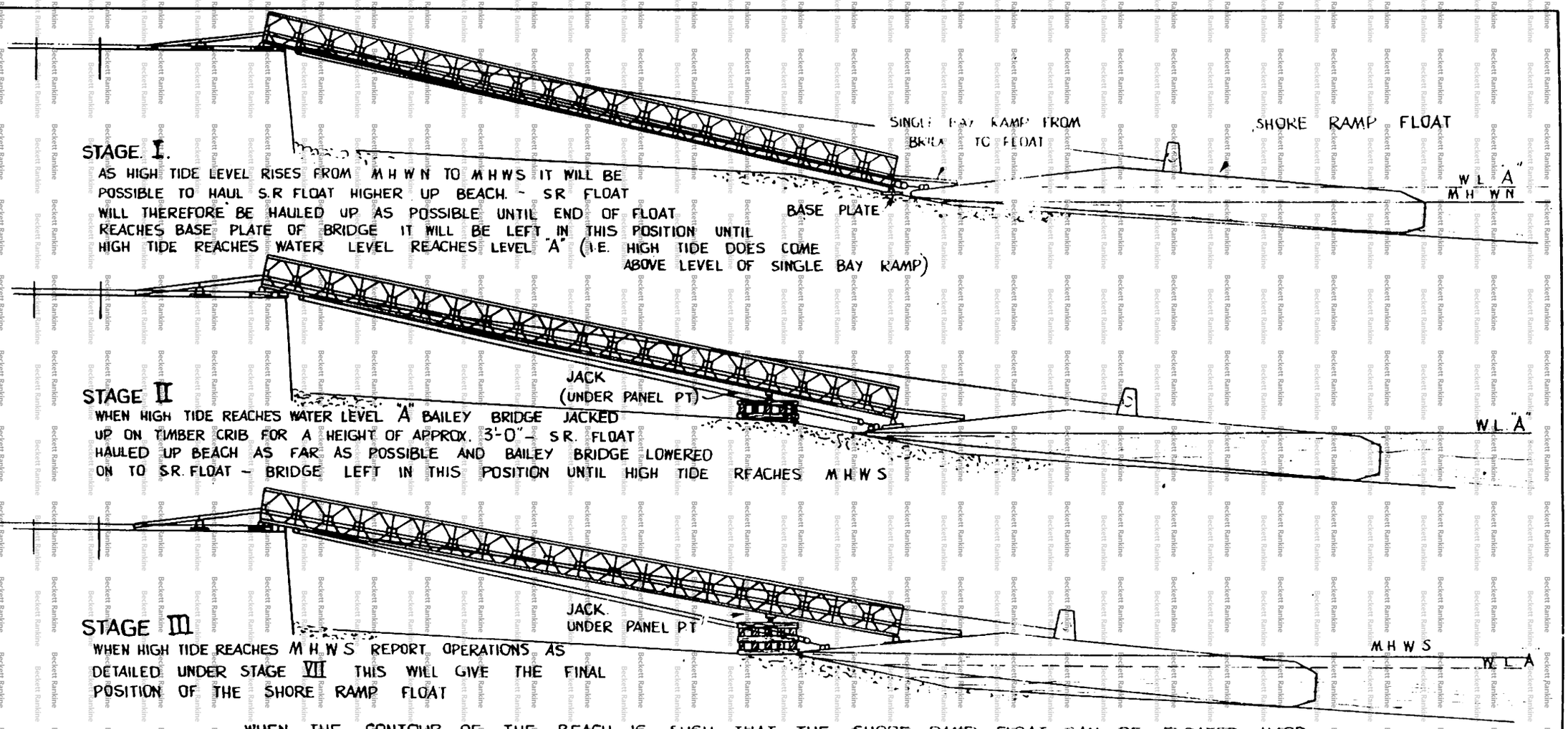
3. A small degree of weeping may be found in some concrete floats and will need occasional pumping out.. A lift and force pump hand operated will generally meet the case though power pumping equipment is available for dealing with serious leaks. The steel floats being of thin metal and subject to corrosion should be kept well painted down to the waterline. While paint is still wet decks should be dusted with sand, thus ensuring a good footgrip.

4. From time to time attention should be given to sliding bearings in telescopic spans. Should it be found that these bearings need replacement the operation is simple if relief wedges W.137 and cradles W160 are used. The cradle fits on to the girder and takes the weight of the bearing as it is slid into position.

SECTION. 24. Repair to Damaged Floats.

1. The most vulnerable of the floating bridge equipment is undoubtedly the bridge floats which can be damaged by enemy action, awkward grounding on boulders etc. and through clumsy handling. From the last two causes the steel floats are least likely to damage since being constructed from thin metal and welded they can be dented and distorted to an amazing degree without leaking. The maintenance of float buoyancy is vitally important since a submerged float will put the whole pier road out of action and may easily result in severe wrenching of bridge span bearings etc..

2. All bridge floats are subdivided into six separate watertight compartments two of which can be holed and flooded without float submergence under normal bridge span loading. The most serious effects from float holing occur if 2(two) end compartments at one end are damaged and as a partial remedy the outside end compartments of concrete floats are filled with steel drums. If all compartments are holed, however, the buoyancy from these drums will be quite inadequate to support the float and bridge spans.



STAGE I.

AS HIGH TIDE LEVEL RISES FROM M.H.W.N TO M.H.W.S IT WILL BE POSSIBLE TO HAUL S.R FLOAT HIGHER UP BEACH. - S.R FLOAT WILL THEREFORE BE HAULED UP AS POSSIBLE UNTIL END OF FLOAT REACHES BASE PLATE OF BRIDGE IT WILL BE LEFT IN THIS POSITION UNTIL HIGH TIDE REACHES WATER LEVEL REACHES LEVEL "A" (I.E. HIGH TIDE DOES COME ABOVE LEVEL OF SINGLE BAY RAMP)

STAGE II

WHEN HIGH TIDE REACHES WATER LEVEL "A" BAILEY BRIDGE JACKED UP ON TIMBER CRIB FOR A HEIGHT OF APPROX. 3'-0" - S.R. FLOAT HAULED UP BEACH AS FAR AS POSSIBLE AND BAILEY BRIDGE LOWERED ON TO S.R. FLOAT - BRIDGE LEFT IN THIS POSITION UNTIL HIGH TIDE REACHES M.H.W.S

STAGE III

WHEN HIGH TIDE REACHES M.H.W.S REPORT OPERATIONS AS DETAILED UNDER STAGE VII THIS WILL GIVE THE FINAL POSITION OF THE SHORE RAMP FLOAT

WHEN THE CONTOUR OF THE BEACH IS SUCH THAT THE SHORE RAMP FLOAT CAN BE FLOATED HARD AGAINST THE SEA WALL AT M.H.W.N THE BAILEY BRIDGE WILL BE ERECTED ON THE DECK OF THE SHORE RAMP FLOAT AND RAISED ON TO SEA WALL IN A SIMILAR MANNER TO THAT SHOWN ON SKETCHES 46 & 47. - THE BAILEY BRIDGE WILL HAVE A SPAN OF EITHER 50' OR 60'

ARRANGEMENT OF SLIDING SHORE RAMP FLOAT UNDER SEA WALL RAMP BRIDGE.

Should steel floats be holed in the bottom only providing the hatches are fastened down and the cork seatings have been well maintained there is little likelihood of the float sinking though should the hatch be opened its replacement may be difficult.

3.

Small holes in floats can be easily repaired without interrupting bridge traffic. A small power pumping set should be brought alongside on a SLUG boat and the holed compartment pumped clear. In concrete floats the hole can then be plugged using sika cement. On steel floats a small steel patch can be welded over the hole as follows. A small steel plate of size sufficient to lap the hole 2" all round and about 1/4" thick is required in addition to a piece of gasket material sufficient to just cover the hole. Working from inside the float the steel patch with gasket underneath is forced over the hole using a timber strut and folding wedges against a dock frame. It should now be possible to pump and bail the float section practically dry and electrically weld the patch all round to the plating. The electric welding plant is carried on a S.L.U.G. boat. Repair to float damage above water on either concrete or steel floats should present no difficulties, quick setting cement being used for concrete floats and electric welding for steel floats.

4.

Where major damage has been caused to floats and the water in a compartment cannot be kept down by pumping the float must be replaced and repaired after beaching. This means that erection tanks must be introduced under the bridge spans each side of the float as soon as possible and every endeavour made to keep the float above water in the meantime. This may mean stopping traffic which should of course be avoided if at all possible. If, however, suitable inflatable rubber camels are available (a large number of rubber reconnaissance boats will serve at a pinch) float buoyancy can be maintained. These camels are inserted deflated into the float sections through the hatches and connected up to air bottles carried on S.L.U.G. boats. Thus the rubber camels can be inflated and float buoyancy preserved until the float can be changed.

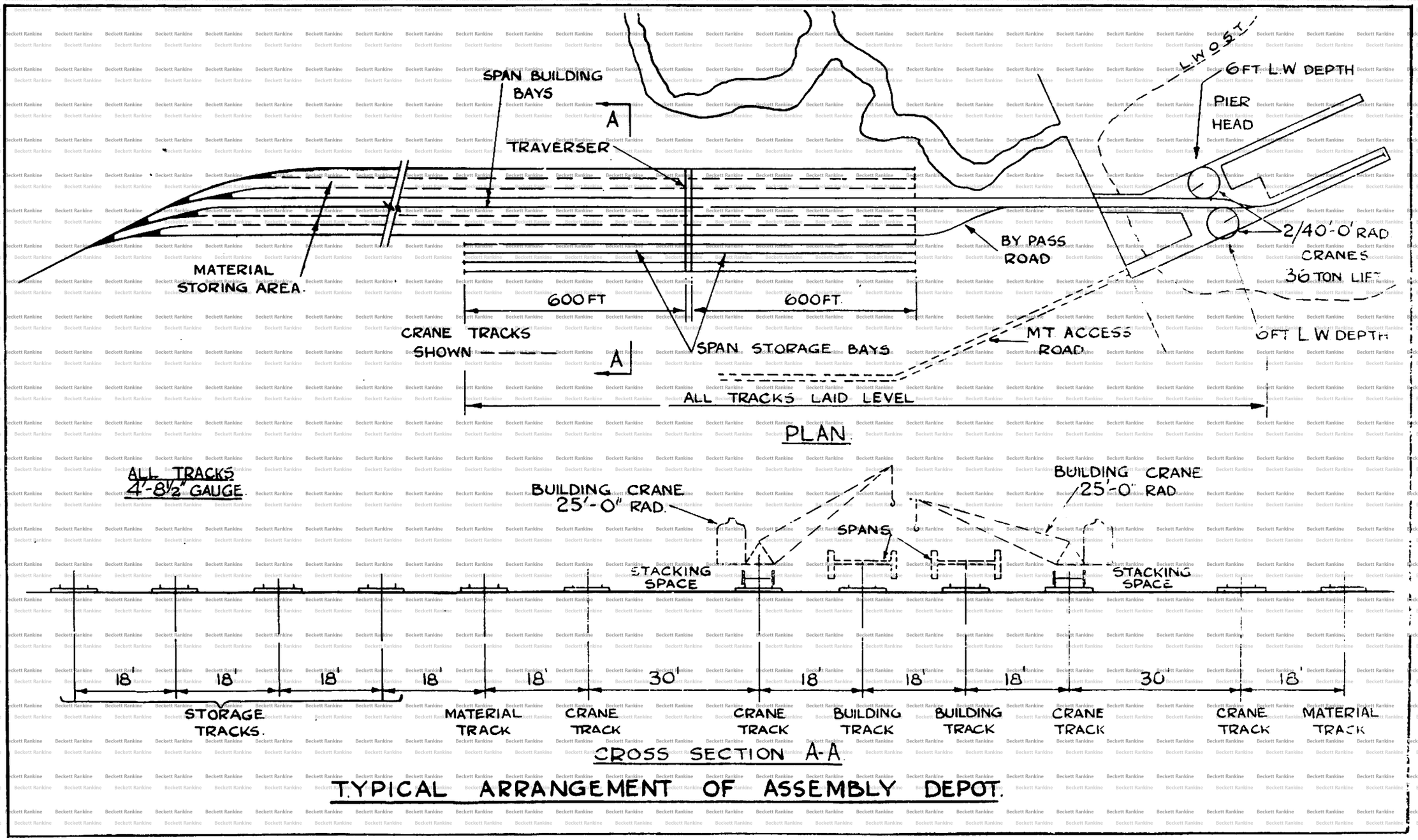
5.

Should floats be so badly damaged that they sink under the weight of the bridge spans they must as soon as possible be brought to the surface. This can be done using the erection tank, which is lowered to the sea bed by flooding, 3/4" air outlets being used. Erection tanks are then rolled under the bridge spans each side of the float by divers and lashed in position. The saddles cannot be used but the saddle grooves should be located as far as possible under the main girders. The erection tanks are then dewatered by blowing thus bringing the damaged float to the surface. In certain cases in deep water it may be more convenient to position the erection tanks on top of the spans and carry the weight by S.W.R. lashings. At least two erection tanks will be required to raise a damaged float. Low headroom saddles W 128 will be of value where floats are partly submerged.

SECTION 25. Repair to Damaged Superstructure.

1.

Minor results of enemy action will generally be repairable with only a brief occupation of the road. Major damage will probably need complete span replacement an operation which need take no more than 2 hours. Where the bridge decking only is damaged it can be replaced with new units. SLUG boats will have to be used under the bridge to remove existing flooring bolts. Should cross girders or main girders suffer minor damage it can be repaired by welding. Flat sections 3" x 3/8" will be the most useful for this form of reinforcement and generally the endeavour should be to replace the lost section plus 10%. Patch strips of this material should be continued at least 9" each side of the damaged area. Weld fillets should be 1/4" generally. If the loss of section on a member exceeds about 30% traffic should be stopped until the repair is complete.


SPAN BUILDING BAYS
A
TRAVERSER
L.W.O.S.T.
6FT L.W DEPTH
PIER HEAD
MATERIAL STORING AREA.
BY PASS ROAD
2/40'-0" RAD CRANES
36 TON LIFT
600 FT
600FT.
CRANE TRACKS SHOWN
A
SPAN STORAGE BAYS
MT. ACCESS ROAD
6FT L.W DEPTH
ALL TRACKS LAID LEVEL
PLAN.
ALL TRACKS 4'-8½" GAUGE.
BUILDING CRANE 25'-0" RAD.
BUILDING CRANE 25'-0" RAD
SPANS
STACKING SPACE
STACKING SPACE
18 18 18 18 18 30 18 18 18 30 18
STORAGE TRACKS.
MATERIAL TRACK
CRANE TRACK
CRANE TRACK
BUILDING TRACK
BUILDING TRACK
CRANE TRACK
CRANE TRACK
MATERIAL TRACK
CROSS SECTION A-A.
TYPICAL ARRANGEMENT OF ASSEMBLY DEPOT.
SCALE 40 FEET TO 1 INCH.
PAGE 102

SECTION 26.- Replacement of Damaged Floats.

1.

This operation is comparatively simple and can be carried out in about two hours with but a brief interruption of traffic. At each side of the damaged float saddles for the erection tank are fitted to the main girders. These saddles can be brought into position on the decks of S.L.U.G. boats and lifted into position by means of the stirrups. Alternatively the saddles can be positioned by a 3 Ton mobile crane operating from the dock of the bridge.

2.

Two erection tanks are now flooded and brought into position under the saddles. To avoid damage to the tanks in choppy water the saddles should be pulled out of the vertical by handlines from the float while the erection tanks are being manoeuvered under the saddles. The erection tanks are now fully dewatered using the compressor truck and bolts connecting transom to float are removed, links disconnected etc.. The float moorings are now removed and temporarily attached to the bridge girders.

3.

The damaged float is now towed clear and the new float introduced. To allow easy connection between transom and float four yale pull lifts can be set up from corner bollards to the transom end holes, strops being used round the bollards. By adjusting the pull lifts the holes can be sufficiently aligned to allow the use of rat tailed spanners. Float connections are completed while the erection tanks are flooded and drawn clear. Finally the moorings are transferred to the new float and set up. By this method the flooring need never be distrubed the transom weight being carried on the keepers W.28. If, however, it is required to replace float complete with transom the end panels of flooring must be removed and bearings W.29 disconnected from the transom. It will probably be necessary to slightly flood the new float in this case before it can be brought into position since the flooring connection on the transoms projects and fouls the bearings.

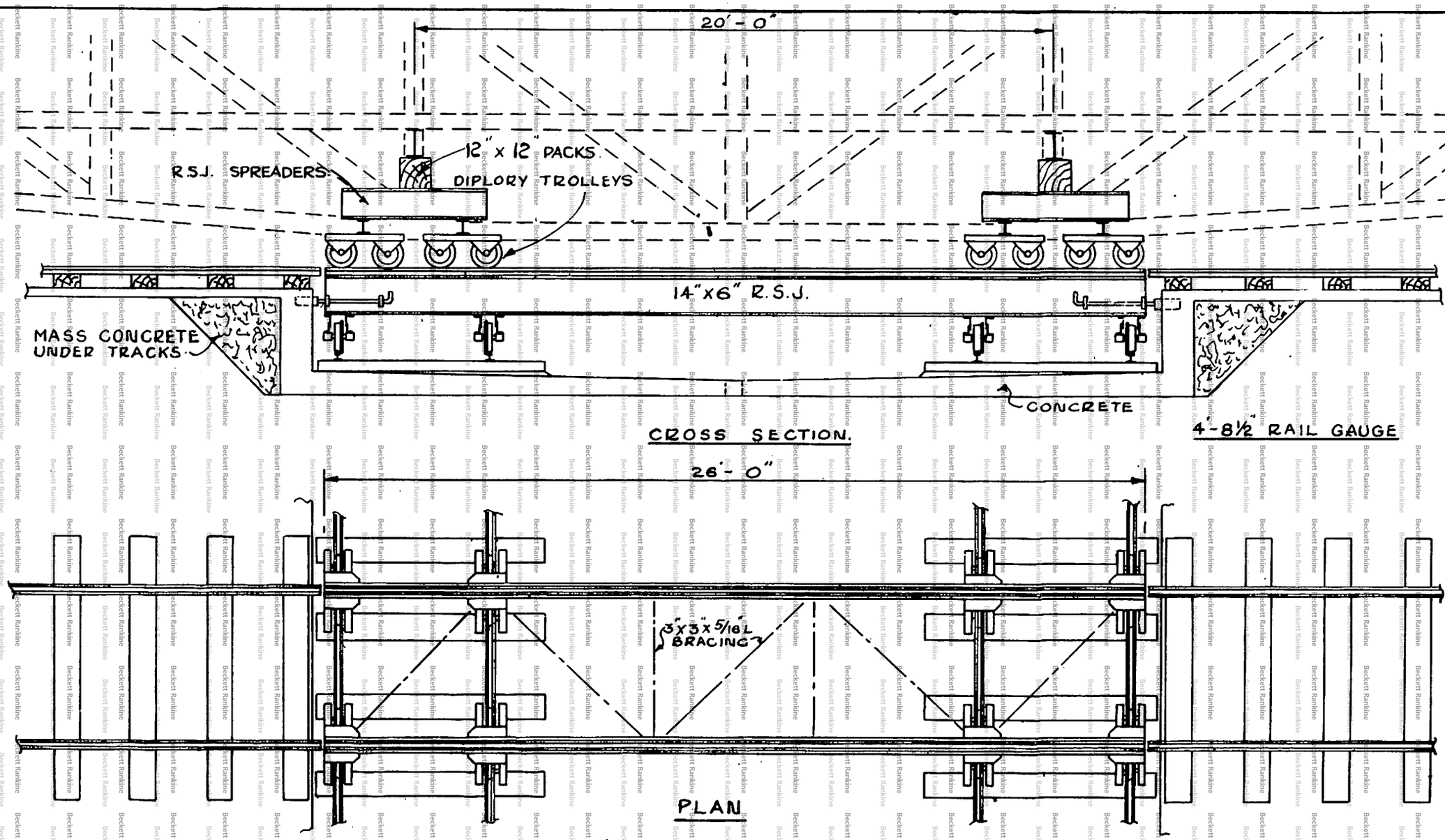
SECTION 27.- Replacement of Damaged Bridge Length.

1.

This is quite a quick operation and can be carried out the same way for any number of spans. For every span removed the float also at its seaward end is taken away. Consider the first sound float at each side of the damaged section. The bridge is broken at these two places and an erection tank introduced in each case at the SEAWARD side thus lifting a W1 end.
Note:- The length of pier replaced, however, may be increased to suit the length of a spare link should one be available ready made up.
The saddles are positioned as for float replacement and trumpets rigged on the float at the shoreward end of the gap. On the W1 box end on seaward side of the gap a timber transom is fitted and outside flooring units taken up. The damaged section of the bridge now becomes in effect a removable link. At the inshore end of this link the end panel of flooring is removed and bearing keepers at both ends are taken off.

2.

The two erection tanks are now dewatered by blowing from compressor trucks and cable springs are removed. The new link is now brought alongside and the moorings are picked up. It will of course be necessary to slack off the moorings a little from the old link.



TRAVERSER FOR BUILDING DEPOT.

It is now a simple matter to move the damaged link along the mooring and bring the new link into the gap coupling up as in the method of erection.

3. Should the damaged link include a telescopic span which has been extended it will be necessary to stretch out the new link to fill the gap. This can be done by setting up between appropriate float transoms the 20 ton tackles borrowed from the shore ramp float and hauling on the fall with yale pull lifts attached with stoppers W63.

SECTION. 28. Clearance of Underwater Obstruction.

1. There is strong possibility that the beaches on which floating bridge piers are to be erected may be fouled by various obstructions so that it will be advisable if possible to inspect the beach at L.W. before the erection operation commences. If possible a clear site can then be chosen and any obstacles marked with spars or buoys.

2. Where it is impossible to avoid submarine obstacles these must of course be removed using explosives. For concrete and masonry, holes for explosives can be bored using the 10lb. underwater beehives. Rock drilling equipment is carried in the compressor truck and may in certain cases be useful in placing bore hole charges. It may be possible to bring the compressor truck to site on the deck of a spare shore ramp float.

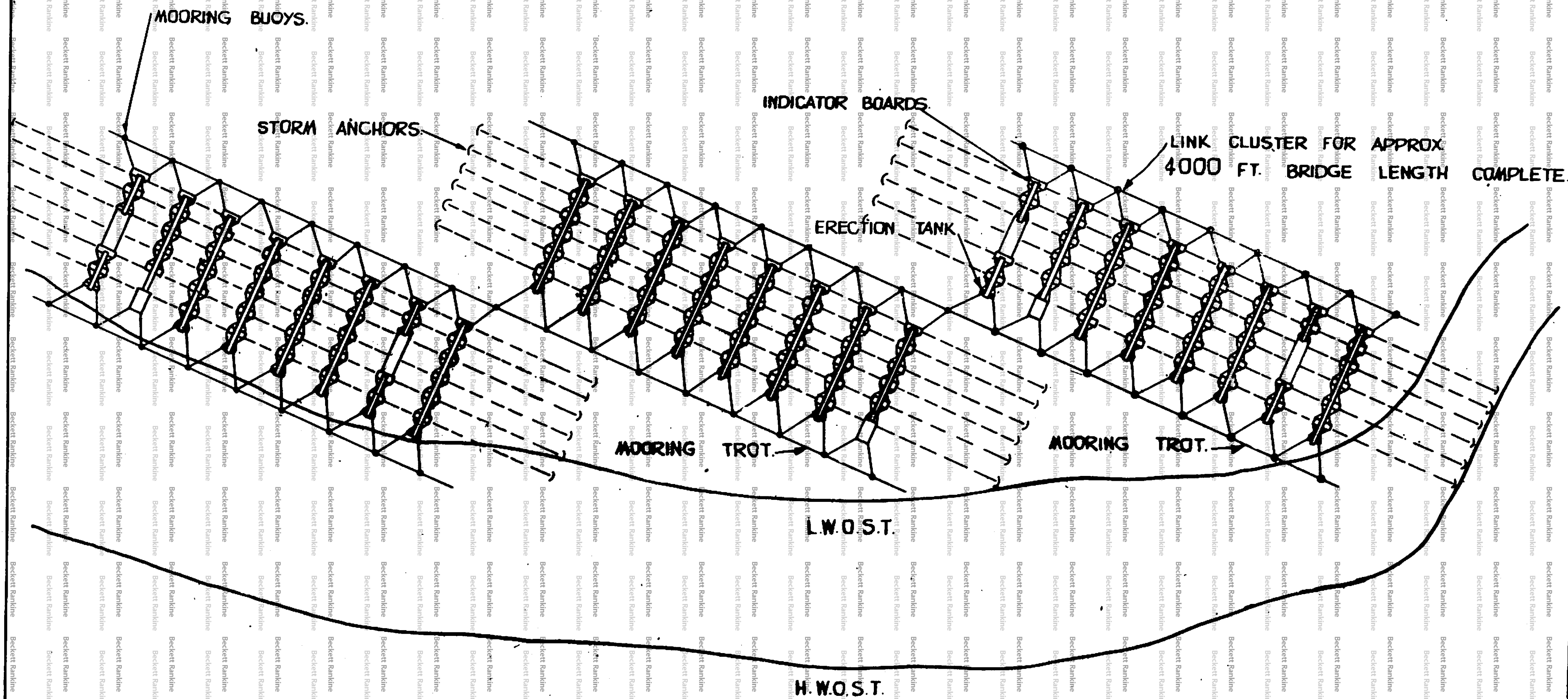
3. Submarine wreckage of steel can in some cases be cut into small pieces using the flame cutting equipment. If a 3 ton mobile crane is mounted on a spare shore ramp float it can be used for lifting and removing various reasonably sized pieces cut up in this way. Consideration should always be given to lifting the obstruction complete. Rubber camels as used in float replacement will be valuable and in certain cases it may be possible to use the erection tanks and lift on wires. In this method the wires are always positioned in the saddle grooves. To submerge the erection tanks completely the 3/4" air cocks must be used.

4. Generally for underwater clearance the following will be found almost indispensable:-

a) Divers.
b) Underwater explosives.
c) Erection Tanks.
d) Spare shore ramp float rigged with compressor truck, mobile crane and diving gear.
e) Underwater flame cutting equipment.

SECTION 29.- Lifting and removal of Anchors.

1. Kite anchors are easily removed with a vertical pull of about 1 ton, providing the mooring wire is slack. A spare shore ramp float can be used for lifting anchors by the following method. From the shore ramp float drop a kedge anchor outside the mooring area and tow or haul the float to the end of the bridge float to which the anchor in question is attached.



NOTE: STORM MOORINGS MUST BE LAID IF SPANS ARE STORED OVER A CONSIDERABLE PERIOD AND RELEASED BEFORE OPERATIONAL TOWING.

STORAGE OF TOWING LINKS.

SKETCH 51

If erection is carried out in a bay a set into the shore can be expected at all states of the tide though this may not necessarily be the case. Generally the tidal stream changes direction earlier inshore than further to seaward and if stream indicators are used this should be borne in mind.

3.

From an operational point of view the time and height of H.W. are important. Unfortunately, the forecasts given in the nautical almanack may be considerably varied by weather conditions not necessarily experienced at the site. The twelfths rule is useful for estimating the depths of water at various times- i.e. for consecutives hours after H.W. or L.W. the tide falls or rises 1/12, 2/12,3/12,3/12,2/12,1/12 of its range. For example with a tidal range of 12ft. a L.W. depth of 6ft. and L.W. at 1200 hours the depth of water at 1600 hours would be 6+1+2+3+3 = 15ft. It is most convenient to relate soundings to L.W.O.S. and this is most easily worked by first relating actual soundings to mean tide level working on the tidal range for the day as taken from the nautical almanack.

4.

As far as possible all manoeuvering over a tidal beach should be carried out on a rising tide so that accidental grounding will result in little delay. There is only one solution to grounding on a falling tide when the craft is of any weight, and that is to immediately reduce its draught by throwing weight overboard. If the crew jump over and push it may be sufficient for mooring shuttles and S.L.U.G.boats. If this fails the craft must remain beached until the next tide.

5.

When running out lines or moorings always take the coil in the boat and arrange to run it out when working down stream. It may be possible to haul out the end of a warp that floats but it cannot be seen that the turns run off properly. Likewise, when laying kedge anchors upstream take the coil and anchor to the upstream position, cast the anchor then pay out the warp working downstream. To lay a downstream kedge anchor pay out the warp first and then cast the anchor. Generally when manoeuvering links with the S.L.U.G. boats it will be best to work on kedge anchors and haul by the S.L.U.G.boats winch. As far as possible the wind and stream should be used to move a link into position, the movement being checked by suitably placed kedge anchors, the warps of which are eased a bit at a time. It is bad to get too far down tide since without the aid of a tug it will take time to work upstream. It is not practicable to propel a link by rowing.

6.

For kedging, kite anchors and C.Q.R.kedge anchors should be given plenty of line at least 8 times the water depth and more on a rising tide. This is necessary on account of the light weight of the anchors. A short line is used to weigh the anchor so under this condition it cannot be expected to hold. When holding a link on upstream kedge anchors only,remember that a change of wind or tide may swing it to an unfavourable position involving hard work on the winch. This can be prevented by downstream kedge anchors and their use is recommended in all cases.

Needless to say warps should be kept always coiled down particularly as they are in long lengths and it will generally pay to stop down the coils with light marline.

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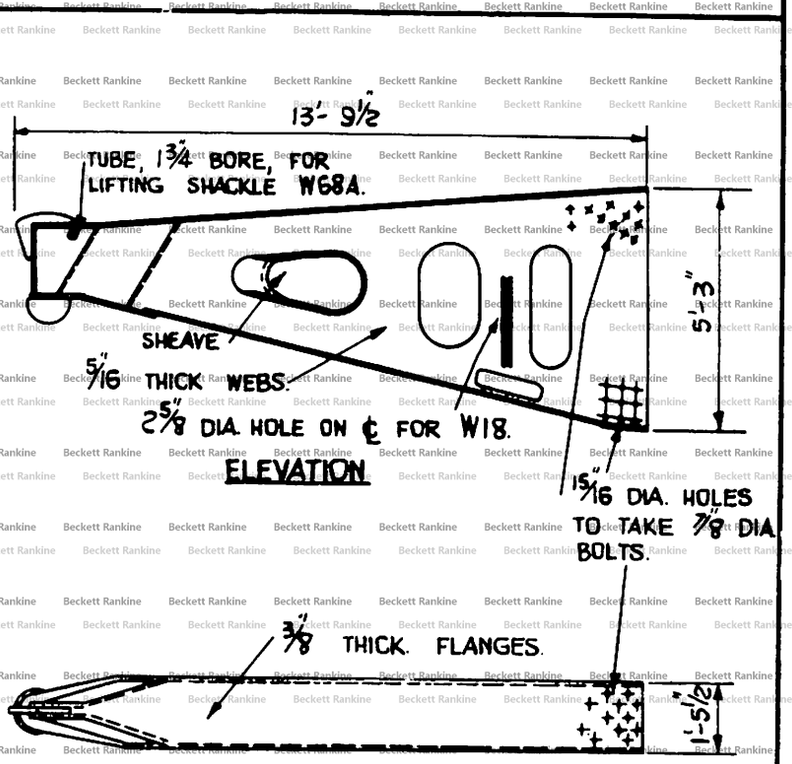
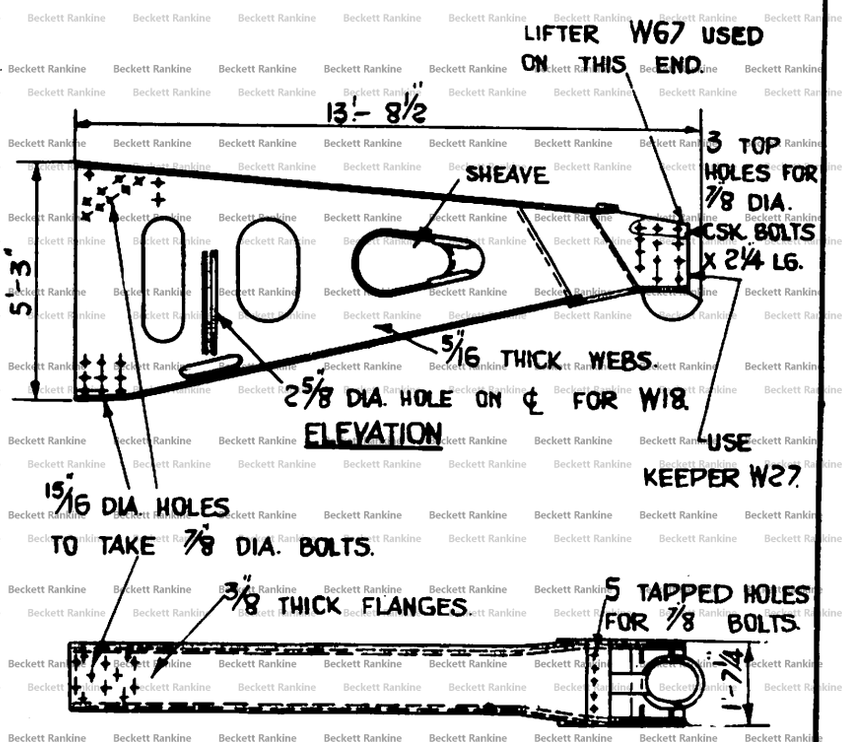
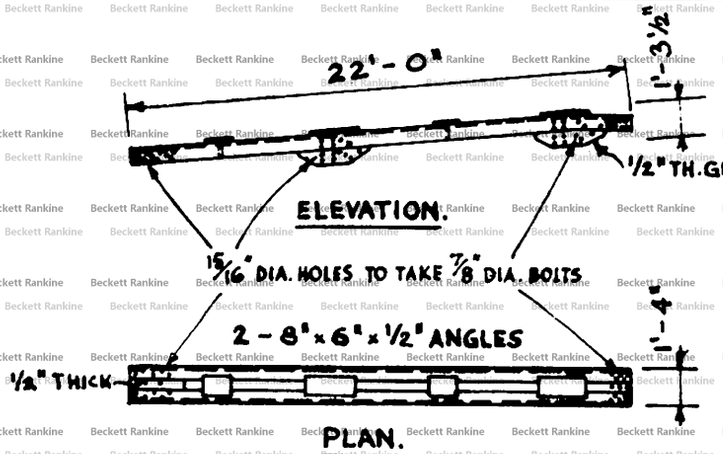
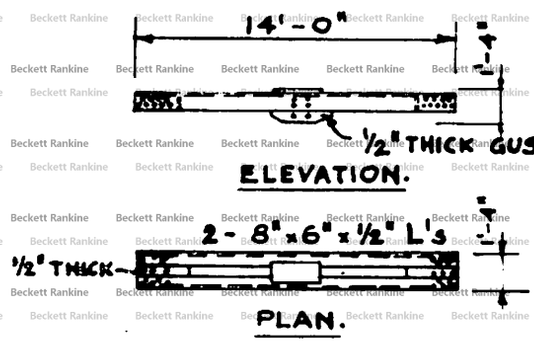
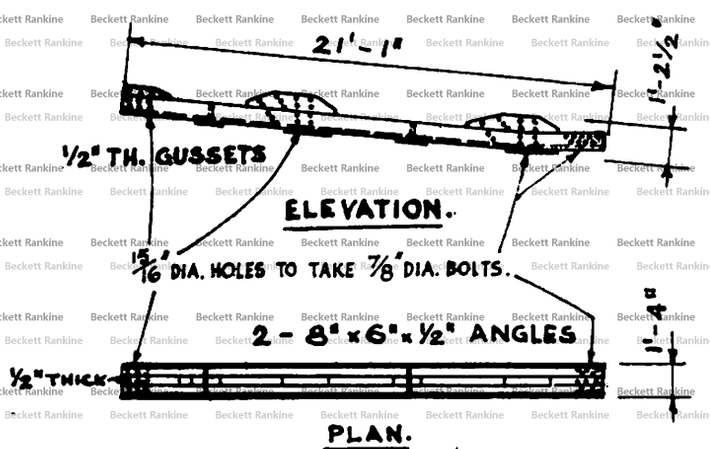
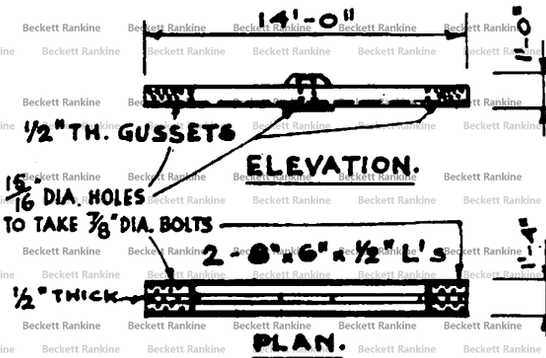
SKETCH. 52.

FLOATING BRIDGE MK. I (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W1.	MAIN GIRDER. GIRDER END WITH INNER BEARING. Nº 2. REQD. PER. STANDARD SPAN. Nº 2. REQD. PER. TELESCOPIC SPAN.	2107	
W2	MAIN GIRDER. GIRDER END WITH OUTER BEARING. Nº 2. REQD. PER STANDARD SPAN. Nº 2. REQD. PER. TELESCOPIC. SPAN. Nº 4 REQD. PER. TELESCOPIC END SPAN.	2225.	

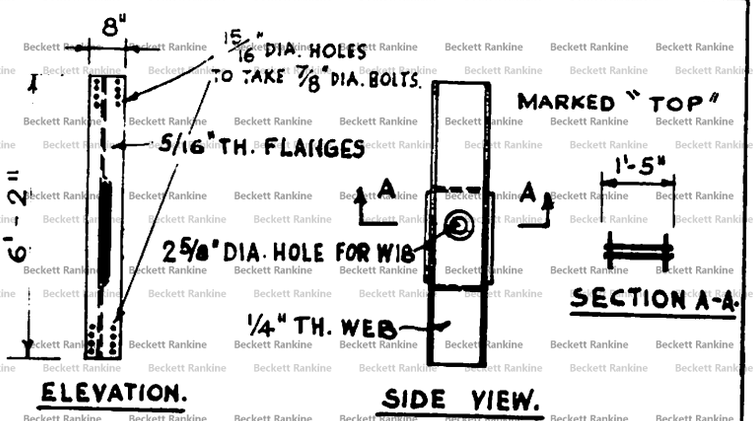
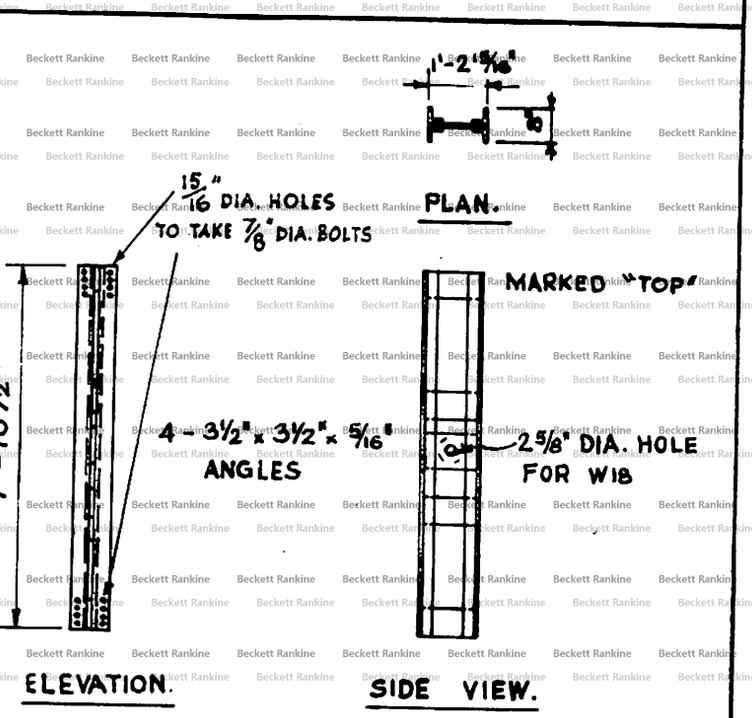
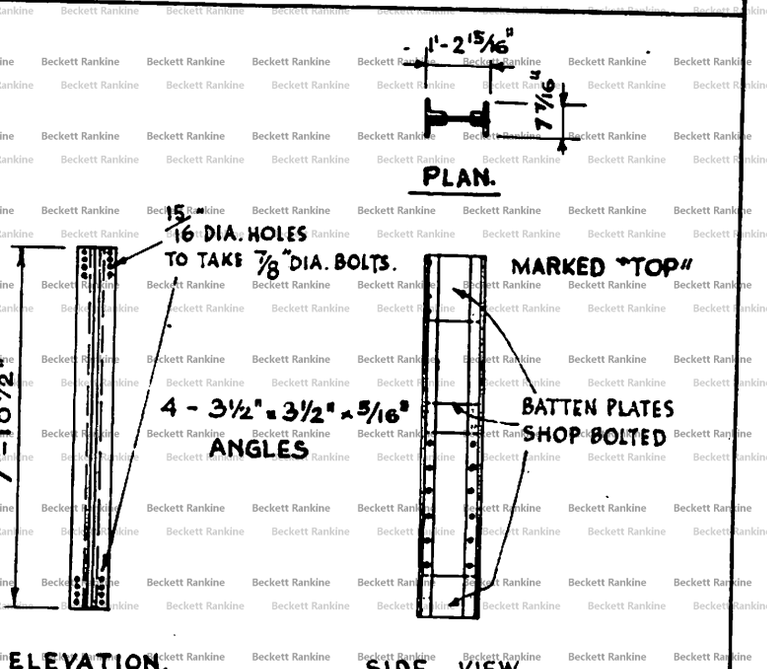
SKETCH. 53.

FLOATING BRIDGE MK.I. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS	DIAGRAM OF UNIT
W3	MAIN GIRDER TOP CHORD № 4 RQD. PER STANDARD SPAN.	1209	
W4	MAIN GIRDER TOP CENTRE CHORD № 2 RQD. PER STANDARD SPAN.	731	
W5	MAIN GIRDER BOTTOM CHORD № 4 RQD. PER STANDARD SPAN.	1182	
W6	MAIN GIRDER BOTTOM CENTRE CHORD № 2 RQD. PER STANDARD SPAN.	750	

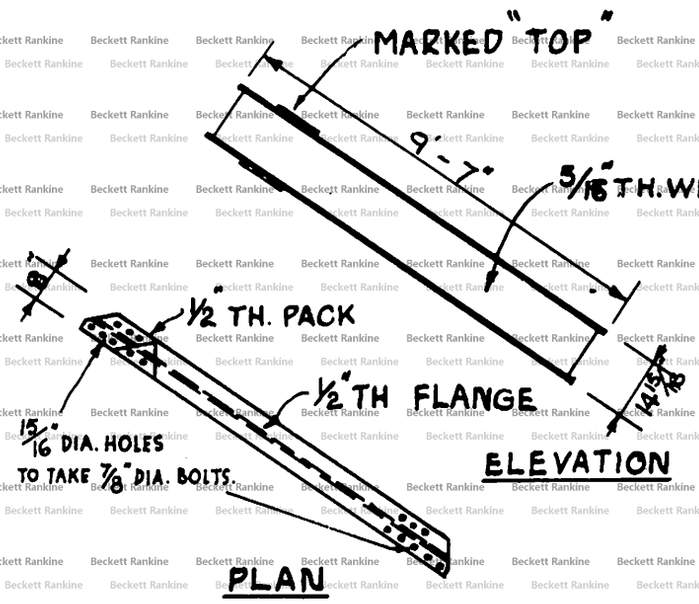
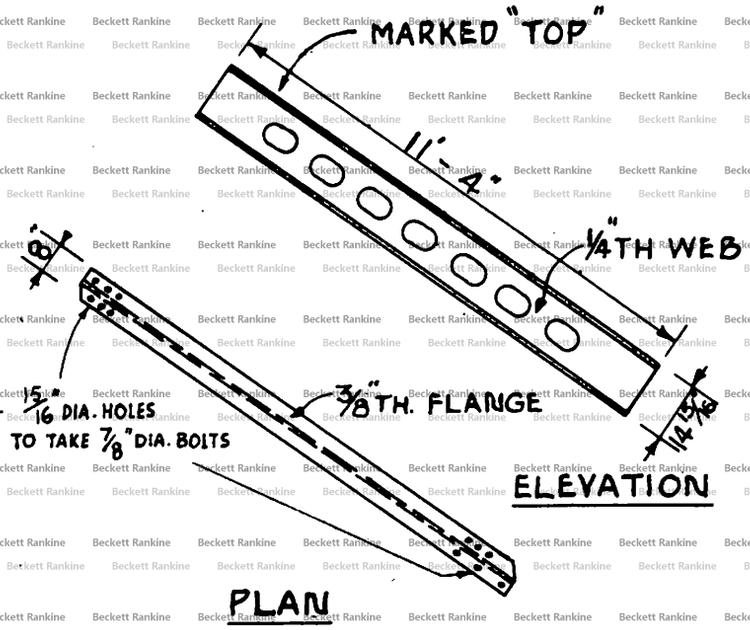
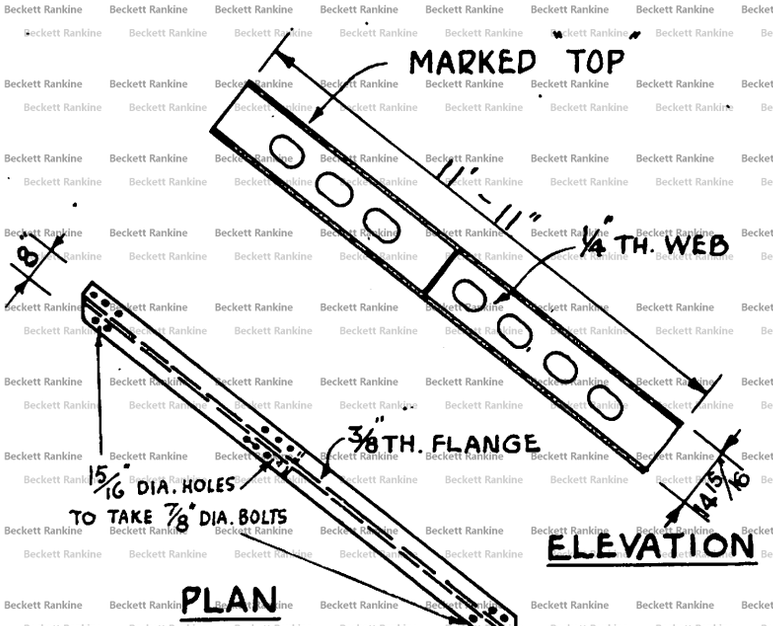
SKETCH 54

FLOATING BRIDGE, MK I. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS	DIAGRAM OF UNIT
W7	MAIN GIRDER END VERTICAL No 1 RQD. PER STANDARD SPAN. No 2. RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	214	
W8	MAIN GIRDER VERTICAL No 4 RQD. PER STANDARD SPAN.	357	
W9	MAIN GIRDER CENTRE VERTICAL No 2 RQD. PER STANDARD SPAN.	346	

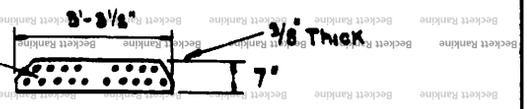
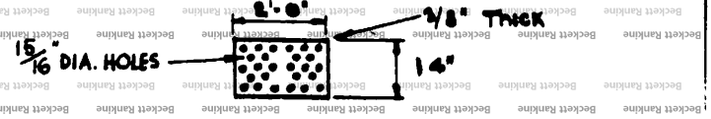
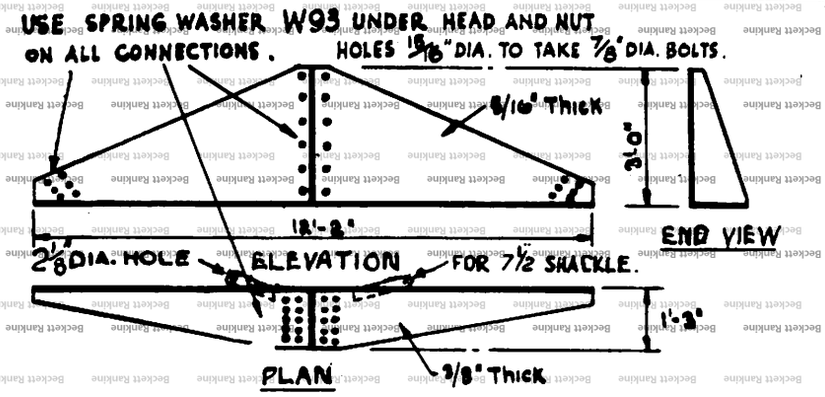
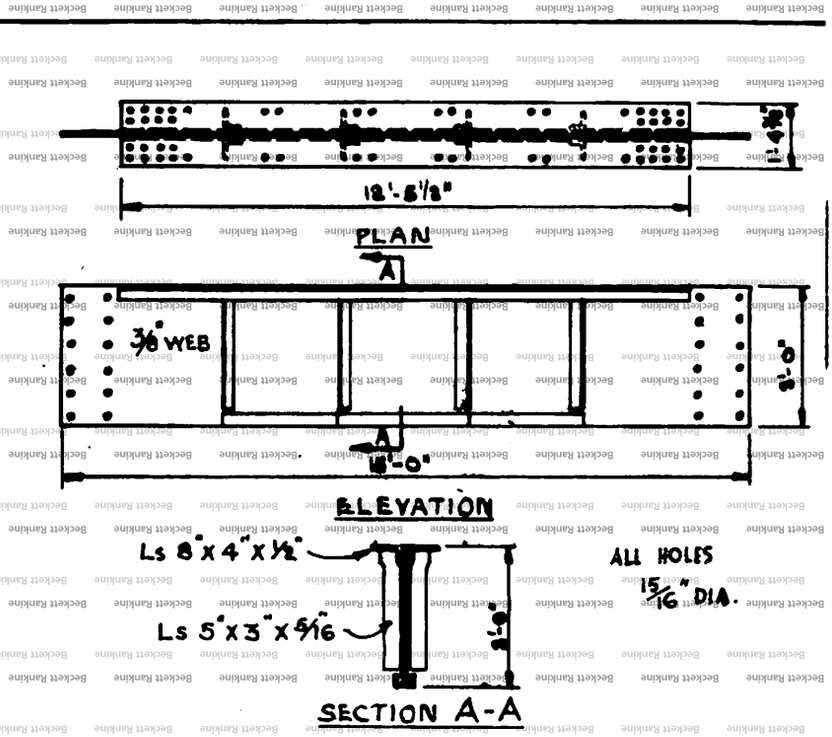
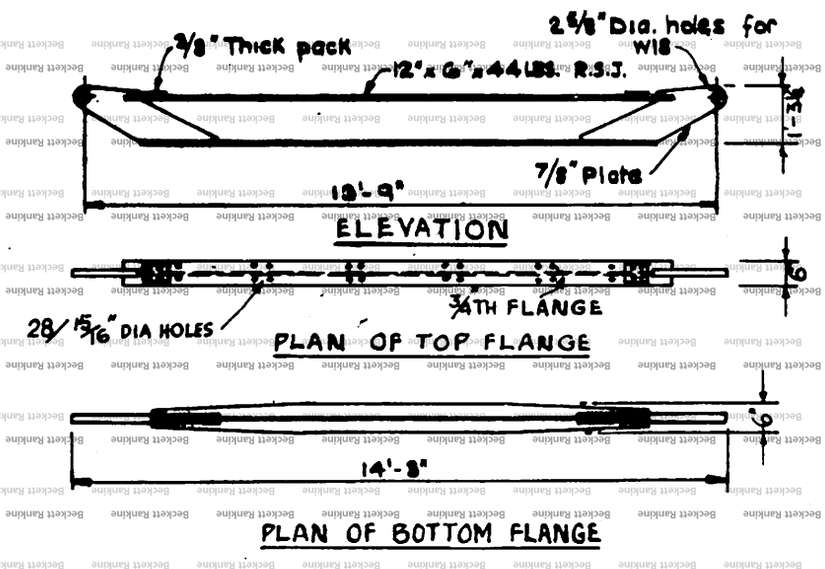
SKETCH. 55

FLOATING BRIDGE. MK I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W10	MAIN GIRDER END DIAGONAL Nº 4 RQD. PER STANDARD SPAN. Nº 2 RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	398	
W11	MAIN GIRDER DIAGONAL Nº 4 RQD. PER STANDARD SPAN.	341	
W12	MAIN GIRDER CENTRE DIAGONAL Nº 4 RQD. PER STANDARD SPAN	369	

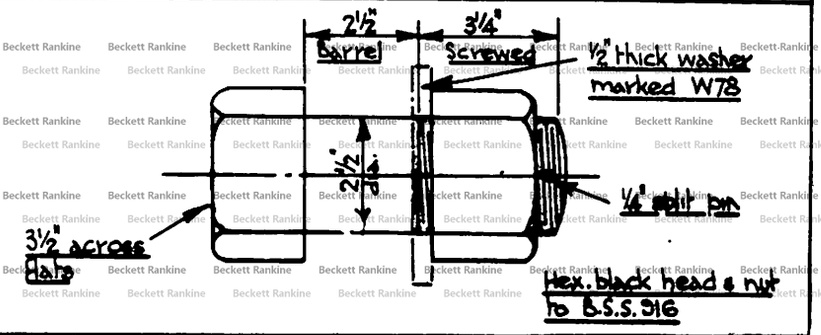
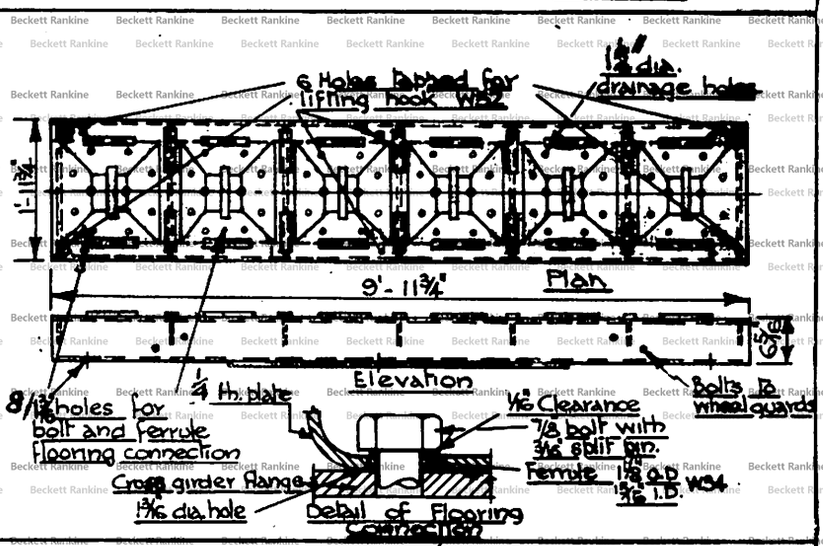
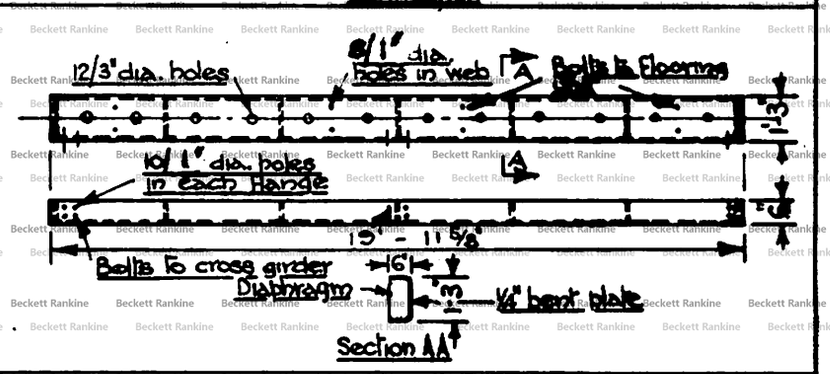
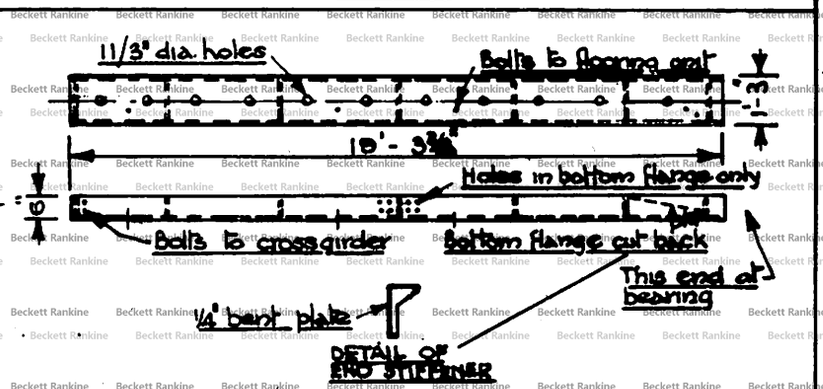
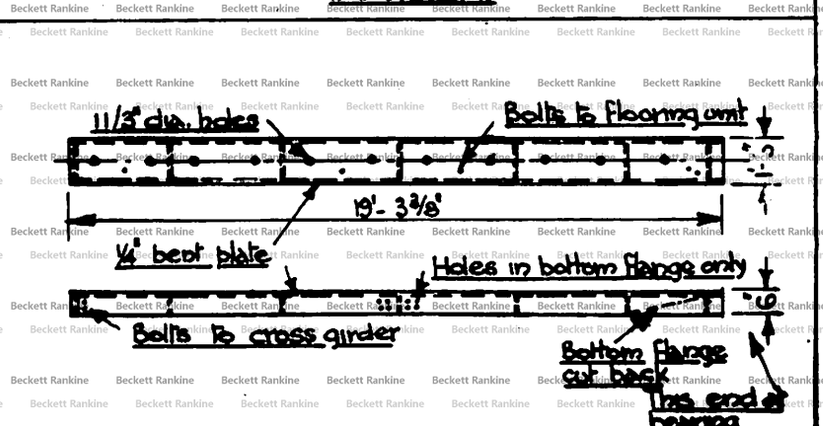
SKETCH. 56

FLOATING BRIDGE. MK. I (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W13	MAIN GIRDER WEB COVER NO. 32 RQD. PER STANDARD SPAN	27	
W14	MAIN GIRDER FLANGE COVER NO. 16 RQD. PER STANDARD SPAN	37	
W15	FLOORING CENTRE BRACKET NO. 2 REQD. PER STANDARD SPAN	468	
W16	FLOORING CENTRE CROSS GIRDER NO. 1 REQD. PER STANDARD SPAN.	1490	
W17	FLOORING CROSS GIRDER No. 5. REQD PER STANDARD SPAN. No. 4 RQD. PER TELESCOPIC SPAN. No. 5. RQD. PER TELESCOPIC END SPAN.	575	

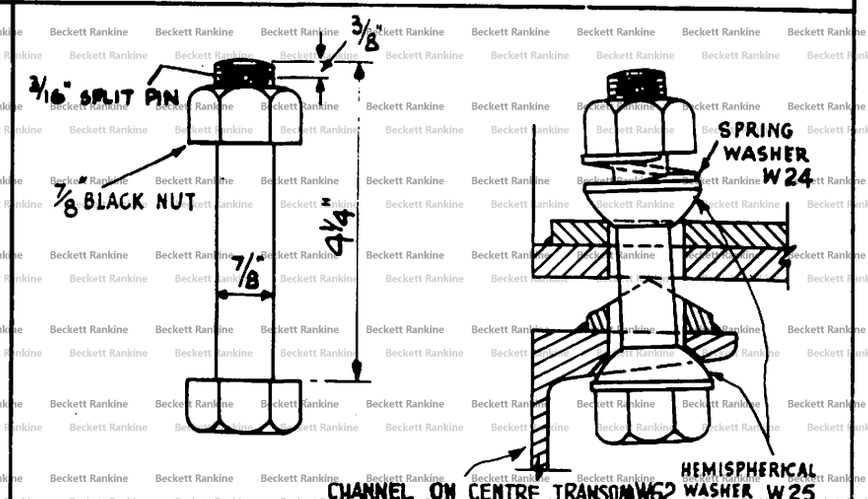
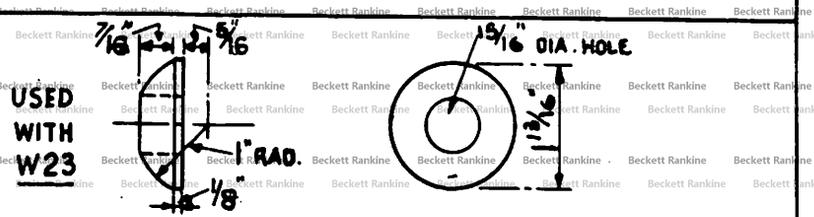
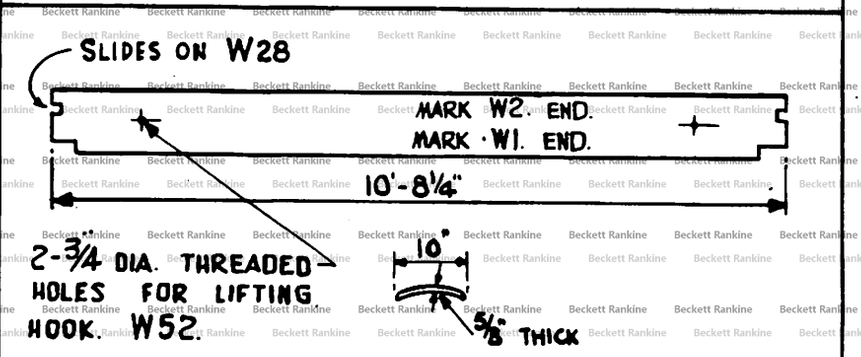
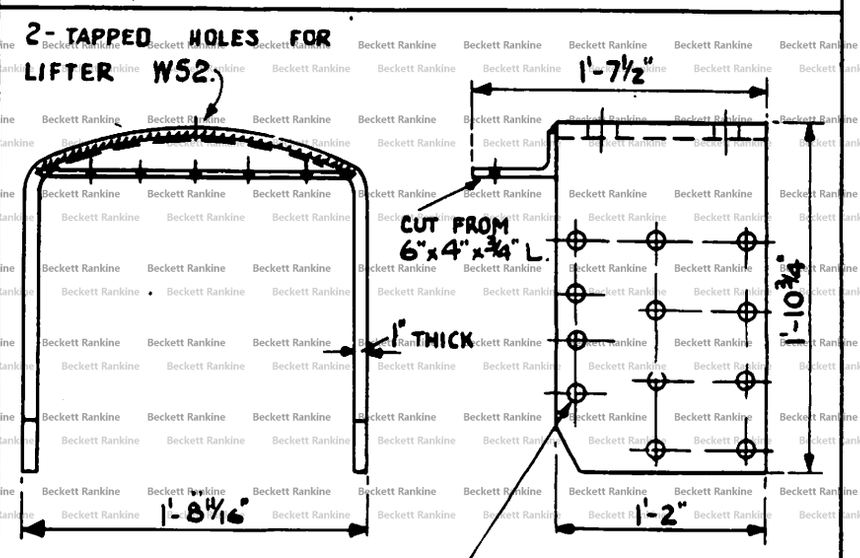
SKETCH. 57

FLOATING BRIDGE. MK. I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W18	FLOORING MACHINED PIN FOR CROSS GIRDER CONNECTIONS No. 12 REQD. PER SPAN	10	
W19	FLOORING FLOORING UNIT No. 32. REQD. PER STANDARD SPAN. No. 24. REQD. PER TELESCOPIC SPAN. & TELESCOPIC END SPAN.	484	
W20	FLOORING WHEEL GUARDS AT CENTRE No. 4. REQD. PER STANDARD SPAN. No. 2. REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	493	
W21	FLOORING WHEEL GUARDS AT ENDS No. 2 REQD PER SPAN	471	
W22	FLOORING WHEEL GUARDS AT ENDS OPP. W21 No. 2 REQD. PER SPAN	471	

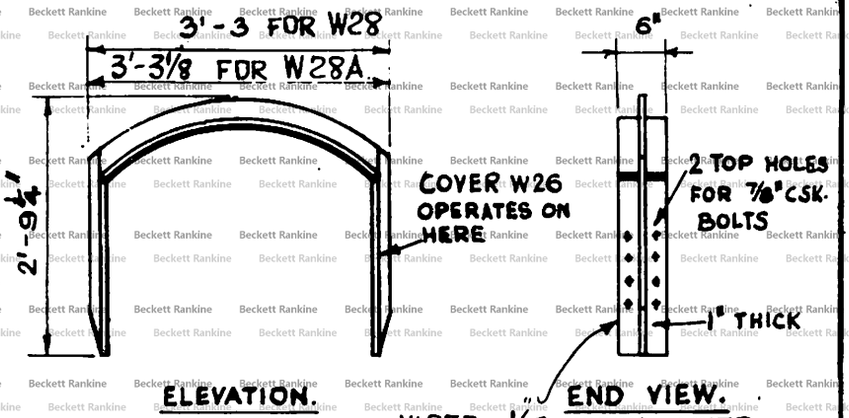
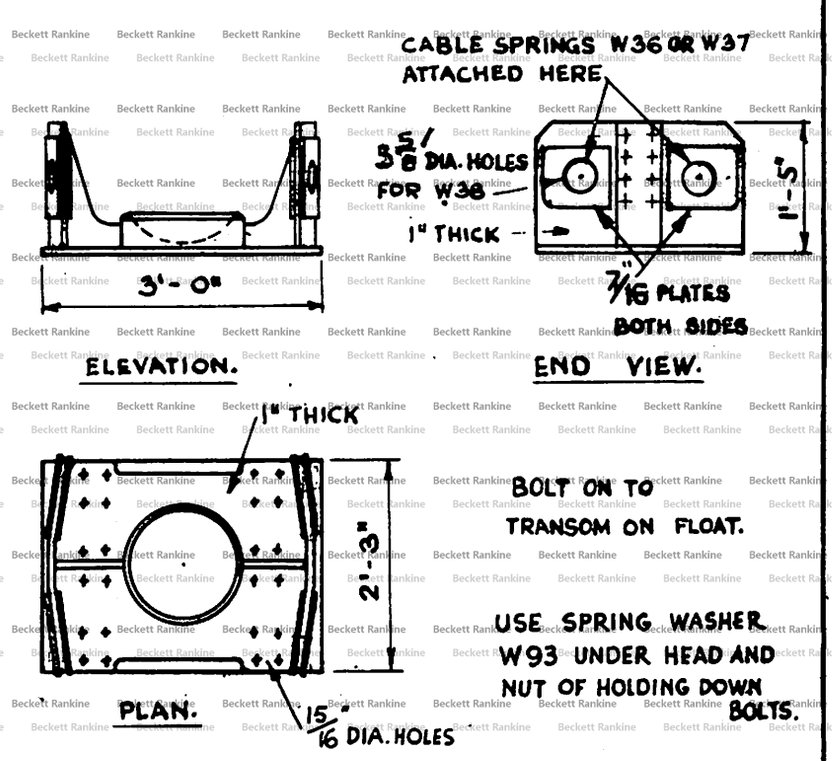
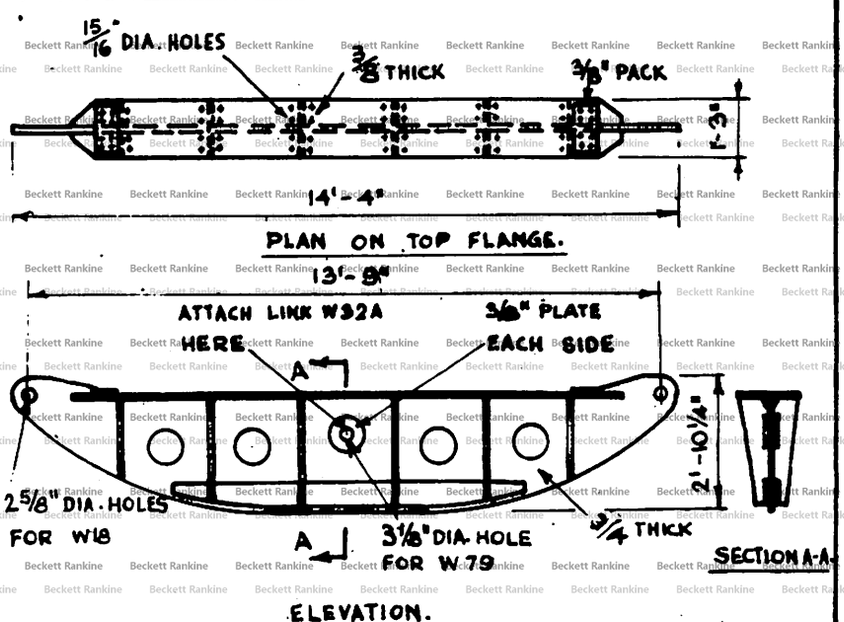
SKETCH. 58

FLOATING BRIDGE M.K.I. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W23	FLOORING BOLT WITH 3/16" SPLIT PIN NO 20 REQD. PER SPAN. CONNECTION - END FLOORING TO TRANSOM.	1·5	
W24	FLOORING SPRING WASHER NO. 20 REQD. PER SPAN.		
W25	FLOORING HEMISPHERICAL WASHER. NO. 40 REQD. PER SPAN.		
W26	FLOORING DISHED COVER NO 1 PER FLOAT.	231.	
W27	MAIN GIRDER KEEPER FOR OUTER BEARING No 2. REQD. PER STANDARD SPAN. & TELESCOPIC SPAN. No 4. REQD. PER TELESCOPIC END SPAN. USED ON W2 BOX ENDS.	278.	

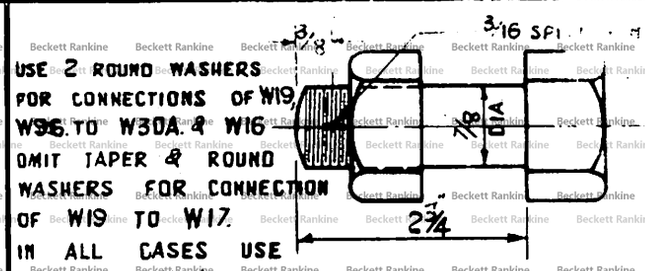
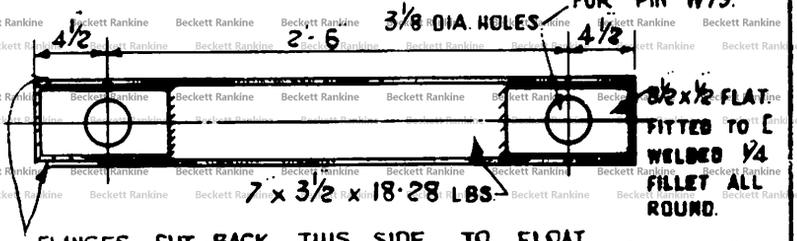
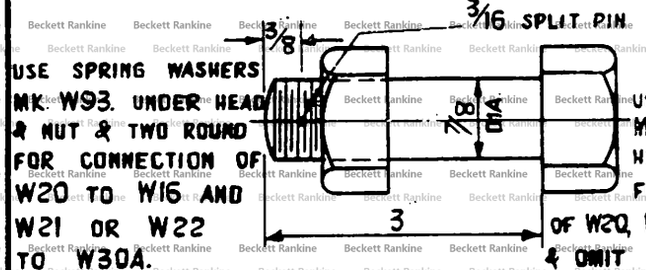
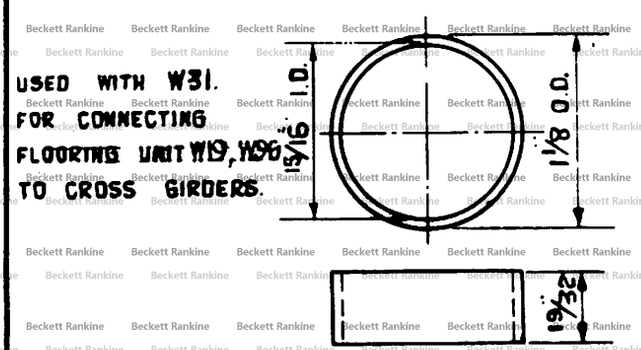
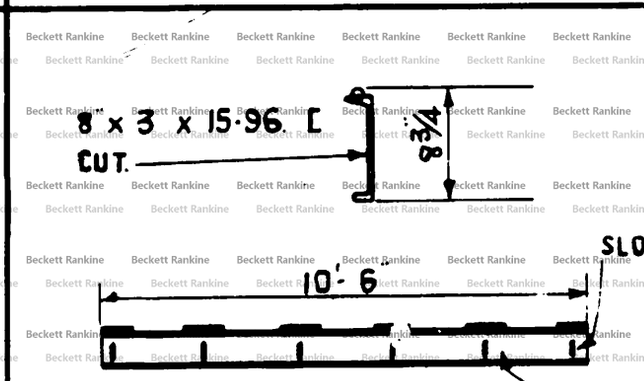
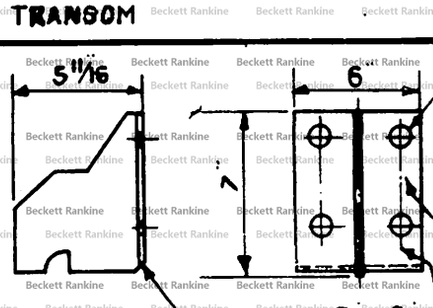
SKETCH. 59

FLOATING BRIDGE. MK. I. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W28 W28A W28B	MAIN GIRDER MAIN KEEPER No 2 RQD. PER FLOAT USED ON W29. No 2 RQD. OF W28A & No 4 RQD. OF W28B PER SHORE RAMP FLOAT.	189	
W29	MAIN GIRDER BEARING SEATING No 2 RQD. PER FLOAT.	693	
W30 A.	FLOORING END CROSS GIRDER No 1 RQD. PER STD. SPAN & TELESCOPIC SPAN ON W2 END.	1284	

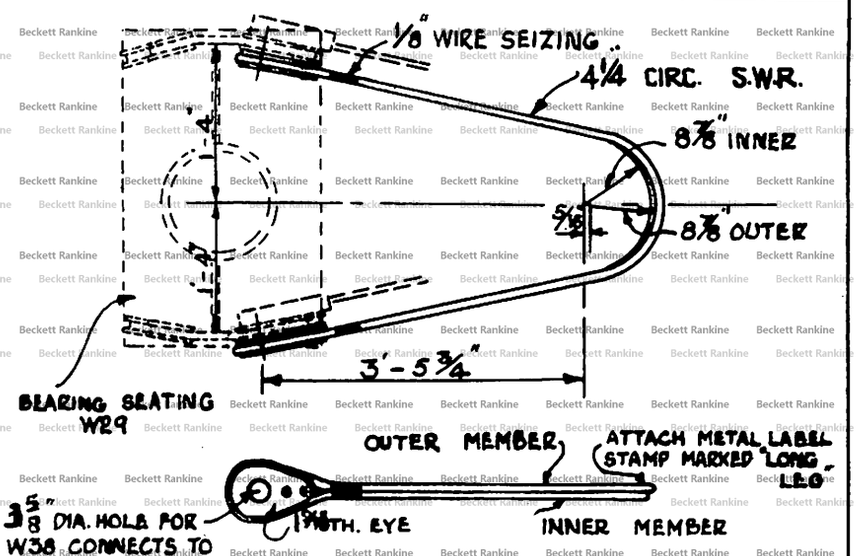
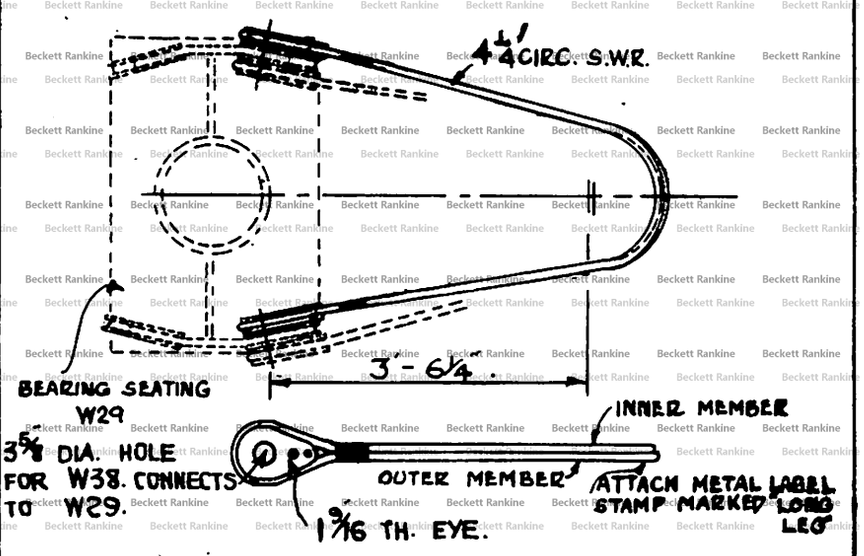
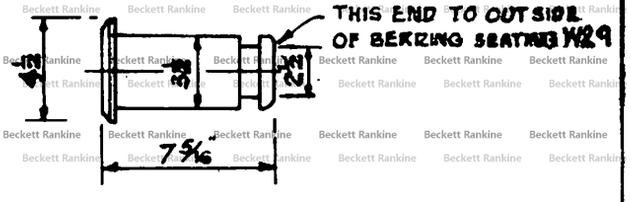
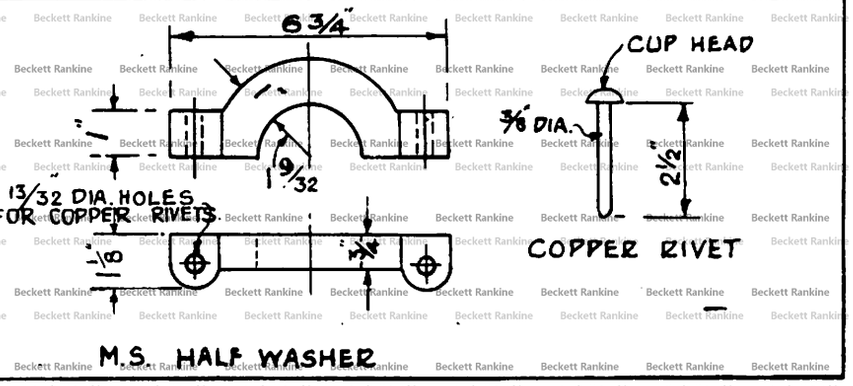
SKETCH. 60

FLOATING BRIDGE. MK I (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W31	FLOORING. 7/8 DIA. BOLT WITH 3/16 SPLIT PIN. No 160 REQD. PER STANDARD SPAN. No 180 REQD. PER TELESCOPIC SPAN. No 200. REQD. PER TELESCOPIC END SPAN.	1·157	 USE 2 ROUND WASHERS FOR CONNECTIONS OF W19, W36 TO W30A. & W16 OMIT TAPER & ROUND WASHERS FOR CONNECTION OF W19 TO W17. IN ALL CASES USE FERRULE W34.
W32A	FLOATS LINK. No 2. REQD. PER STANDARD SPAN & TELESCOPIC SPAN.	62	 FLANGES CUT BACK THIS SIDE TO FLOAT.
W33	FLOORING. 7/8 DIA. BOLTS WITH 3/16 SPLIT PIN 80 PER SPAN.	1·242	 USE SPRING WASHERS MK. W93. UNDER HEAD & NUT & TWO ROUND FOR CONNECTION OF W20 TO W16 AND W21 OR W22 TO W30A. USE SPRING WSHR. MK. W93. UNDER HEAD AND NUT FOR CONNECTION OF W20, W21. OR W22 TO W17 & OMIT TAPER WASHER.
W34	FLOORING. FERRULE. No 160. REQD. PER STANDARD SPAN. No 180 REQD. PER TELESCOPIC SPAN. No 200. REQD. PER TELESCOPIC END SPAN.	·053	 USED WITH W31. FOR CONNECTING FLOORING UNIT W19, W36 TO CROSS GIRDERS.
W35B	FLOORING. CONNECTOR LEAF No 1. REQD PER FLOAT.	150.	 USED FOR FLOORING END PANELS ON TRANSOM
W35C	FLOORING. FLOORING CONNECTOR BRACKET No 6. REQD PER. FLOAT.	10	 CUT FROM 8 x 6 R.S. [

SKETCH. 61

FLOATING BRIDGE. MK. I. (PAINTED GREY UNLESS NOTED)

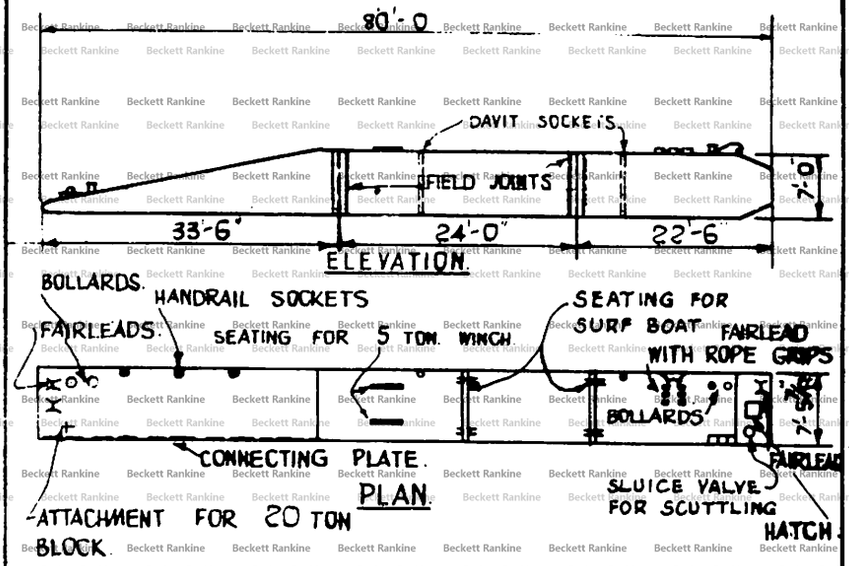
UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W36	MAIN GIRDER CABLE SPRING Nº 2 RQD PER W28 END UNPAINTED	100	
W37	MAIN GIRDER CABLE SPRING Nº 2 RQD. PER W1. END PAINTED RED	100	
W38	MAIN GIRDER M.S. MACHINED PIN Nº 8 RQD. PER SPAN	21	
W39	MAIN GIRDER M.S. HALF WASHER & COPPER RIVET Nº 16 OF EACH RQD. PER SPAN	3	

W10, W41 & W42 ARE OBSOLETE UNITS

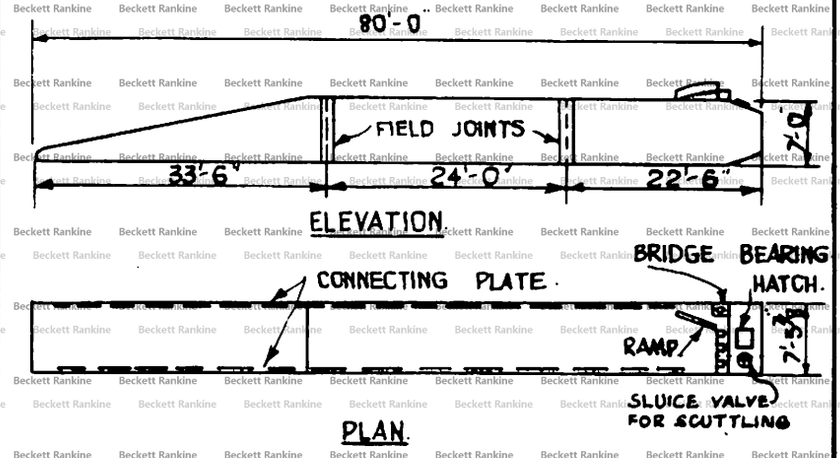
SKETCH. 62

FLOATING BRIDGE. MARK I (PAINTED GREY UNLESS NOTED)

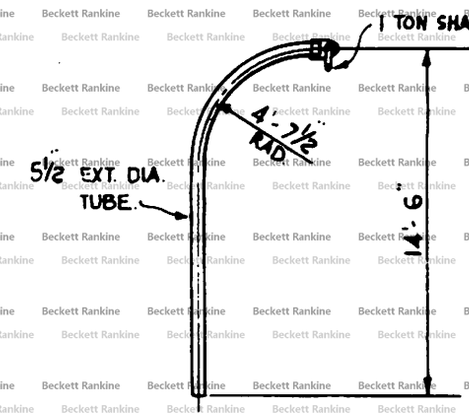
UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 43A.	SHORE RAMP FLOAT		
TO PAIR WITH W 46A	FLOAT UNIT.		
	NO 1 REQUIRED OF W43A		
	NO 1 REQUIRED OF W46A PER SHORE RAMP FLOAT		



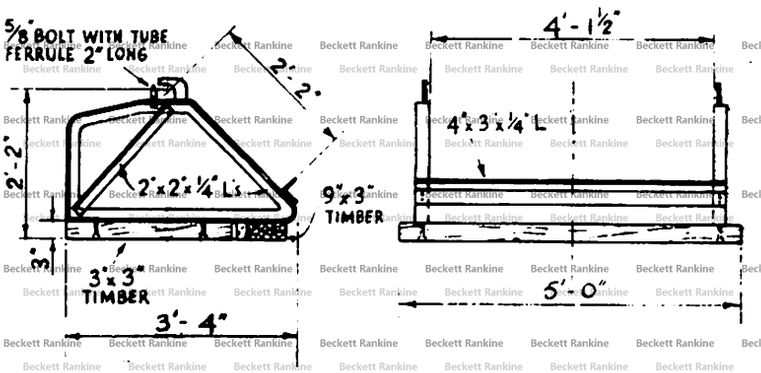
W 44A.	SHORE RAMP FLOAT.		
TO PAIR WITH W 45A.	FLOAT UNIT		
	NO. 1 REQUIRED OF W44A.		
	NO 1. REQUIRED OF W45A. PER SHORE RAMP FLOAT.		



W 47A.	SHORE RAMP FLOAT.	334	
	DAVITS.		
	NO. 4 REQUIRED PER SHORE RAMP FLOAT.		



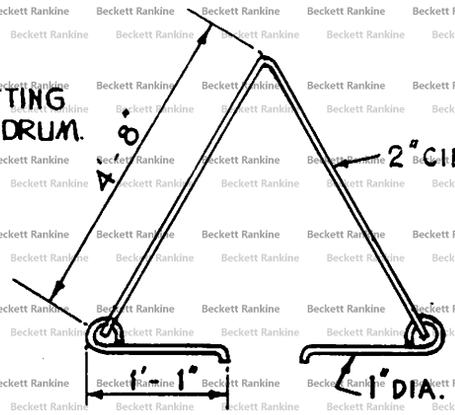
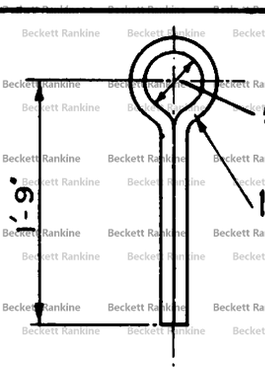
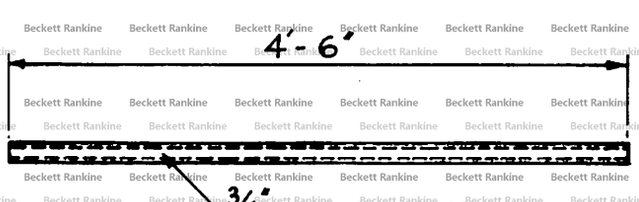
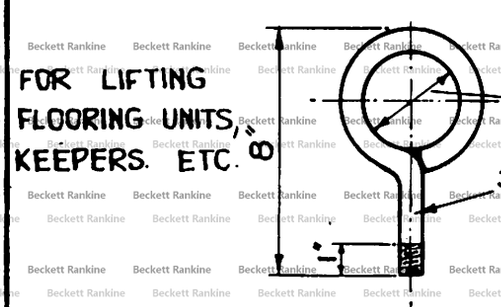
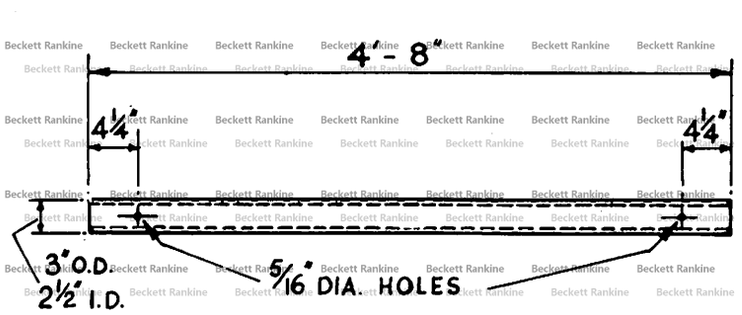
W 48A	MOORINGS. CRADLE FOR CABLE W115A.		
	NO 1. REQUIRED PER CABLE DRUM		



SKETCH. 63

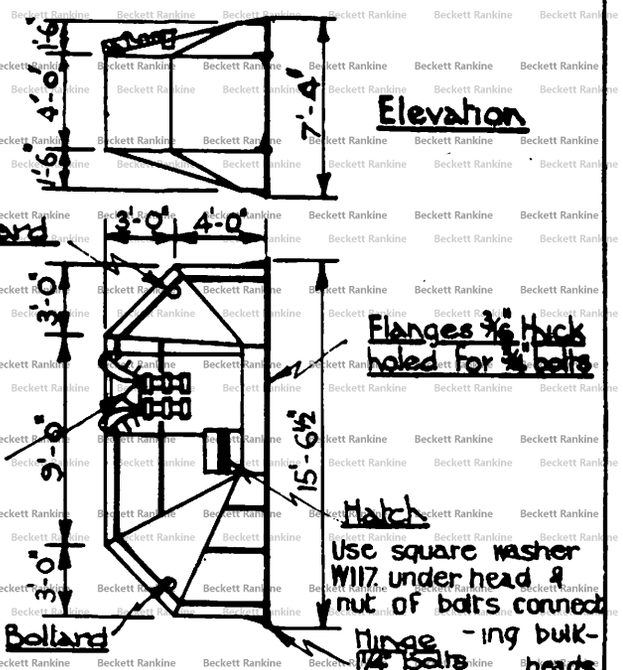
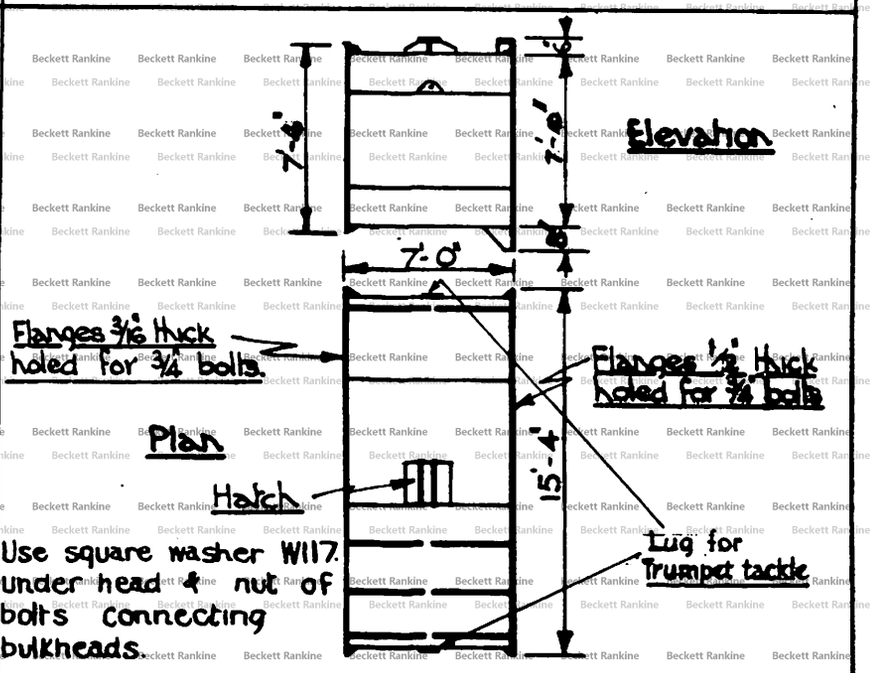
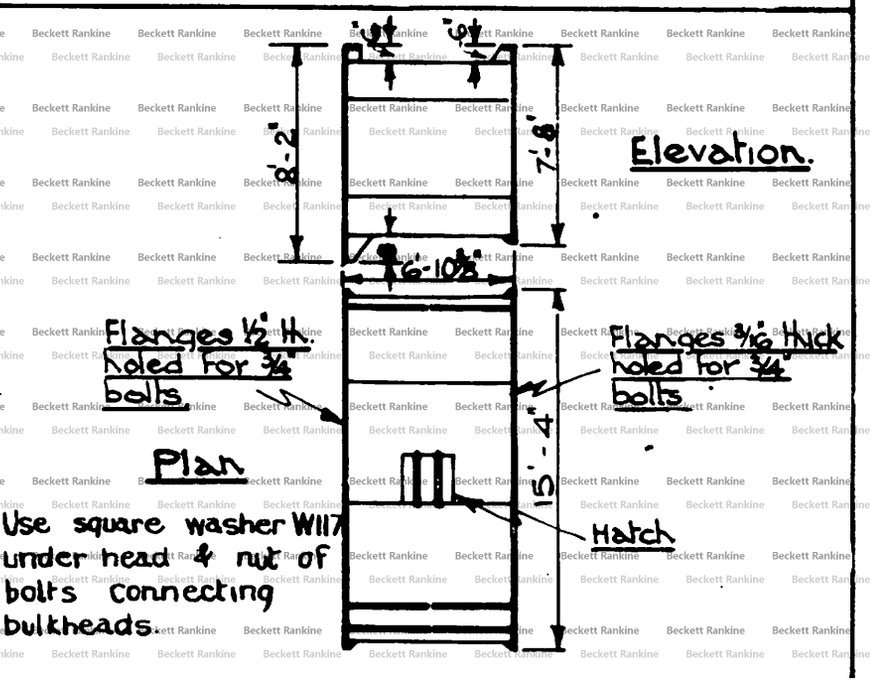
FLOATING BRIDGE MK. I.

(PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 49A.	MOORINGS. SLING FOR CABLE DRUM W115A. Nº 1. REQUIRED PER CABLE DRUM.		
W 50A.	MOORINGS. ROCK ANCHOR BOLT. Nº 1. RQD. PER MOORING FOR ROCKY GROUND.		
W 51A.	MOORINGS. HANDSPIKE. Nº RQD. PER CABLE. DRUM.		
W 52.	ASSEMBLY. LIFTING HOOK. Nº 6 REQUIRED PER SET.		
W 53A.	MOORINGS. SPINDLE FOR CABLE DRUM W115A. Nº 1 REQUIRED PER CABLE DRUM.		

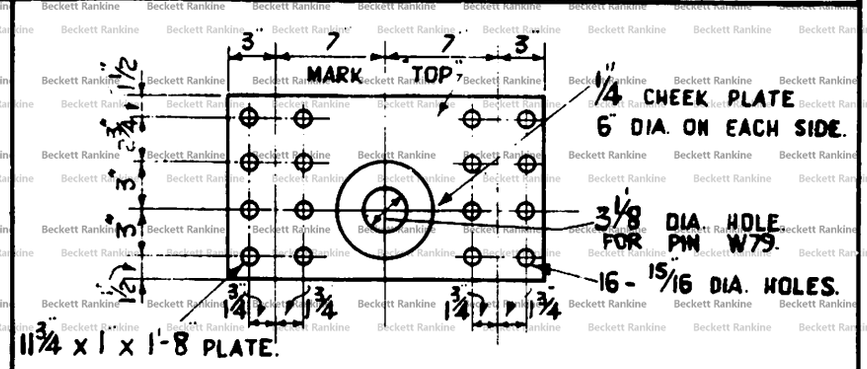
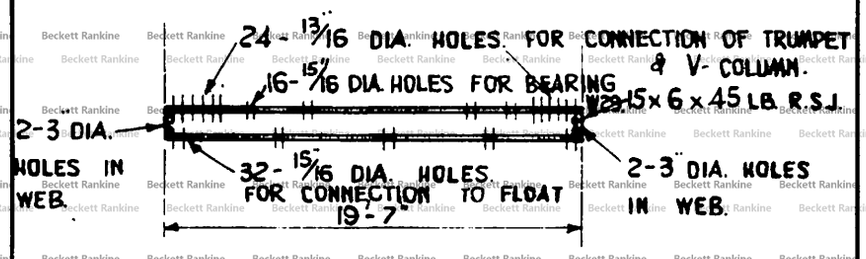
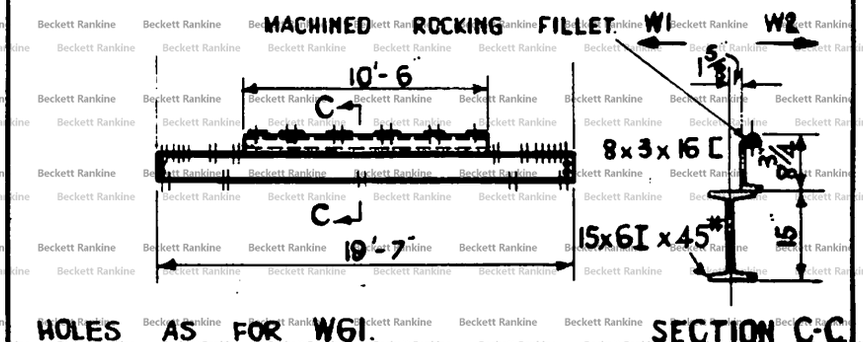
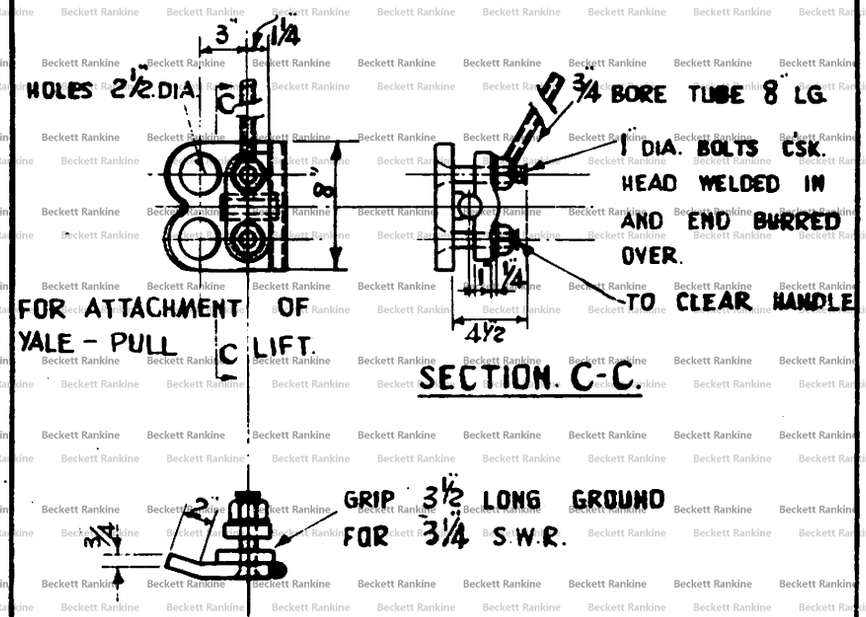
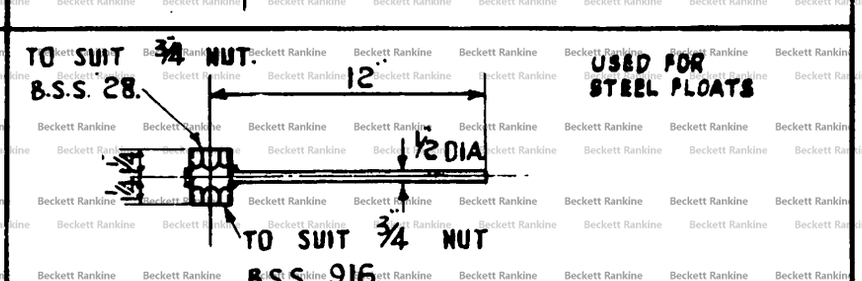
SKETCH. 64

FLOATING BRIDGE. MK I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W54 TO PAIR WITH W59	STEEL FLOAT FLOAT UNIT No 1 W54 REQ'D PER STEEL FLOAT No 1 W59 REQ'D PER STEEL FLOAT	4704	
W55 TO PAIR WITH W58	STEEL FLOAT FLOAT UNIT No 1 W55 REQ'D PER STEEL FLOAT No 1 W58 REQ'D PER STEEL FLOAT	6062	
W56 TO PAIR WITH W57	STEEL FLOAT FLOAT UNIT No 1 W56 REQ'D PER STEEL FLOAT No 1 W57 REQ'D PER STEEL FLOAT	5845	

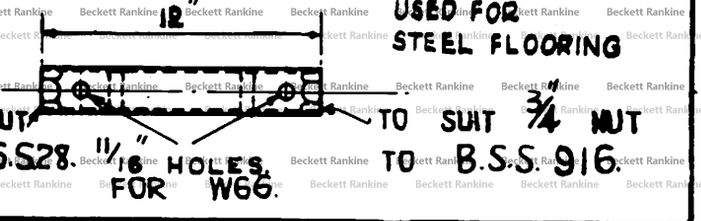
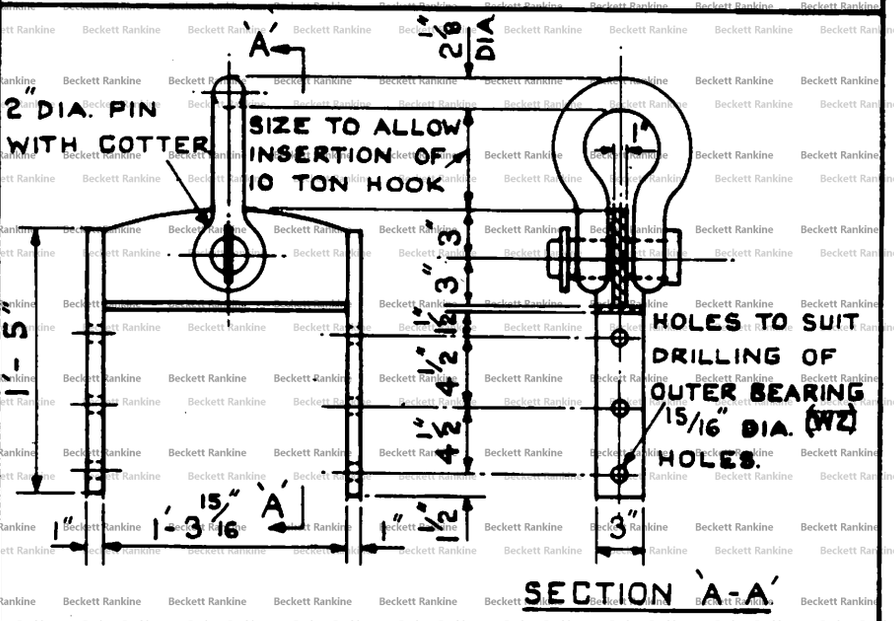
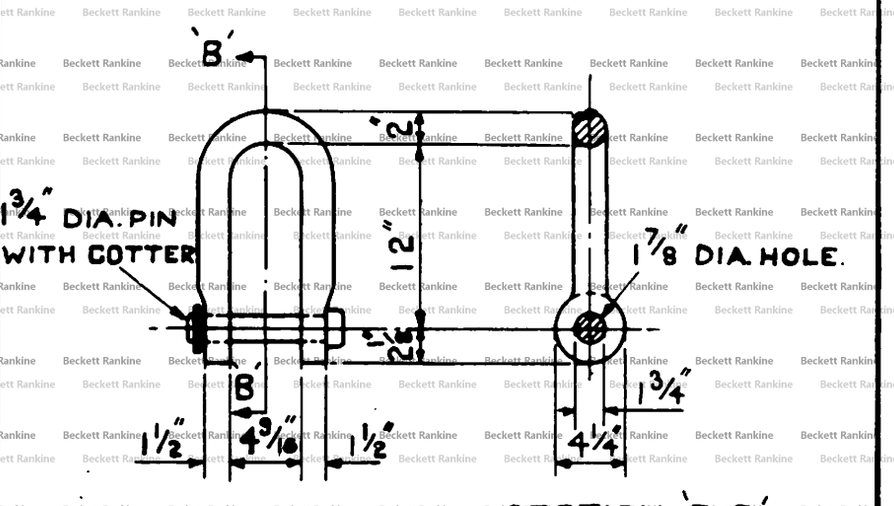
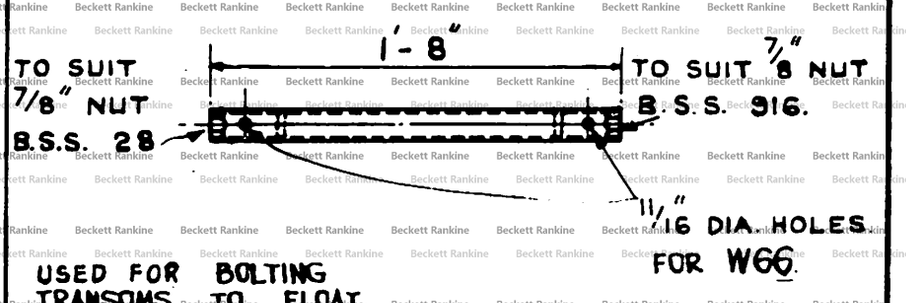
SKETCH. 65

FLOATING BRIDGE. MK.I. (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W60	STEEL FLOAT. LINK PLATE. 1 NO. REQD PER STEEL FLOAT.	68	
W61	FLOAT. TRANSOM JOIST. 2 NO. REQD. PER FLOAT.	1154	
W62	FLOAT CENTRE TRANSOM JOIST. 1 NO. REQD. PER FLOAT.	1854	
W63	FLOAT. ROPE GRIPS. NO. 1 REQD. PER FLOAT. TO BE CARRIED ON FLOAT.	38.	
W64	ASSEMBLY 3/4" SPANNER No 6. REQD. PER SET.		

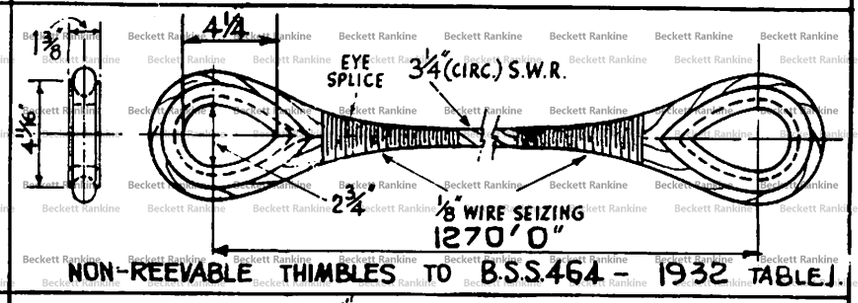
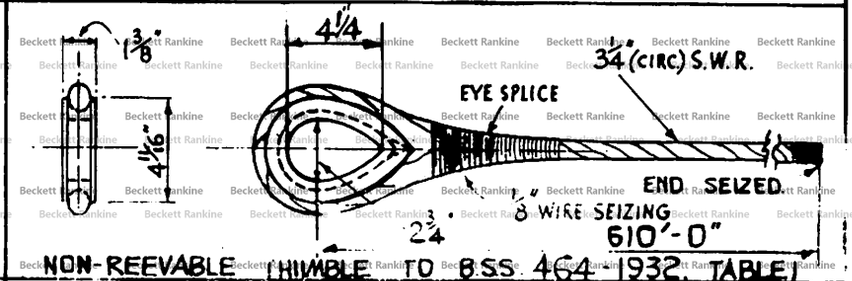
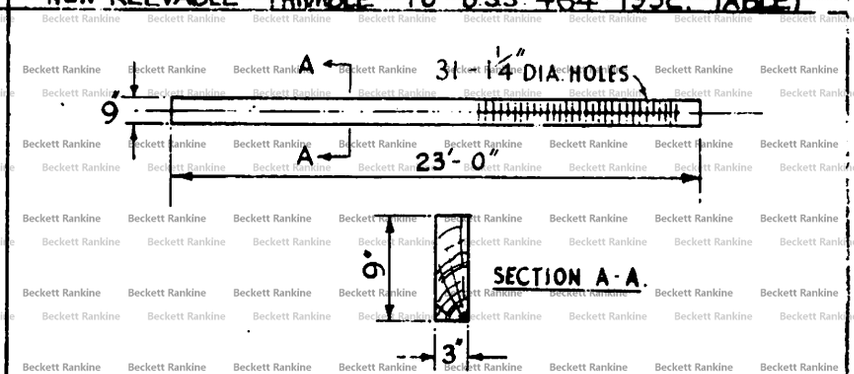
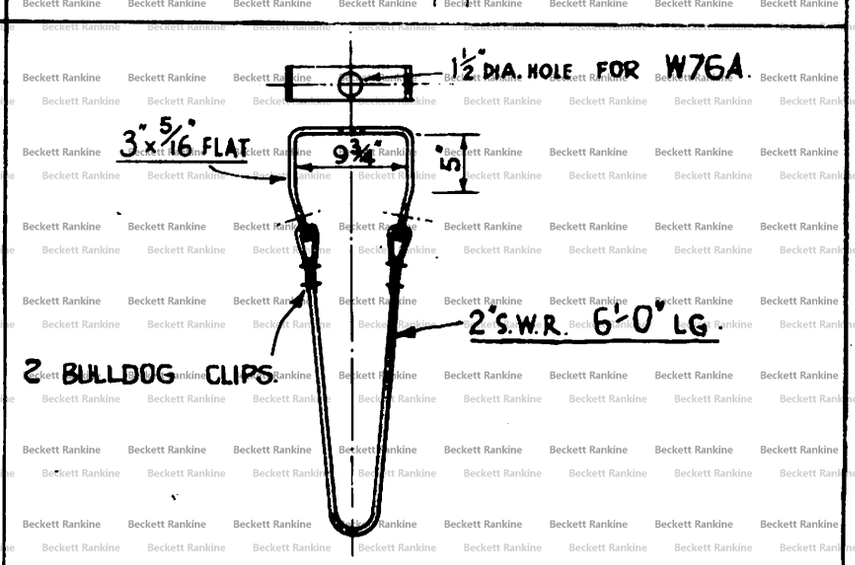
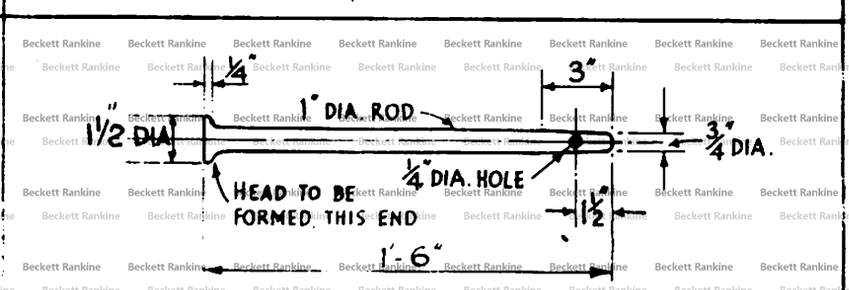
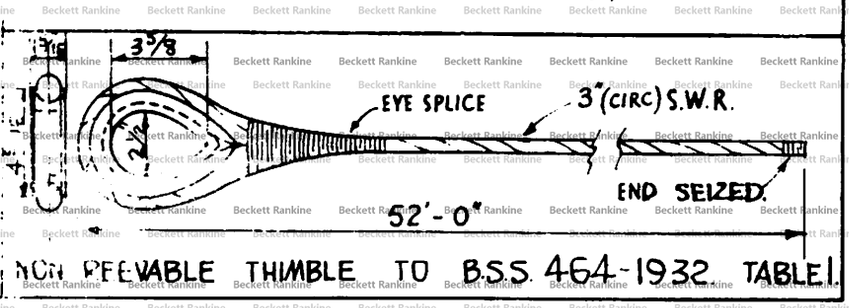
SKETCH. 66

FLOATING BRIDGE. MK. I (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION & USE	W.T. IN LB.	DIAGRAM OF UNIT
W.65.	ASSEMBLY. 3/4" BOX SPANNER. 6 REQD. PER SET.		
W.66.	ASSEMBLY. TOMMY BAR. 12 REQD. PER SET.		
W.67.	ASSEMBLY. LIFTING SHACKLE FOR W.2. GIRDER END. 2 REQD. PER SET.	82	
W.68. A.	ASSEMBLY. LIFTING SHACKLE FOR W.1. GIRDER END. 2 REQD. PER SET.	32	
W.69.	ASSEMBLY. 7/8" BOX SPANNER. 6 REQD. PER SET.		

SKETCH. 67

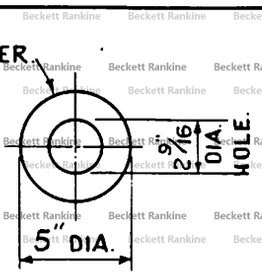
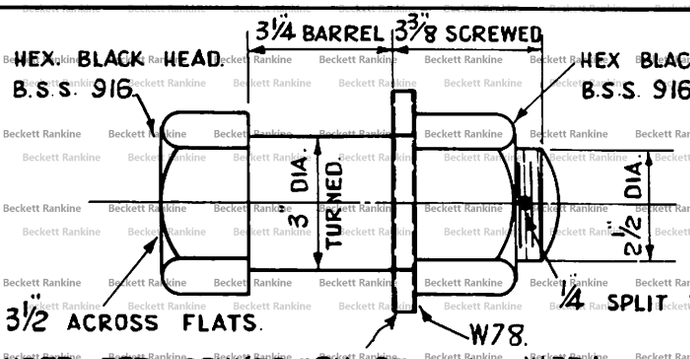
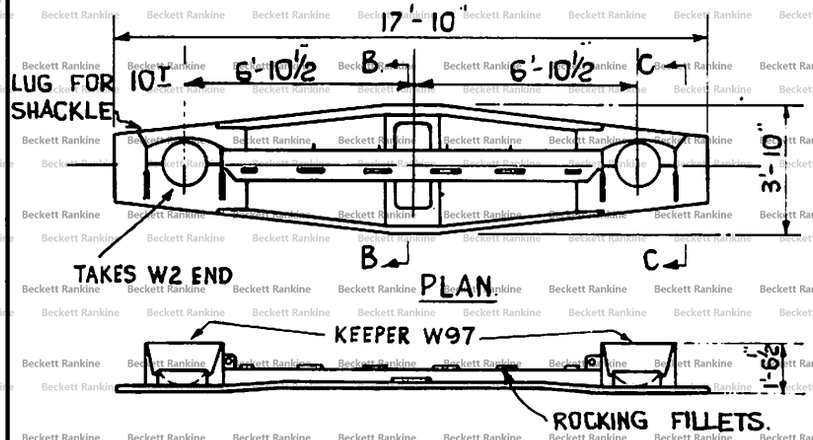
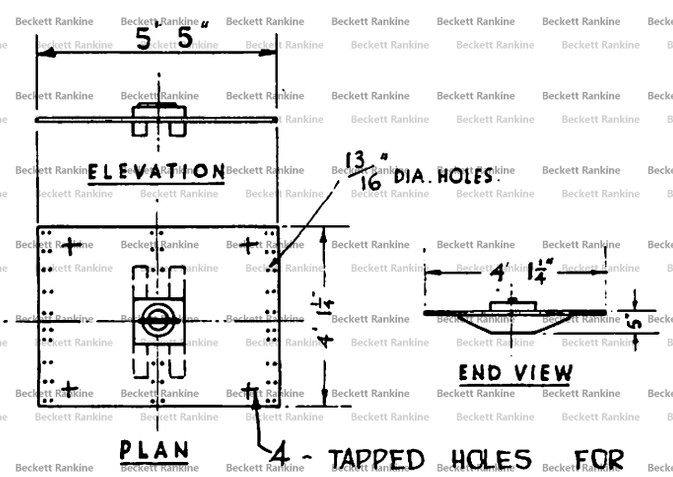
FLOATING BRIDGE · MARK I (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W 70A	MOORINGS. LONG MOORING. No 1. REQUIRED PER FLOAT.		
W 71A	MOORINGS. SHORT MOORING.		
W 74A	TOWING. TIMBER STEERING VANES. No 16. RQD. PER TOWING TRAIN A,B,C,D,E,F, G & J.		
W 75A	TOWING. SLINGS FOR STEERING VANES. No 2. RQD. PER STEERING VANE.		
W 76A	TOWING. FIXING PIN FOR STEERING VANES. No 1. REQ'D PER STEERING VANE		
W 77A	TOWING. 3"(CIRC) RACKING CABLE SPRING. No 4 REQUIRED PER SPAN.		

W72 AND W73 ARE OBSOLETE UNITS

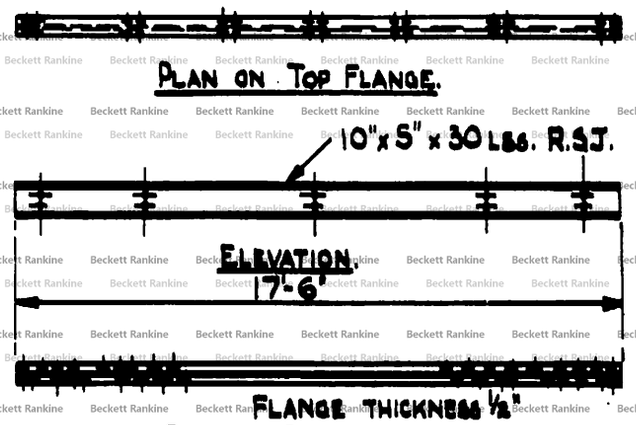
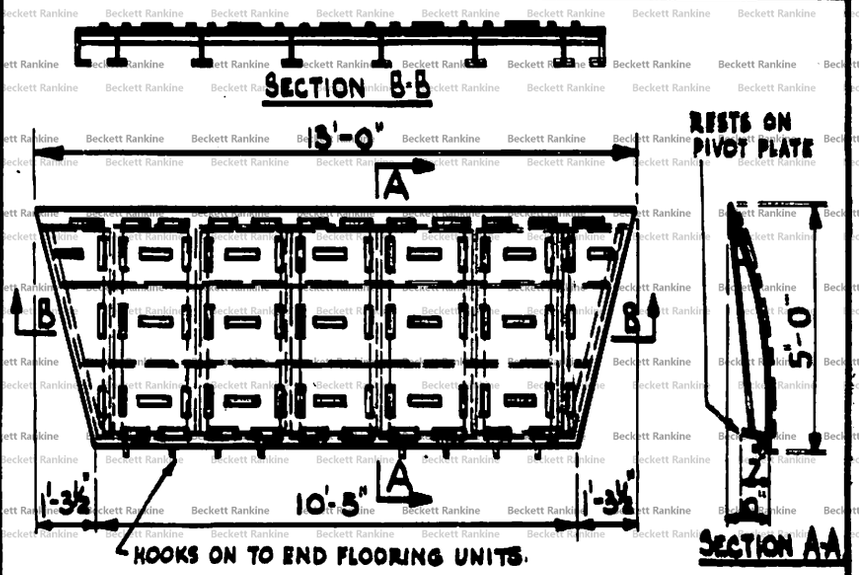
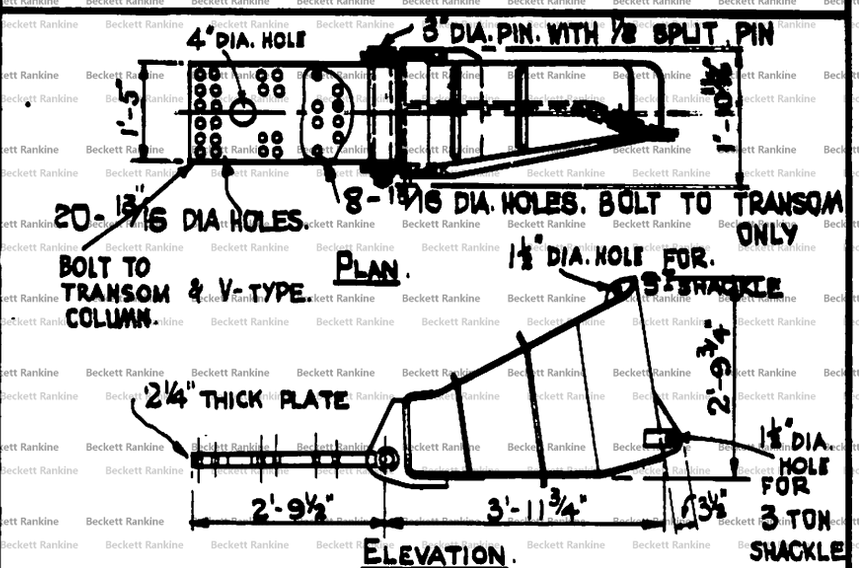
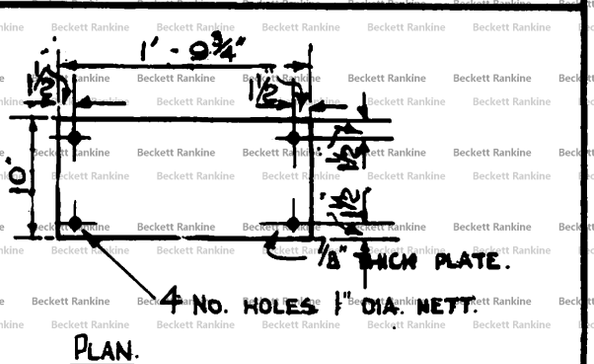
SKETCH. 68

FLOATING BRIDGE. MK I. (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W78	FLOORING WASHER. Nº 14 REQD. PER STANDARD SPAN & TELESCOPIC SPAN. Nº 12 REQD. PER TELESCOPIC END SPAN.		 USED WITH PIN W18 & W79.
W79	FLOORING. PIN USED WITH ONE WASHER MKD. 78. Nº 2. REQD. PER STANDARD SPAN & TELESCOPIC SPAN.		 USED FOR CONNECTION OF LINK W32A.
W80.	PIVOT PLATE. PIVOT PLATE. Nº 1. REQD. PER PIER. HEAD & V-TYPE. TRESTLE APPROACH. Nº 2. REQD. PER TELESCOPIC END SPAN.	4459.	
W81	PIVOT PLATE. PIVOT BED PLATE. FOR V-TYPE TRESTLE APPROACH Nº 1 REQD. PER V-TYPE. TRESTLE APPROACH.		

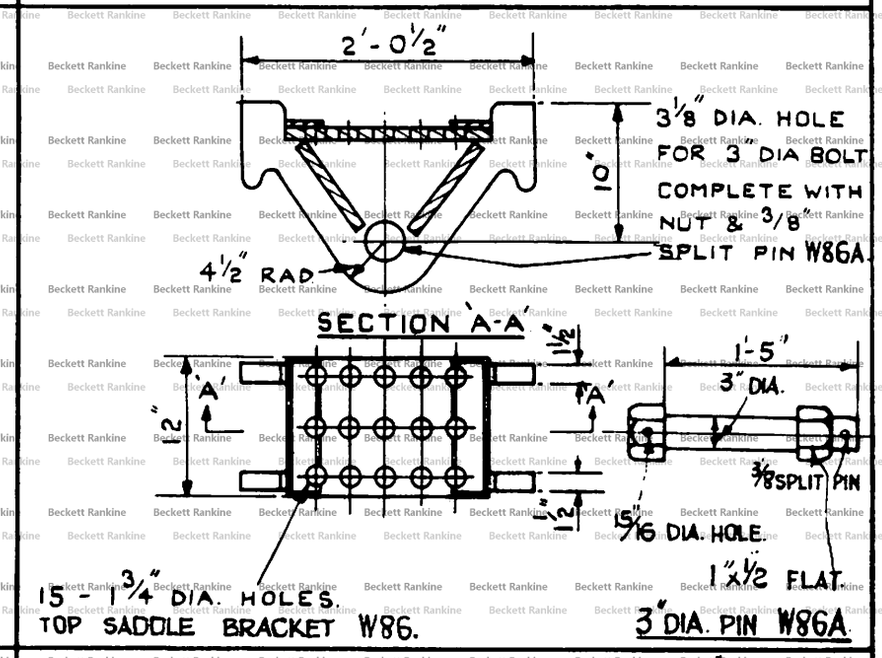
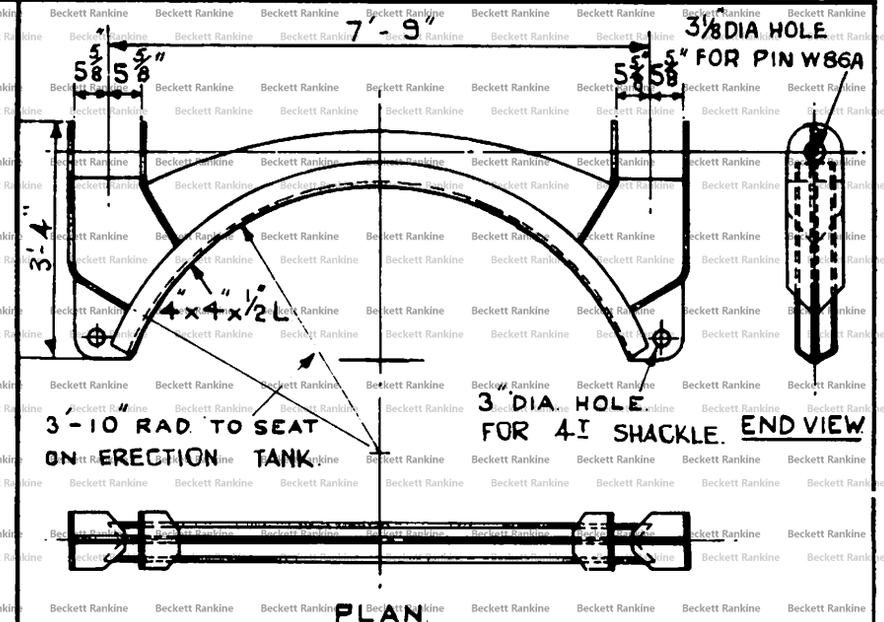
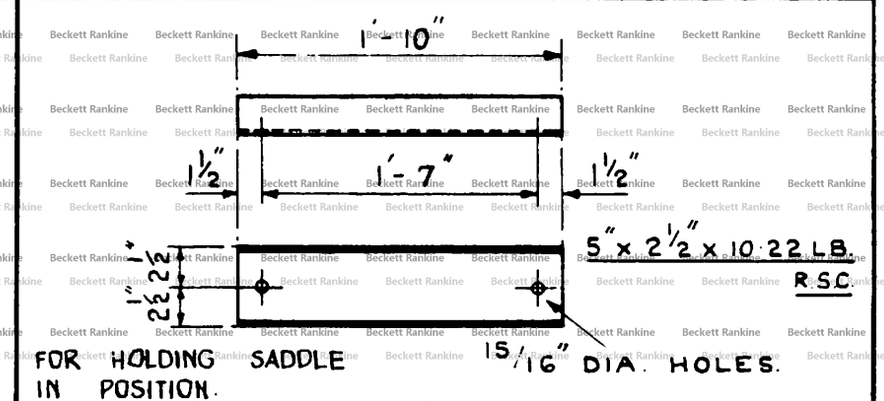
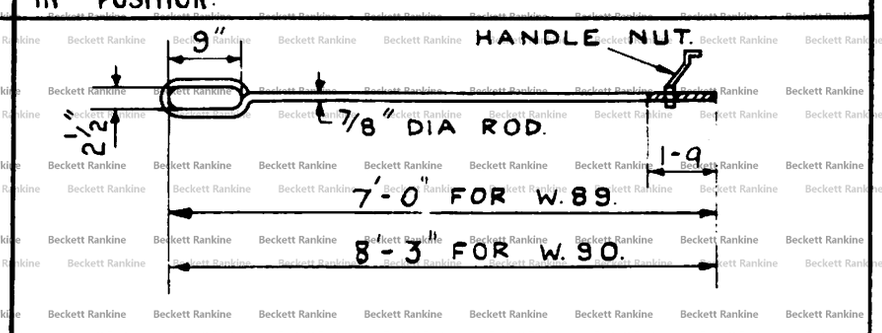
SKETCH. 69

FLOATING BRIDGE. MK. I. (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W82	PIVOT PLATE ON V. TRESTLE APPROACH CILL JOIST. No. 5 REQD. PER V TRESTLE APPROACH.	525	
W83	PIVOT PLATE. RAMP. No. 1 REQD. PER PIVOT PLATE.	1589.	
W84 TO PAIR WITH W84A	ERECTION. TRUMPET No. 1. W84. REQD. PER TOWING. UNIT. No. 1. W84A. REQD. PER TOWING UNIT	827	
W85	ERECTION. HOLDING PLATE FOR TIMBER. No. 1 REQD. PER W84 No. 1 REQD PER W84A	54.	

SKETCH 70

FLOATING BRIDGE. MK.I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION & USE	WT IN LB	DIAGRAM OF UNIT.
W.86. W86A.	ERECTION TOP SADDLE BRACKET FOR ERECTION TANK. 4 REQD. PER ERECTION TANK.		
W.87.	ERECTION. BOTTOM SADDLE BRACKET. FOR ERECTION TANK. 2 REQD PER ERECTION TANK		
W.88.	ERECTION CLAMP 4 REQD PER ERECTION TANK.		
W.89 W.90.	ERECTION EYE BOLTS No4 ROD. MK.W.89. No4. ROD. MK.W.90. REQD. PER ERECTION TANK.		

SKETCH 71

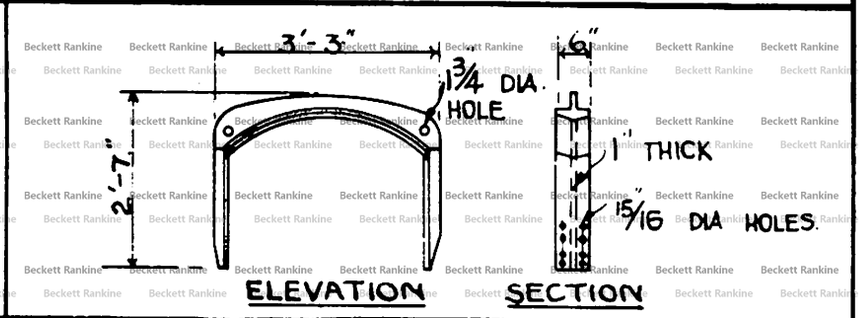
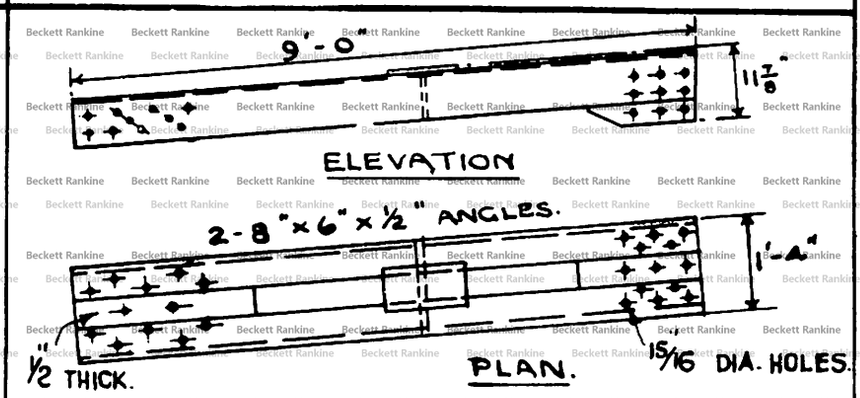
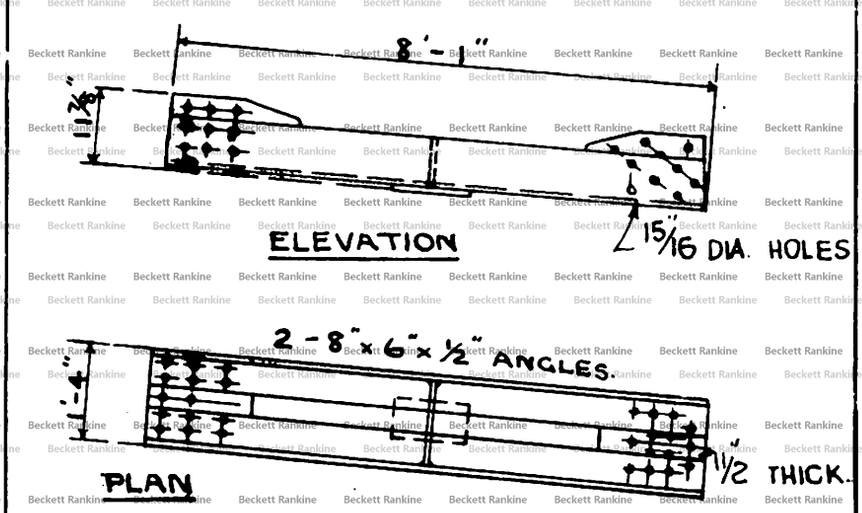
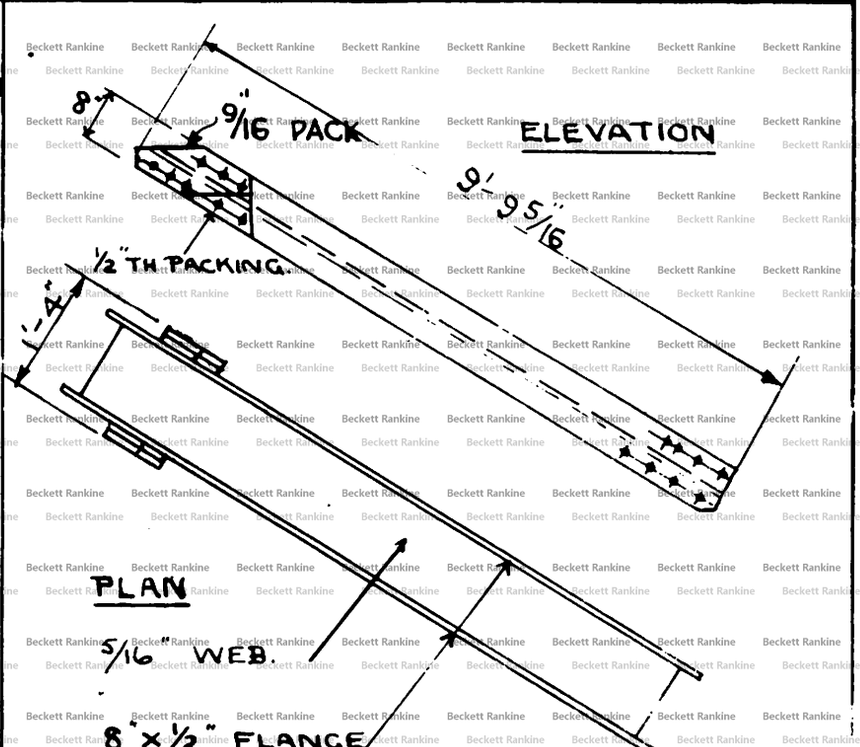
FLOATING BRIDGE. MK.I. (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE	WT IN LBS.	DIAGRAM OF UNIT
W91.	ERECTION 3 WIRE No 1 REQD PER ERECTION (Anx.)		4 T. SHACKLE TO B.S.S. 825 - 1939 TABLE 4. 3" S.W.R. 3" 18'-0" 2- REEVABLE THIMBLES TO B.S.S. 464 - 1932. TABLE 11.
W92.	ERECTION ERECTION TANK. No 1. REQD. PER. TOWING TRAIN No 2. REQD. PER TELESCOPIC END SPAN.	123200 (5·5 TONS)	SADDLES SIT HERE CONTROLS OF SLUICE VALVES MOORING RING 8'-0" DIA. 1'-0" DIA. LUG. 3'-6" 7'-7½" 13'-9" 7'-7½" 3'-6" 36'-0" END VIEW.
W93	FLOORING. SPRING WASHER. No 380. REQD. PER STANDARD SPAN No 350 REQD. PER TELESCOPIC & TELESCOPIC END SPAN.		1/8" 3/16" 15/16" DIA. 1/8" 1/16" THICK SPRING STEEL. SHARP CORNERS.
W94	FLOORING. 7/8" DIA. BOLT. No 32. REQD PER SPAN.	1·05.	3/8" 7/8" DIA. 3/16" SPLIT PIN X 2" LG. 2" USE SPRING WASHER MK. W93. UNDER HEAD AND NUT FOR CONNECTION OF WHEEL GUARD W20, W22 TO W19.
W95	ASSEMBLY RING SPANNER PER. W18. BOLT. No 6. REQD PER SET		1½" DIA. ROD. 5¾" TO SUIT 2½" DIA. BOLT. W18. & W79. 6" 1'-2"
W96	FLOORING CENTRE FLOORING PANEL. No 8. REQD PER STANDARD SPAN. No 6 REQD PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	397.	1'-11¾" 9'-11¾" 6" x 1¼ TIMBERS. 5"x2½" L. x 10·22 LBS.

SKETCH. 72

FLOATING BRIDGE. MK. I.

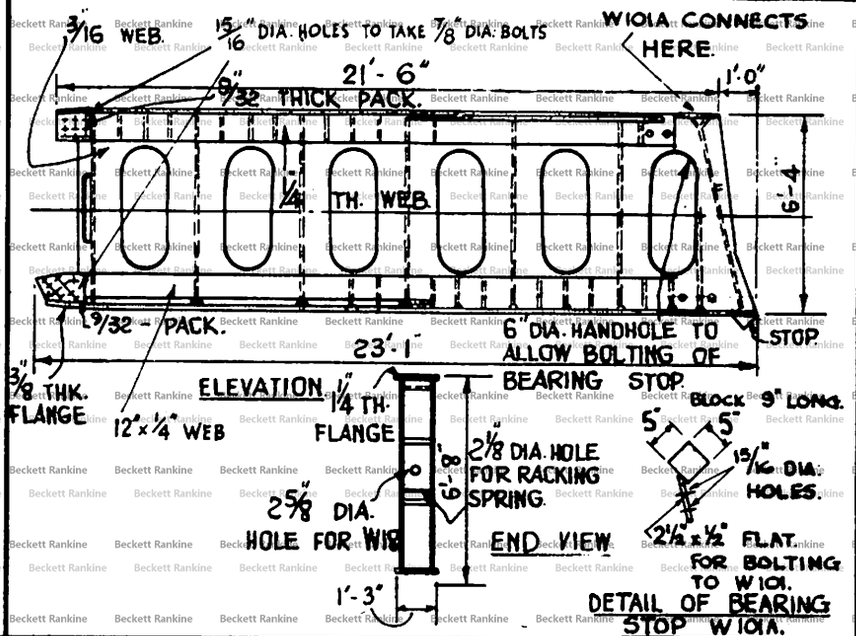
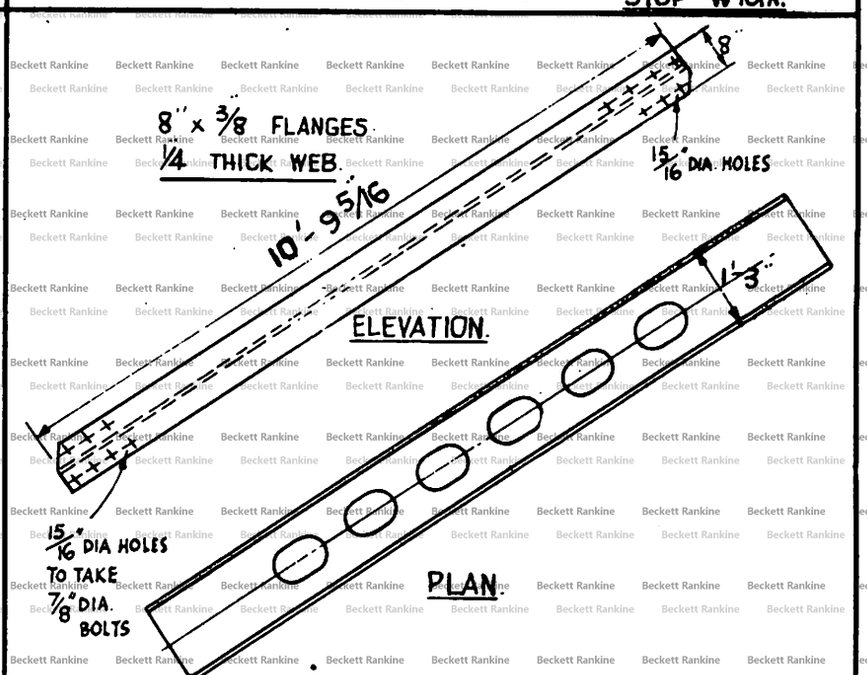
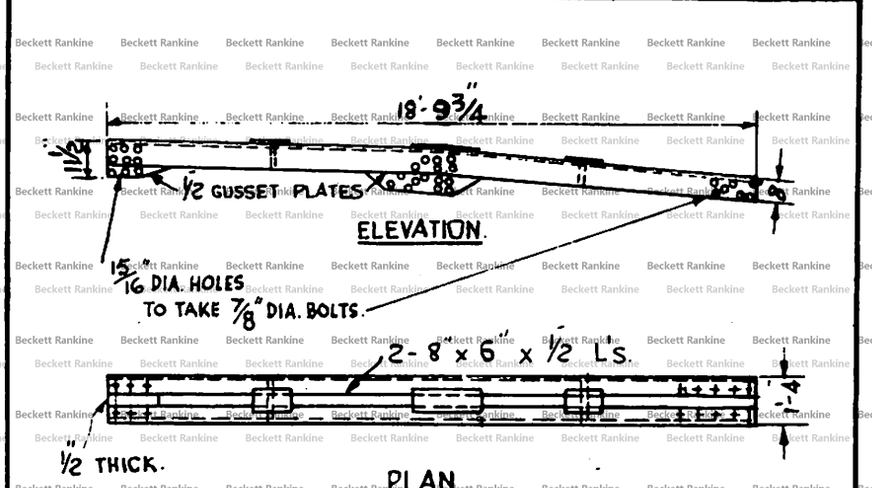
(PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 97	PIVOT PLATE **MAIN KEEPER.** NO. 2 REQD PER PIVOT PLATE.	196.	
W 98	MAIN GIRDER (TELESCOPIC SPAN) **TOP CHORD** NO. 2. REQD PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	472	
W 99	MAIN GIRDER (TELESCOPIC SPAN) **BOTTOM CHORD.** NO 2. RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	445	
W 100	MAIN GIRDER (TELESCOPIC SPAN **DIAGONAL** No 2. RQD PER TELESCOPIC SPAN & TELESCOPIC END SPAN	409	

SKETCH 73.

FLOATING BRIDGE. MK I.

(PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION & USE	WT IN LBS.	DIAGRAM OF UNIT
W 101 & W 101A.	MAIN GIRDER. (TELESCOPIC SPAN) INNER BOX. Nº 2 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	5295.	
W 102	MAIN GIRDER. (TELESCOPIC SPAN) DIAGONAL. Nº 2 REQD. PER TELESCOPIC SPAN AND TELESCOPIC END SPAN	348.	
W 103	MAIN GIRDER (TELESCOPIC SPAN) TOP CHORD. Nº 2. REQD. PER TELESCOPIC SPAN AND TELESCOPIC END SPAN.	1019.	

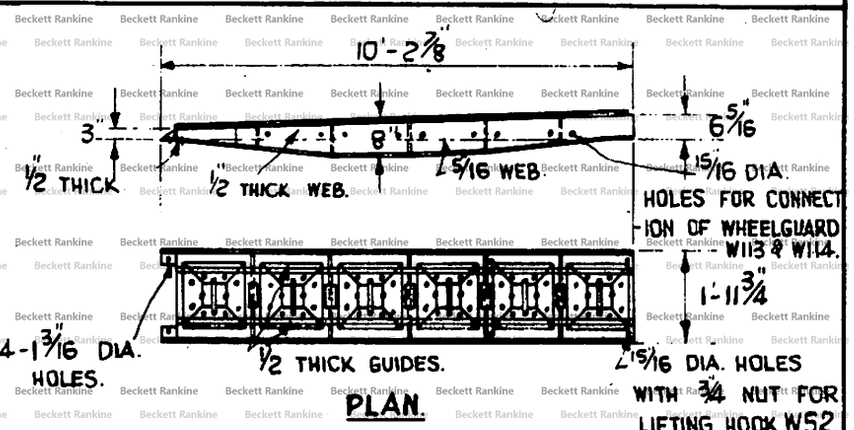
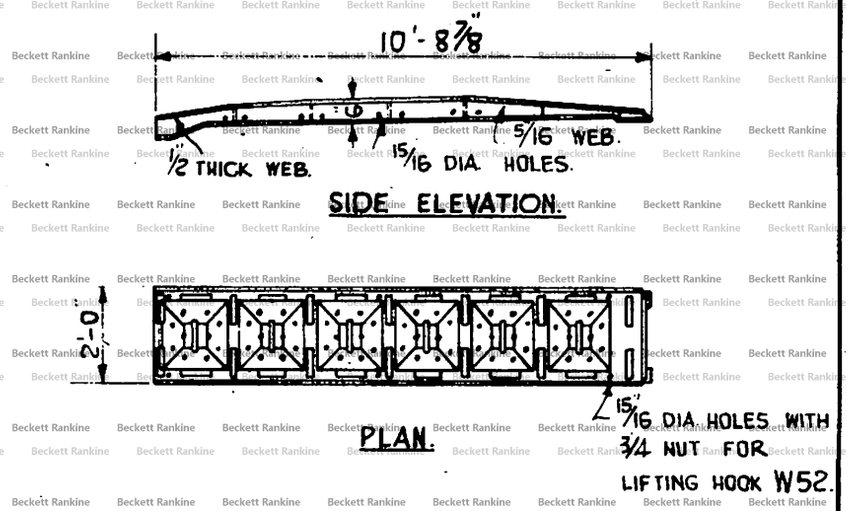
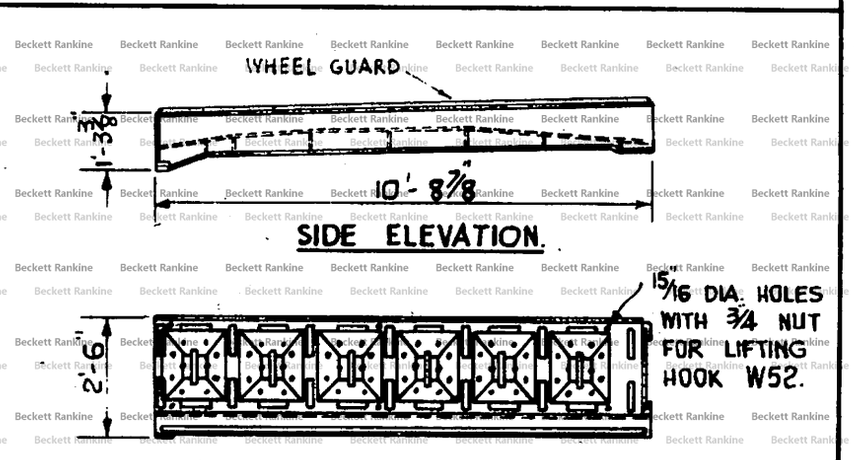
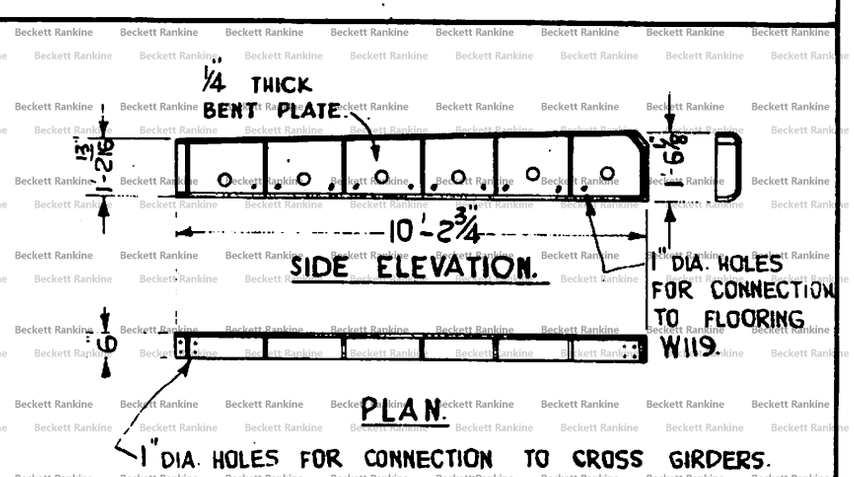
SKETCH. 74

FLOATING BRIDGE. MARK I (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS	DIAGRAM OF UNIT
W 104	MAIN GIRDER. (TELESCOPIC SPAN) **BOTTOM CHORD** Nº 2. RQD PER. TELESCOPIC SPAN & TELESCOPIC END SPAN.	967	½ THICK GUSSET PLATES; 17'-6"; ELEVATION; 15/16" DIA. HOLES; 2-8" x 6" x ½ L's.; 1'-4"; PLAN.
W 105. TO PAIR WITH. W 106. & W 106A	MAIN GIRDER (TELESCOPIC SPAN.) **OUTER BOX:** Nº 2. REQD. PER. TELESCOPIC SPAN & TELESCOPIC END SPAN Nº 4 SETS REQD OF W106A. PER. TELESCOPIC SPAN & TELESCOPIC END SPAN.	5639	HOLES FOR GREASING BEARINGS; WOODEN BEARINGS W136.; 7/8 TAPPED HOLES FOR 7/8 DIA BOLT; 15/16" DIA. HOLES; 3/8 THICK.; 2 1/8 DIA. HOLE FOR RACKING SPRING; 5/16 WEB PLATE; 2 5/8 DIA HOLE FOR W18.; INSERT RELIEF WEDGES W137 HERE; ELEVATION; HOLES FOR PUSHING OUT BEARING W136; 22'-0"; 1'-4 3/4"; PLAN; 3/8 THICK FOR CONNECTION OF CENTRE CROSS GIRDER W107; LOCKING PIN SET W106A
W 107	FLOORING. (TELESCOPIC SPAN) **CENTRE CROSS GIRDER** Nº 1 RQD. PER. TELESCOPIC SPAN & TELESCOPIC END SPAN.	1323	12'-4"; 3'-0"; 8"x4"x½" ANGLE; ⅜" WEB PLATE; HOLES 15/16 DIA; ELEVATION; SECTION; 1'-4½"; 7/16 SLOT FOR WEB ON OUTER BOX W105 & W106; PLAN
W 108	FLOORING. (TELESCOPIC SPAN) **CROSS GIRDER.** Nº 1 RQD PER TELESCOPIC SPAN & TELESCOPIC END SPAN	521	12'-8 3/8"; 2 5/8 DIA HOLE FOR W18; 2 5/8 DIA HOLE FOR W18; ELEVATION; 3/4 TH FLANGE; PLAN; 3/8 PACK; 5/16 DIA HOLES

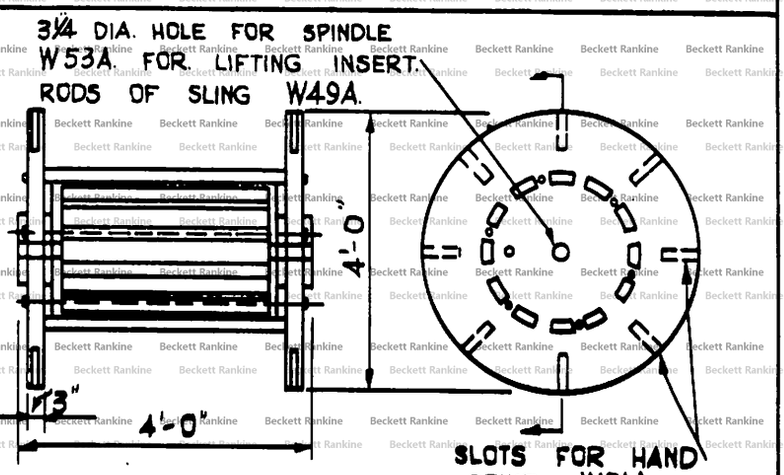
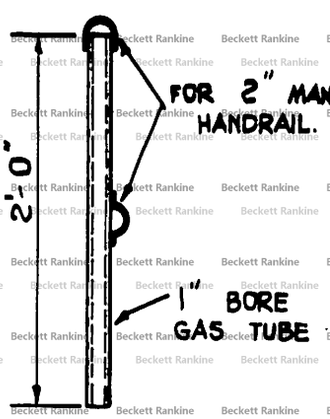
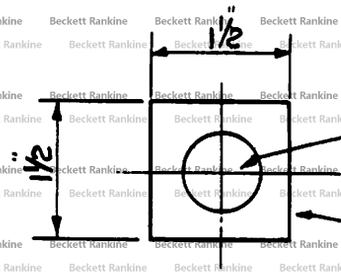
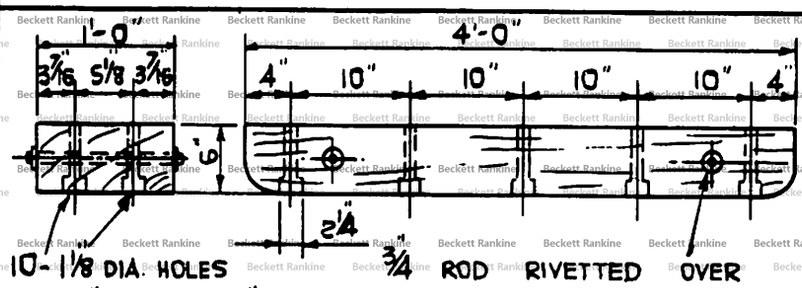
SKETCH. 75

FLOATING BRIDGE. MK.I. (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W109	FLOORING (TELESCOPIC SPAN) BOTTOM LEAF FLOORING UNIT. 5 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN		
W110.	FLOORING. (TELESCOPIC SPAN) TOP LEAF CENTRE FLOORING UNIT. No 3. REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		
W111. TO PAIR WITH W112.	FLOORING. (TELESCOPIC SPAN) TOP LEAF FLOORING UNIT WITH WHEEL GUARD No 1 RQD. OF W111 No 1 RQD. OF W112. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		
W113 TO PAIR WITH W114.	FLOORING (TELESCOPIC SPAN) WHEEL GUARD TO BOTTOM LEAF FLOORING UNIT. No 1. RQD. OF W113. No 1 RQD. OF W114. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		

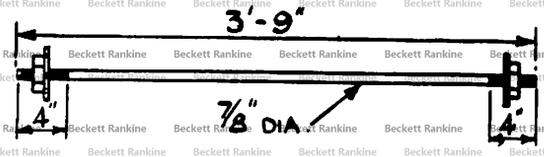
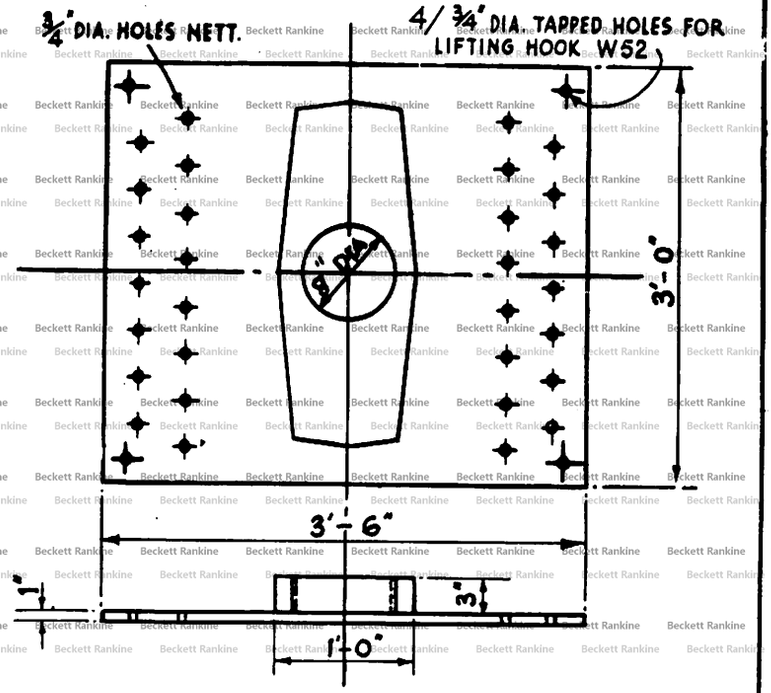
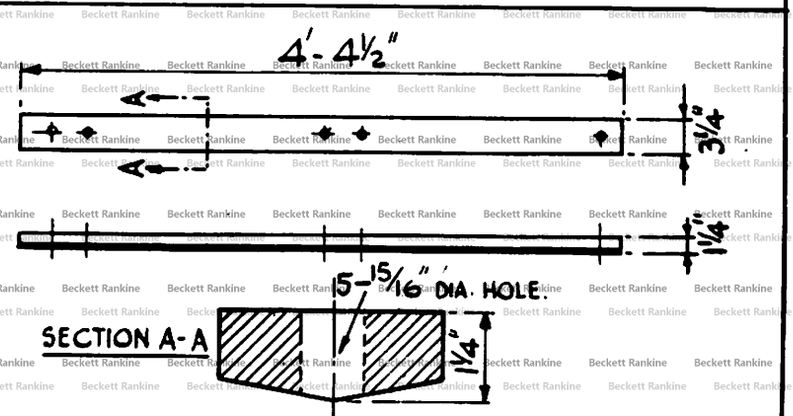
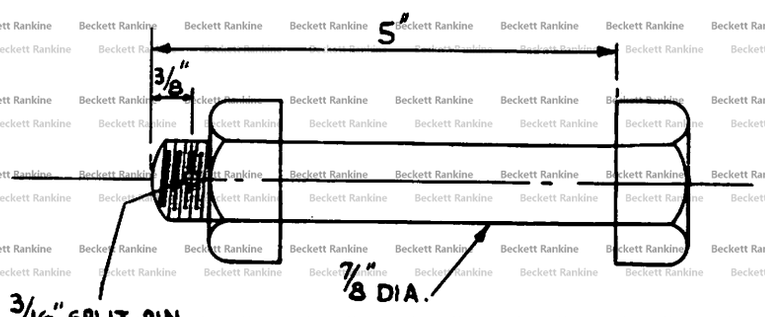
SKETCH. 76.

FLOATING BRIDGE MK. I (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 115 A.	MOORINGS CABLE DRUM. № 1. REQD. PER. MOORING W70 A. & W71A.		
W 116	STEEL FLOAT. HANDRAIL STANDARD. № 22. REQD. PER. SHORE RAMP FLOAT. № 12. REQD. PER. STEEL FLOAT.		
W 117.	STEEL FLOAT. SQUARE WASHER. № 560. REQD. PER STEEL FLOAT. № 250. REQD. PER. ROCK INSERTION IN ADDITION TO ABOVE		 USED ON STEEL FLOAT BULKHEAD CONNECTIONS. UNDER HEAD & NUT.
W 118.	STEEL FLOAT. HARDWOOD BUMPER. BOLTS TO UNDERSIDE OF FLOAT ON BULKHEADS UNDER MAIN BEARINGS.		
W 119.	ERECTION & ASSEMBLY. RIVET SNAP. USED FOR FORMING HEAD ON COPPER RIVETS. № 4. REQD. PER SET.		

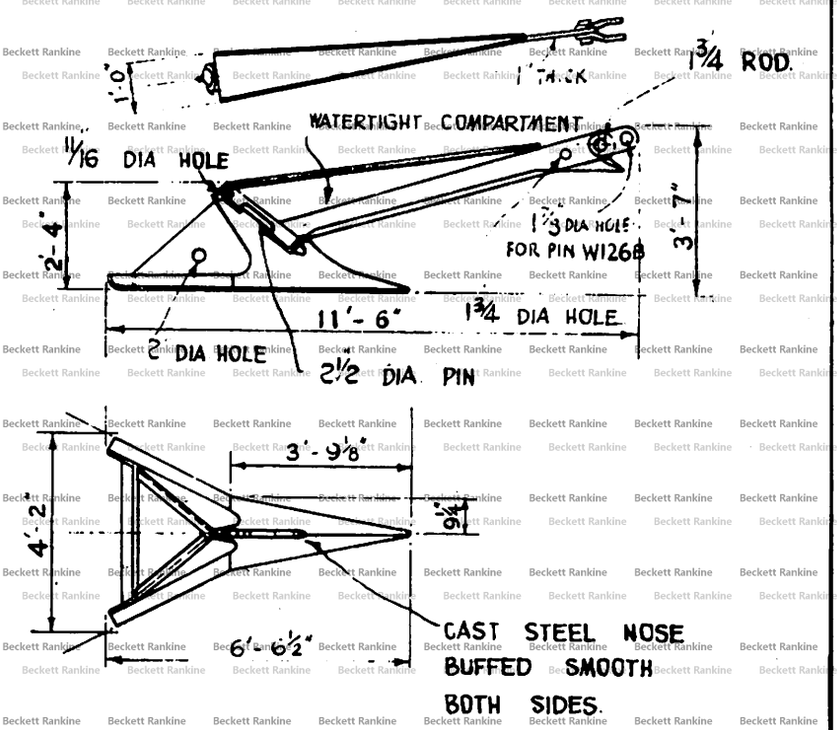
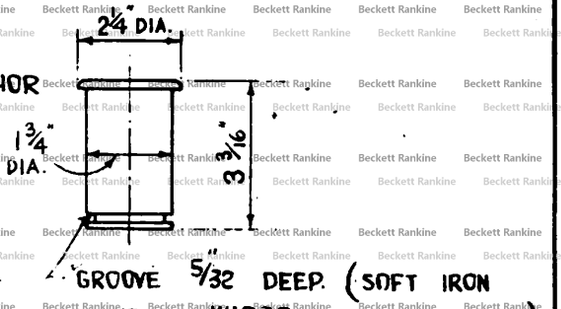
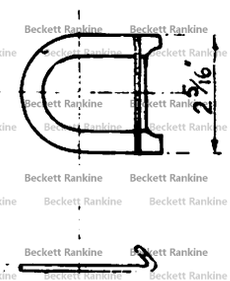
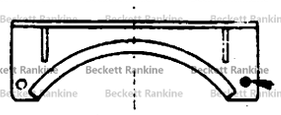
SKETCH 77

FLOATING BRIDGE MK.I. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS	DIAGRAM OF UNIT
W 120	ERECTION RODS FOR HOLDING PLATE W85 Nº 8 REQUIRED PER TIMBER TRANSOM W130	8	
W 121	PIVOT PLATE. PIVOT BED PLATE. (DIRECT SEATING.) Nº 1 REQUIRED PER PIER HEAD. Nº 2 REQUIRED PER TELESCOPIC END SPAN.		
W 122	SHORE RAMP FLOAT. ROCKING FILLET NO. 2 REQD. PER SHORE RAMP FLOAT.		
W 123	SHORE RAMP FLOAT. BOLT 7/8" DIA. WITH NUT AND 3/16" SPLIT PIN. USED WITH W122 Nº 10 REQD. PER SHORE RAMP FLOAT.		

SKETCH. 78

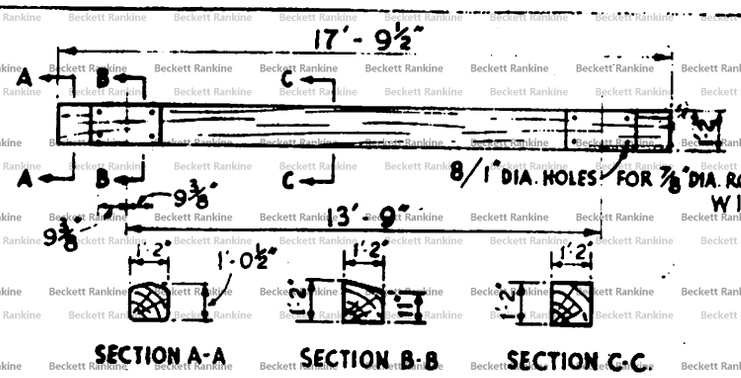
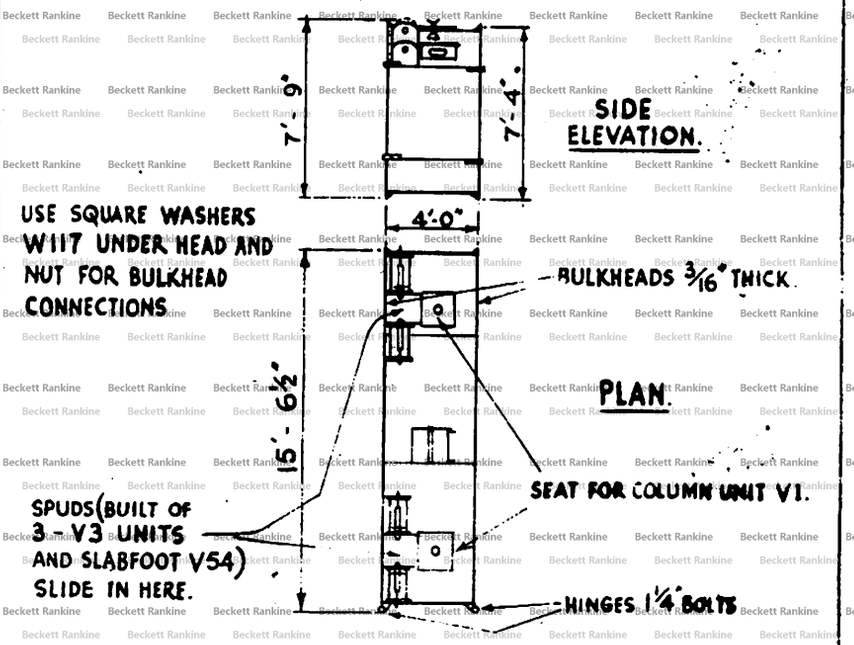
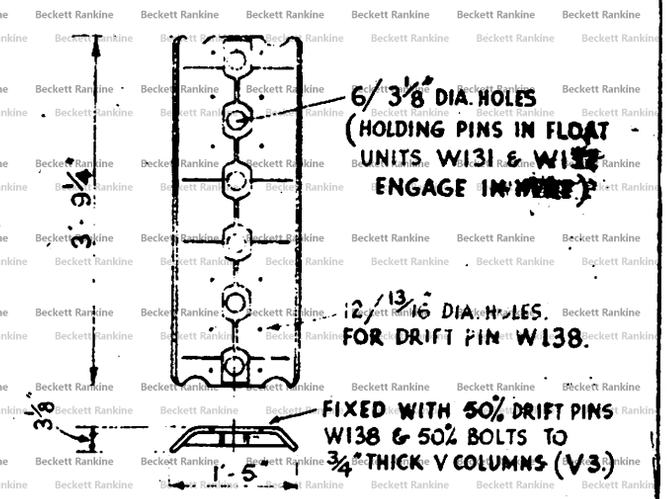
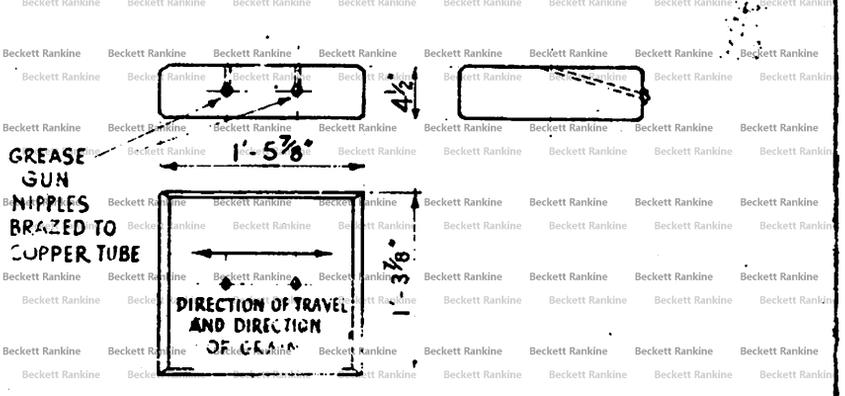
FLOATING BRIDGE. MARK I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 124B	MOORINGS. KITE ANCHOR. Nº 2 REQUIRED PER FLOAT PAINTED WITH RED LEAD ONLY		
W 126B.	MOORINGS PIN. FOR USE WITH W124B. Nº 1 REQUIRED PER ANCHOR. Nº 1 REQUIRED PER MOORING LINK W157		USED FOR FIXING MOORINGS W70A & W71A. TO KITE ANCHOR W124B. & FOR JOINING 2 MOORINGS TOGETHER WITH MOORING LINK W157 
W 127B	MOORINGS SOFT IRON KEEPER. NO. 1 REQD. PER PIN W126B.		FOR USE WITH PIN W126B. 
W 128	FLOAT REPLACEMENT LOW HEADROOM SADDLE No 4 REQD. PER ERECTION TANK USED ON FLOAT REPLACEMENT.		
W 129	ERECTION. SOFTWOOD PACK. FOR TOP OF TRESTLE UNIT. Nº 4 REQUIRED PER TRUMPET & ROCK INSERTION.		

W125 IS AN OBSOLETE UNIT

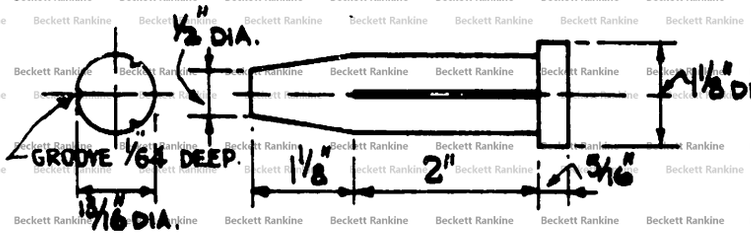
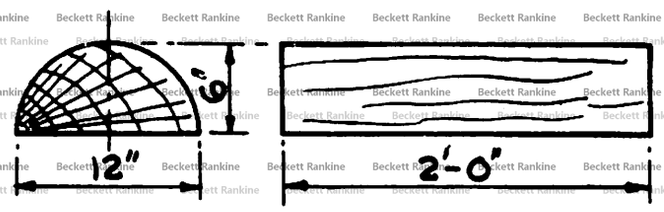
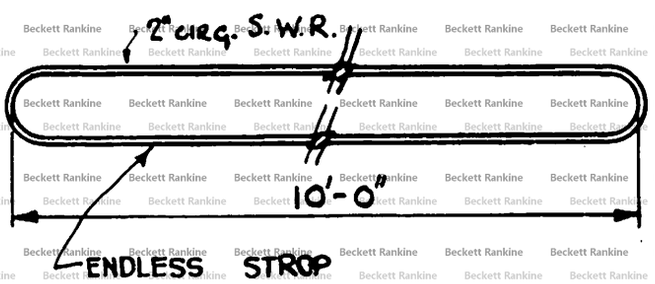
SKETCH 79

FLOATING BRIDGE MARK I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W 130	ERECTION HARDWOOD TRANSOM. No 1 REQD. PER TOWING TRAIN. B.C.D.F.G.H.J. & K.		
W 131 TO PAIR WITH W 132	ROCK INSERTION (STEEL FLOAT) FLOAT UNIT No 1 REQD. OF W131. No 1 REQD. OF W132. PER STEEL FLOAT FOR BEACHING ON ROCKY GROUND	4480.	
W 133	ROCK INSERTION (STEEL FLOAT) GUIDE UNIT No 24 REQD. PER ROCK INSERTION SET.	128.	
W 136	MAIN GIRDER BEARING BLOCKS. No 4 REQD. PER TELESCOPIC SPAN. TELESCOPIC END SPAN		

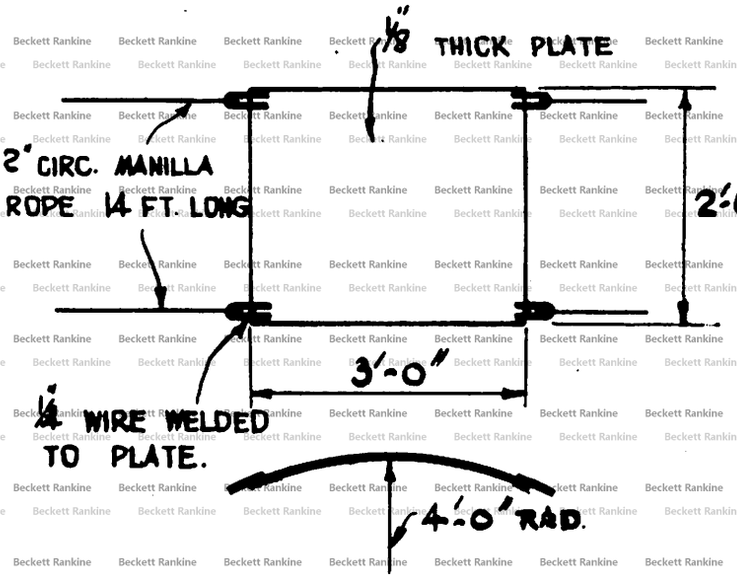
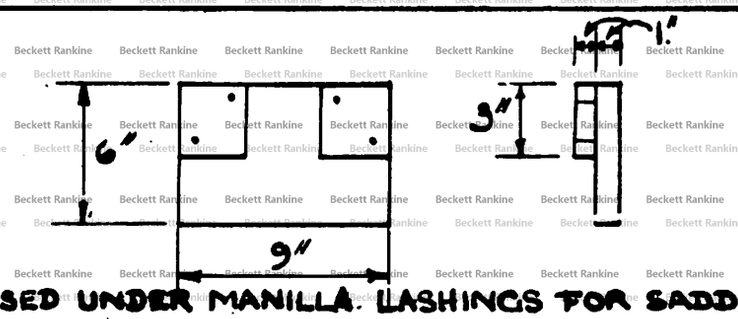
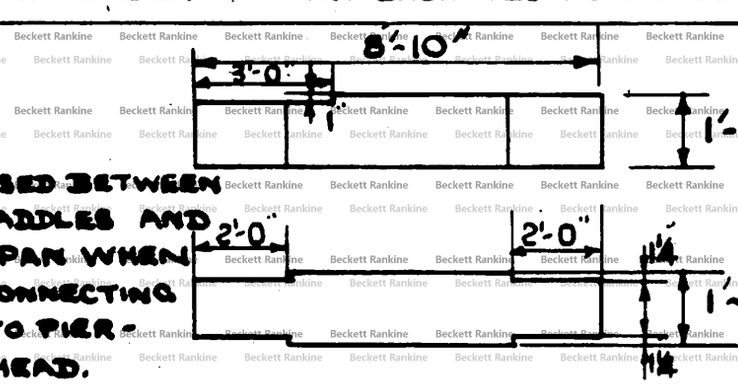
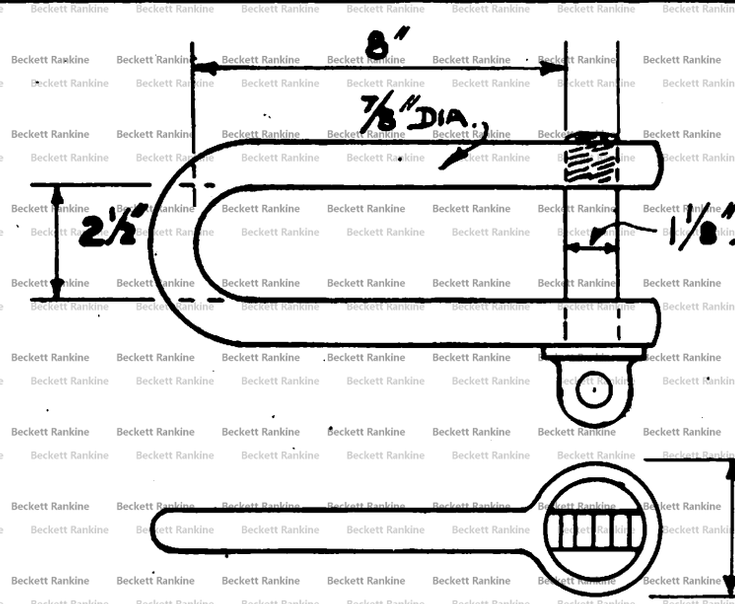
SKETCH. 80

FLOATING BRIDGE. MK. 1 (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 137	TELESCOPIC SPAN RELIEF WEDGE USED WHEN CHANGING OR GREASING BEARINES № 2. RQD. PER BEARING BLOCK.	57	
W 138	ROCK INSERTION (STEEL FLOAT) DRIFT PIN. USED TO ATTACH W133 TO V-COLUMN. № 120. RQD. PER ROCK INSERTION SET.		
W 139	20 RUNG LADDER. FOR SCALING SEA WALL № 1. RQD. PER BRIDGE LENGTH.		
W 140	BAILEY BRIDGE RAMP. TIMBER CHOCK. USED ON TOP OF SEA. WALL TO CARRY 20 TON. BLOCKS. № 2. RQD. PER BRIDGE LENGTH.		
W 141	BAILEY BRIDGE RAMP. TIMBER CHOCK. USED UNDER LIFTING TRANSOM FOR BAILEY BRIDGE. № 2. RQD. PER BRIDGE LENGTH.		
W 142	ERECTION S.W.R. STROP USED FOR ATTACHMENT OF SNATCH BLOCKS TO GIRDER MEMBERS. № 3 RQD. PER TOWING TRAIN.		

SKETCH. 81.

FLOATING BRIDGE MK. I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION & USE.	UNIT WT. (LBS)	DIAGRAM OF UNIT.
W143	ERECTION INLET COVER. FOR ERECTION TANK W.92. No. 2 REQD. PER ERECTION TANK FOR MUDDY GROUND TO PROTECT STRAINER BOX.	40	
W144	ERECTION. TIMBER PACK. No. 2 REQD PER ERECTION TANK		 USED UNDER MANILLA LASHINGS FOR SADDLES
W145	ERECTION SOFT WOOD PACK. No. 2 REQD PER TOWING TRAIN D. No. 4 REQD PER TELESCOPIC END SPAN.		 USED BETWEEN SADDLES AND SPAN WHEN CONNECTING TO PIER-HEAD.
W146	ERECTION STIRRUP EXTENSION No. 8 REQD PER TOWING TRAIN D No. 24 REQD PER TELESCOPIC END SPAN. (TOWING TRAIN L)		

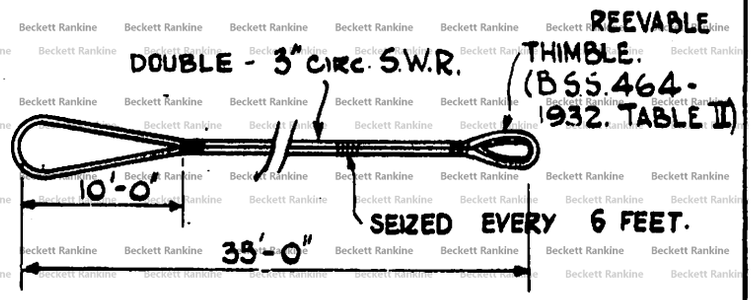
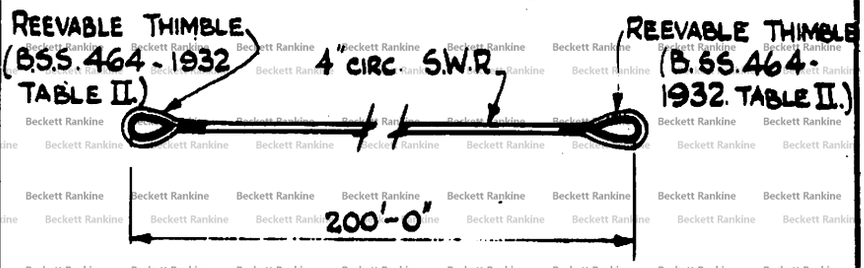
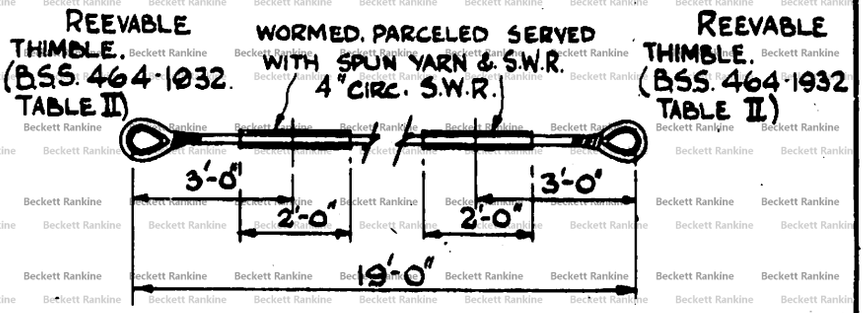
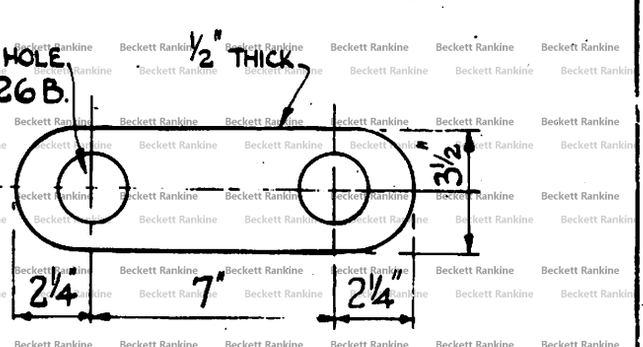
SKETCH 82

FLOATING BRIDGE MK I (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W 147	ERECTION PIN LEVER. No.2 REQD. PER TOWING TRAIN.		2" THICK; 2¼" RAD.; 2" DIA.; 10"; 7½"; USED FOR INSERTING PIN W38 FOR CABLE SPRINGS.
W 148	MOORING SHUTTLE SKID (TIMBER) No.1 REQD. PER TOWING TRAIN.		ROD STOP; HINGED HOOK; SECTION A-A.; 6" 3'-1½" 6"; TRANSOM OF STEEL FLOAT; 13'-0" APPROX.
W 149	ERECTION. TOOL BOX No.1 REQD. PER TOWING TRAIN.		HINGED LID.; BOLT TO WEB MEMBERS OF SPAN.; 1'-6"; FIXED TO OUTSIDE OF MAIN GIRDER.; 6'-0"; 2'-0"; CONNECTION TO OUTSIDE OF MAIN GIRDER.
W 150	TOWING QUICK RELEASE ATTACHMENT No2 REQD. PER TOWING TRAINS. A,B,C,E,F,G & J.		17/32 DIA. HOLE FOR COPPER RIVETS; 10½"; 10½"; TRANSOMS; HINGED KEEPER; 3'-0"
W 151	TOWING TOW ROPE No2. REQD. PER TOWING TRAINS A,B, C,E,F,G,H,J & K.		REEVABLE THIMBLE TO B.S.S. 464/1932 TABLE I; 4" CIRC. S.W.R.; 20'-0"; REEVABLE THIMBLE TO B.S.S 464/1932 TABLE I
W 152	TOWING TOW ROPE No1. REQD. PER TOWING TRAIN		REEVABLE THIMBLE TO B.S.S 464/1932 TABLE I; 4" CIRC. S.W.R; 400'-0"; NON-REEVABLE THIMBLE TO B.S.S. 464/1932 TABLE II
W 153	ERECTION GUY FOR TRUMPET COLUMN NO.1 REQD. PER TRUMPET		END SEIZED; 1'-7¾" TO 2'-6⅜"; 2½" CIRC. S.W.R. 16-0 LONG; TO B.S.S 464/1932 TABLE I.; TO B.S.S 716A/1936 TABLE I.; 4 BULLDOG CLIPS FOR ATTACHING TO V COLUMN

SKETCH. 83

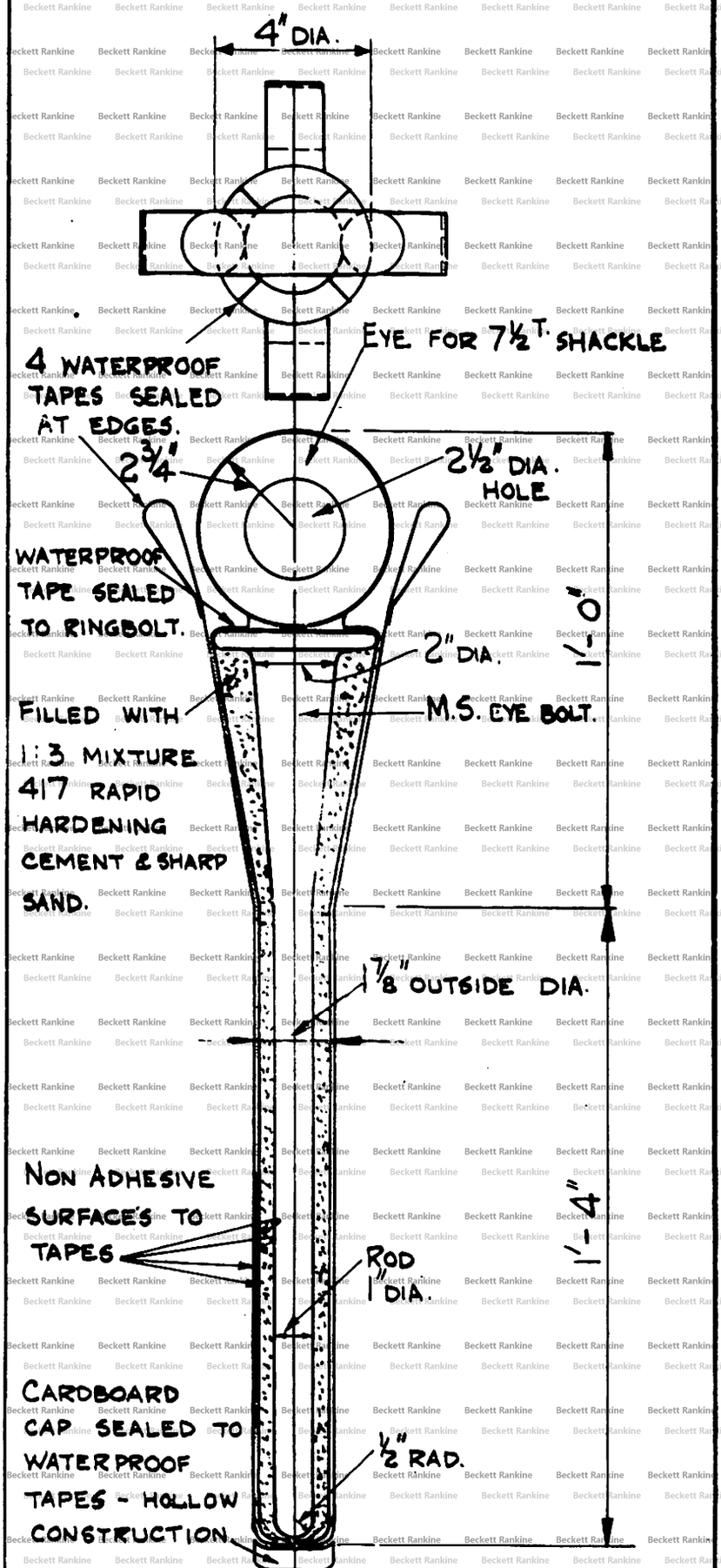
FLOATING BRIDGE MARK I. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 154	TOWING TOW-ROPE WITH LOOP. No. 6 REQD. PER TOWING TRAIN M. No. 2 REQD. PER TOWING TRAIN H & K.		
W 155	TOWING TOW ROPE (200 FT.) No. 1 REQD. PER TOWING TRAIN M.		
W 156	TOWING TOW ROPE (PARCELED.) No. 2 REQD. PER TOWING TRAIN D.		
W 157.	MOORING MOORING LINK TO COUPLE MOORINGS No. 2 REQD. PER CONNECTION		

SKETCH 84

FLOATING BRIDGE MARK 1. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 158	MOORINGS. SELF-GROUTING ROCK ANCHOR.		

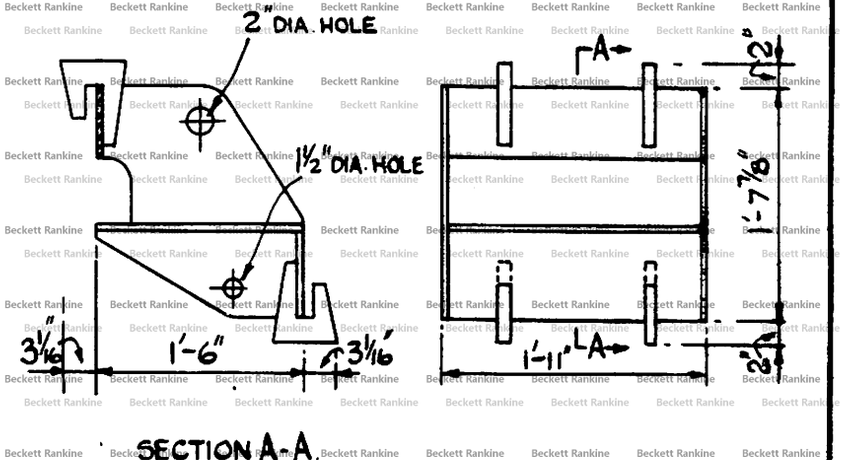
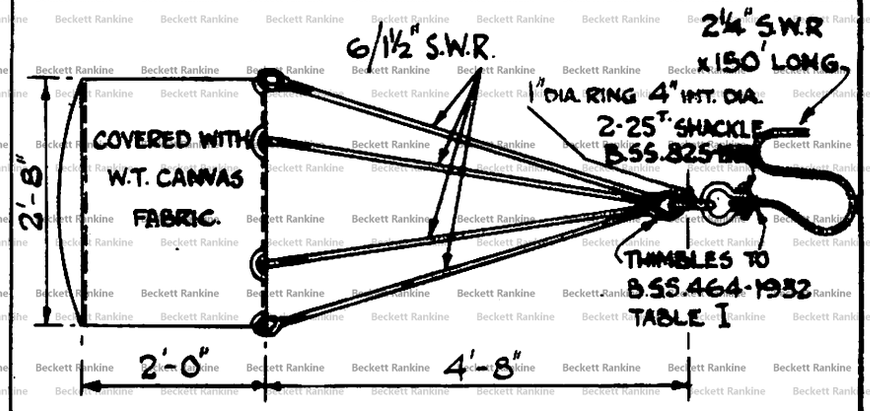
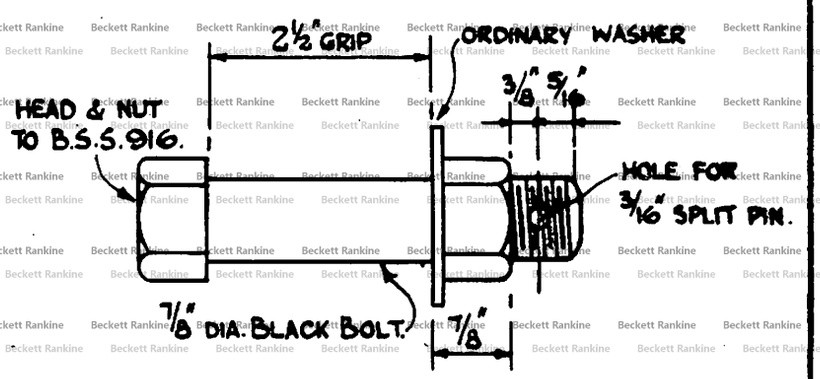
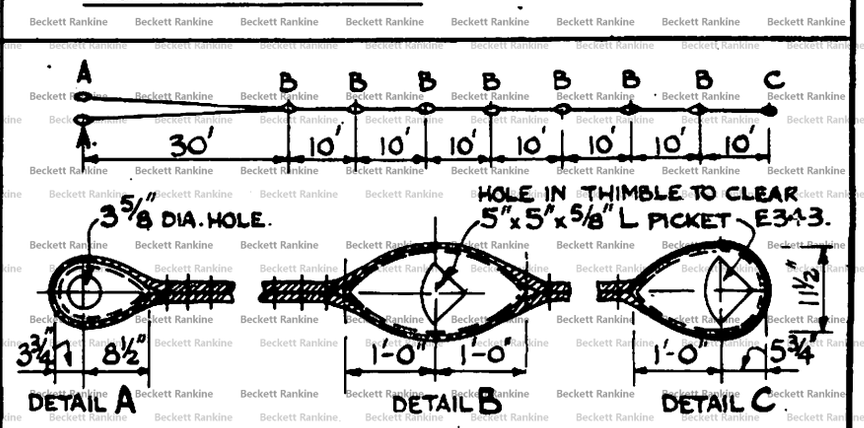


NOTE: TAPES LAID ON DOUBLE & TO BE THICKNESS OF TRACING LINEN. ALL OVER SEALING WITH PARAFFIN WAX. TO BE DESPATCHED IN LIGHT WOODEN BOX.

W159 IS AN OBSOLETE UNIT

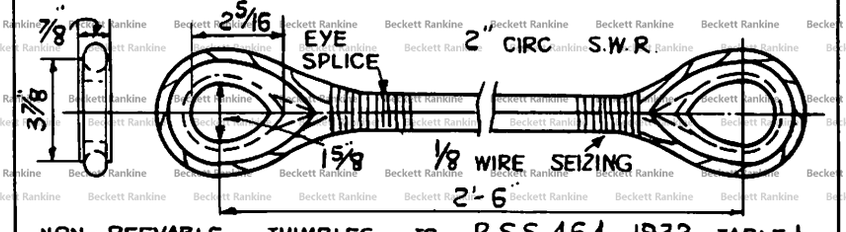
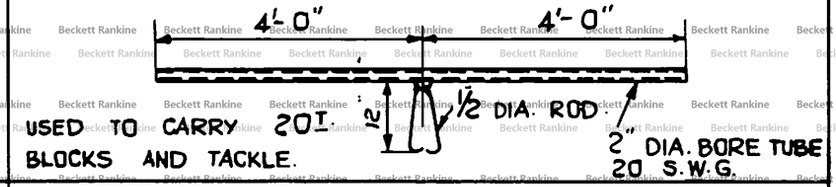
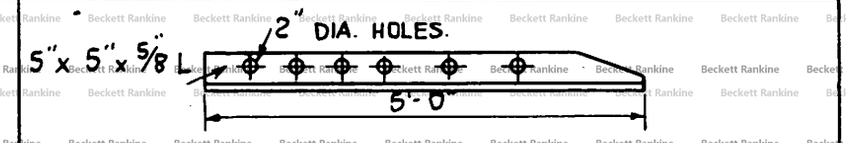
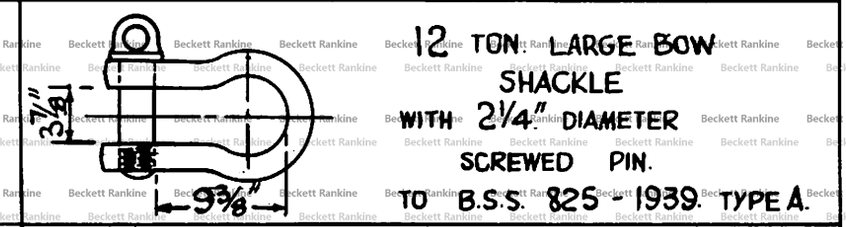
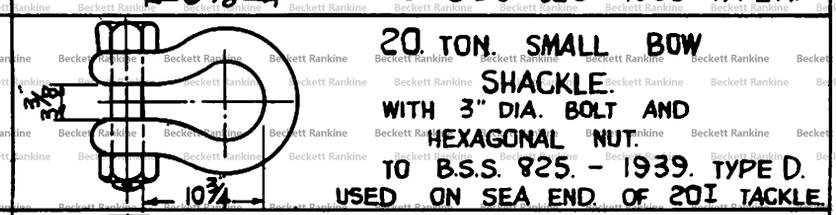
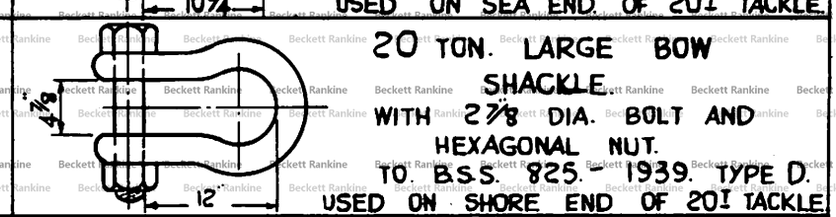
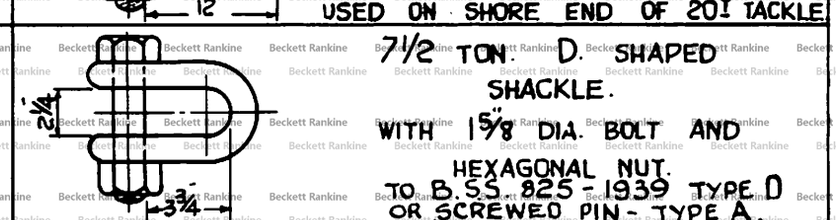
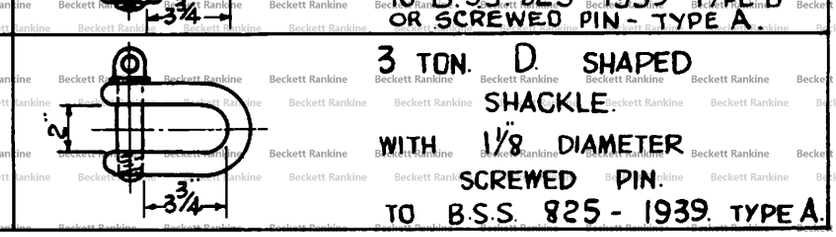
SKETCH. 85.

FLOATING BRIDGE MARK I. (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS	DIAGRAM OF UNIT.
W 160	TELESCOPIC SPAN. **CRADLE.** FOR CHANGING OR GREASING METAL BEARING BLOCKS W.H. 136 A & B.		
W 161	TOWING **TOWING DROGUE** No 2 REQD. ON END OF TOWING TRAIN WHEREVER DEPTH OF WATER MAKES IT NECESSARY.		
W 162	SHORE RAMP FLOAT. **CONNECTING BOLT** No. 132 REQD. PER FLOAT COMPLETE.		
W 163	MOORING **SHORE ANCHORAGE** No 8 ANGLE PICKETS E343 REQD. PER ANCHORAGE. No 2 REQD. ON GOOD GROUND — No 6 REQD. ON POOR GROUND — PER SHORE RAMP FLOAT.		

SKETCH 86.

FLOATING BRIDGE MK. I (PAINTED GREY UNLESS NOTED)

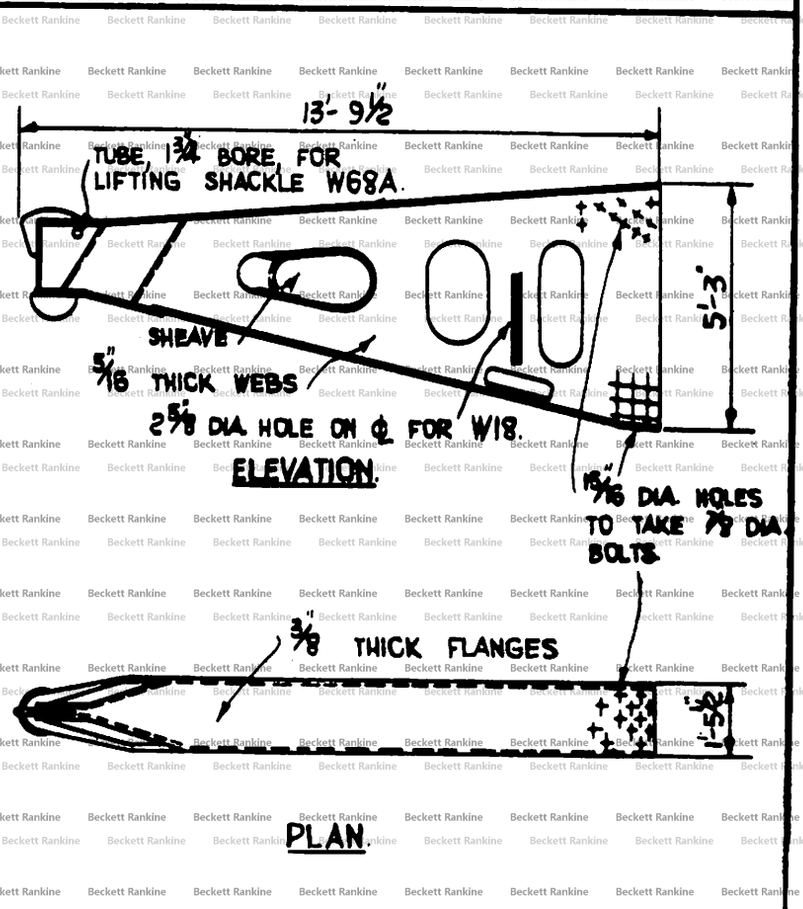
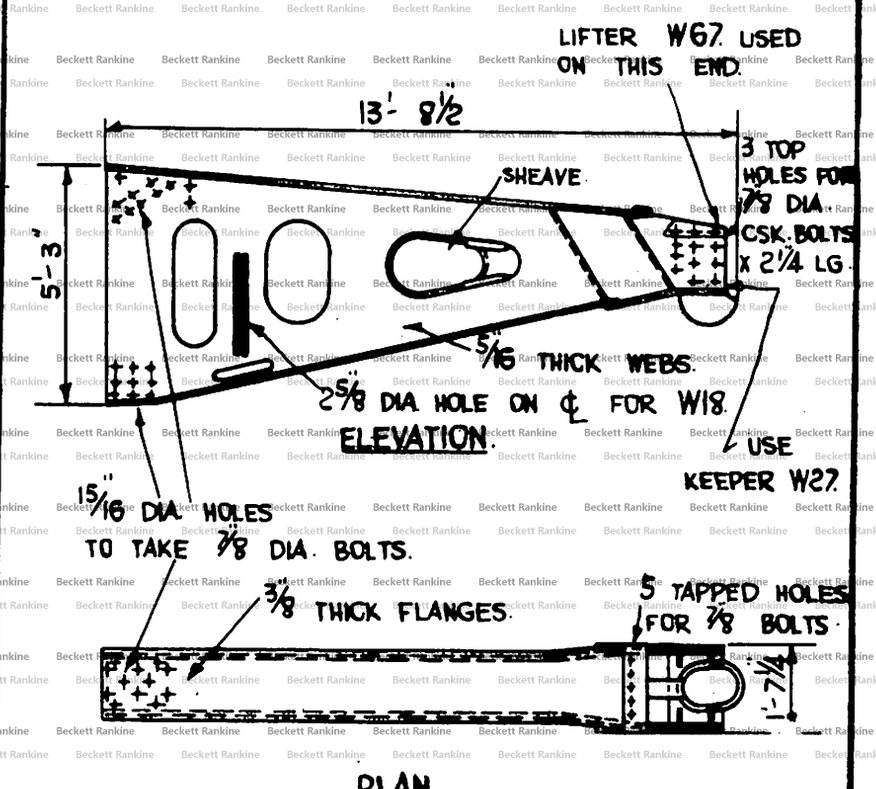
UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS	DIAGRAM OF UNIT.
W 164	ERECTION. STROP FOR TRUMPET. No 2. REQUIRED PER. TRUMPET.		 NON-REEVABLE THIMBLES TO B.S.S. 464-1932. TABLE 1.
W 165	MOORINGS. SLUG BOAT. No 4. REQUIRED. PER. SHORE RAMP FLOAT.		SEE SKETCH No. 21.
W 166.	MOORINGS SHUTTLE. No 1 REQD. PER. FLOAT.		SEE SKETCH No 22.
W 167.	ERECTION. LIFTING BAR. No 4. REQD. PER. SHORE RAMP FLOAT.		 USED TO CARRY 20I BLOCKS AND TACKLE.
E 343	SHORE ANCHORAGE ANGLE PICKET. No 8. REQD PER. SHORE ANCHORAGE		
B.S. STANDARD SHACKLES.	TOWING 12 TON. SHACKLE. No 2. REQD. PER. TOW ROPE T.B & T.C. No 4. REQD. PER. TOW ROPE T.A. & T.D. No 3. REQD. PER. TOW ROPE. T.E		 12 TON. LARGE BOW SHACKLE WITH 2 1/4" DIAMETER SCREWED PIN. TO B.S.S. 825-1939. TYPE A.
	SHORE ANCHORAGE 20 TON. SHACKLE. No 2. REQD. PER. SHORE RAMP FLOAT.		 20 TON. SMALL BOW SHACKLE. WITH 3" DIA. BOLT AND HEXAGONAL NUT. TO B.S.S. 825. - 1939. TYPE D. USED ON SEA END OF 20I TACKLE.
	SHORE ANCHORAGE 20 TON. SHACKLE. No 2. REQD. PER. SHORE RAMP FLOAT.		 20 TON. LARGE BOW SHACKLE. WITH 2 7/8 DIA. BOLT AND HEXAGONAL NUT. TO B.S.S. 825. - 1939. TYPE D. USED ON SHORE END OF 20I TACKLE.
	TOWING & MOORING. 7 1/2 TON. SHACKLE. No 1 REQD. PER RACKING SPRING. No. 2 REQD PER ROCK ANCHOR BOLT & TOW ROPE T.E.		 7 1/2 TON D. SHAPED SHACKLE. WITH 1 5/8" DIA. BOLT AND HEXAGONAL NUT. TO B.S.S 825-1939 TYPE D OR SCREWED PIN - TYPE A.
	ERECTION. 3 TON. SHACKLE. No. 5: REQD. PER TRUMPET.		 3 TON. D. SHAPED SHACKLE. WITH 1 1/8" DIAMETER SCREWED PIN. TO B.S.S. 825-1939. TYPE A.

SKETCH 87.

UNITS PREFIXED "W" ARE IDENTICAL WITH MARK I EQUIPMENT.

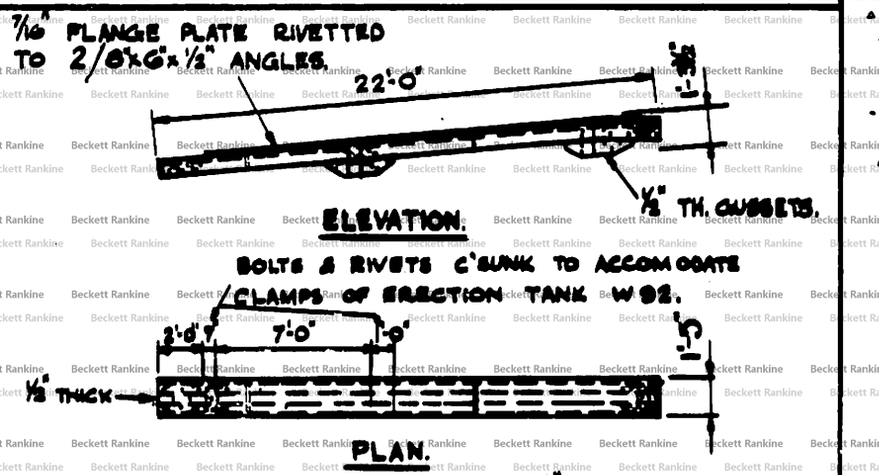
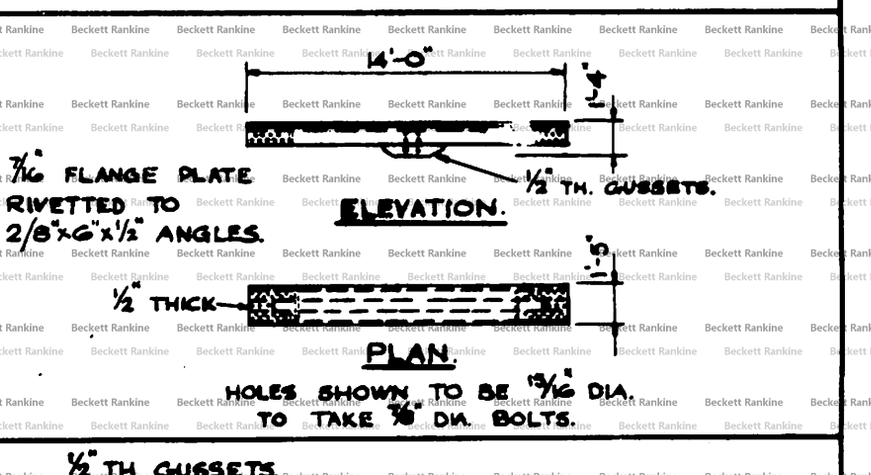
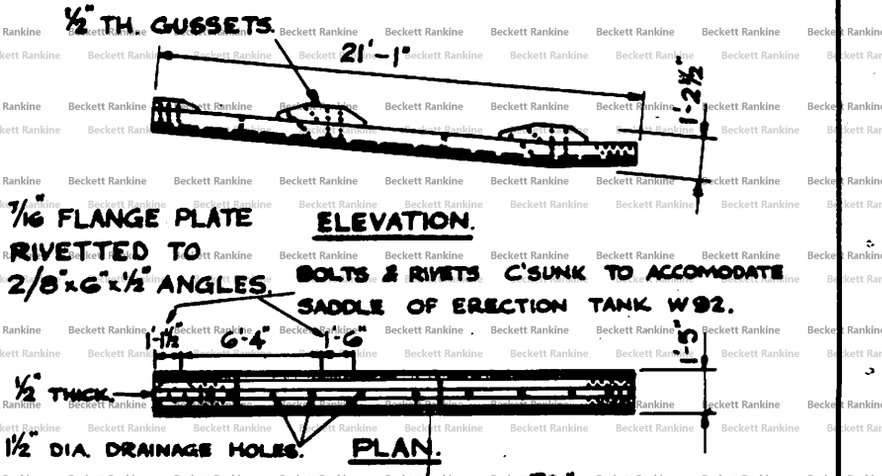
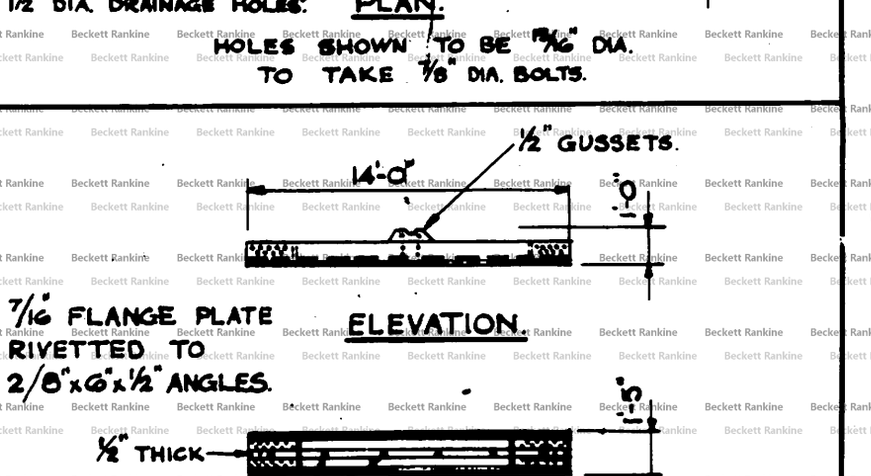
FLOATING BRIDGE MK. II

(PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W1.	MAIN GIRDER. GIRDER END WITH INNER BEARING. Nº 2. REQD. PER STANDARD SPAN. Nº 2 REQD. PER TELESCOPIC SPAN.	2107.	
W2	MAIN GIRDER. GIRDER END WITH OUTER BEARING. Nº 2. REQD PER STANDARD SPAN. Nº 2. REQD. PER TELESCOPIC SPAN Nº 4. REQD. PER TELESCOPIC END SPAN.	2225.	

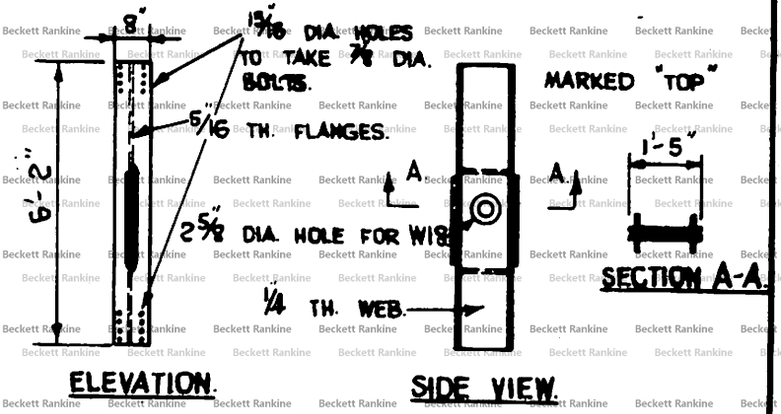
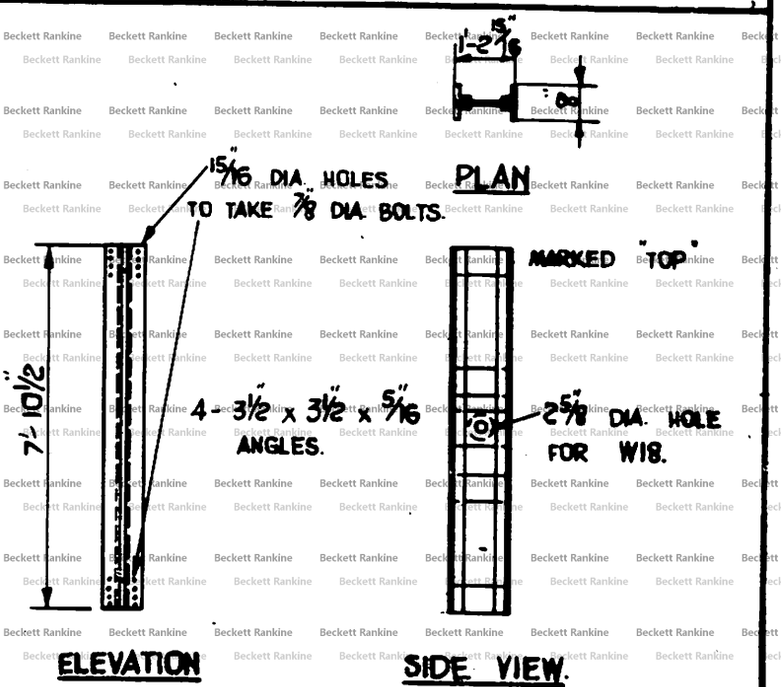
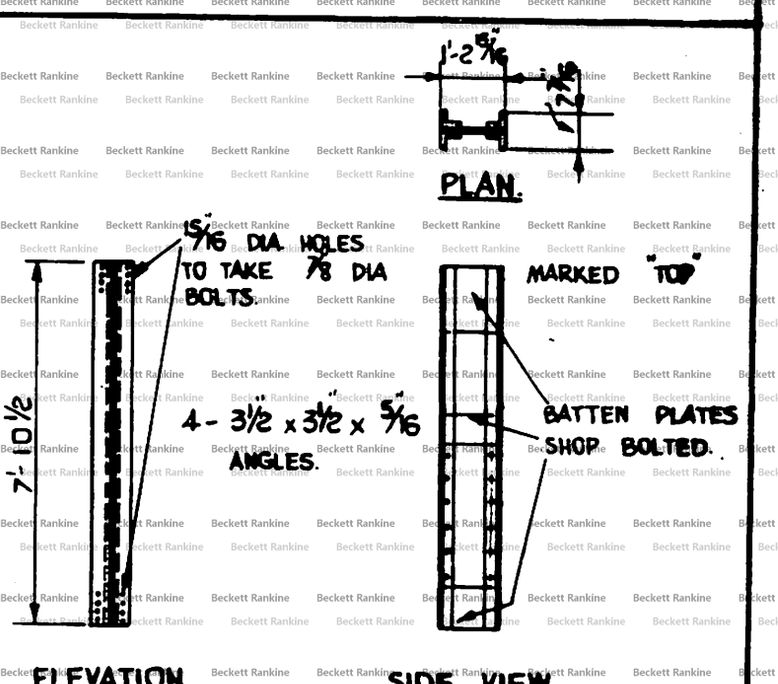
SKETCH 88

FLOATING BRIDGE MARK II. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
WH 3	MAIN GIRDER. TOP CHORD. No. 4 REQD. PER STANDARD SPAN.	1681	
WH 4.	MAIN GIRDER. TOP CENTRE CHORD. No. 2 REQD. PER STANDARD SPAN.	1054	
WH 5	MAIN GIRDER. BOTTOM CHORD. No. 4 REQD. PER STANDARD SPAN.	1571	
WH 6.	MAIN GIRDER. BOTTOM CENTRE CHORD. No. 2 REQD. PER STANDARD SPAN.	1017.	

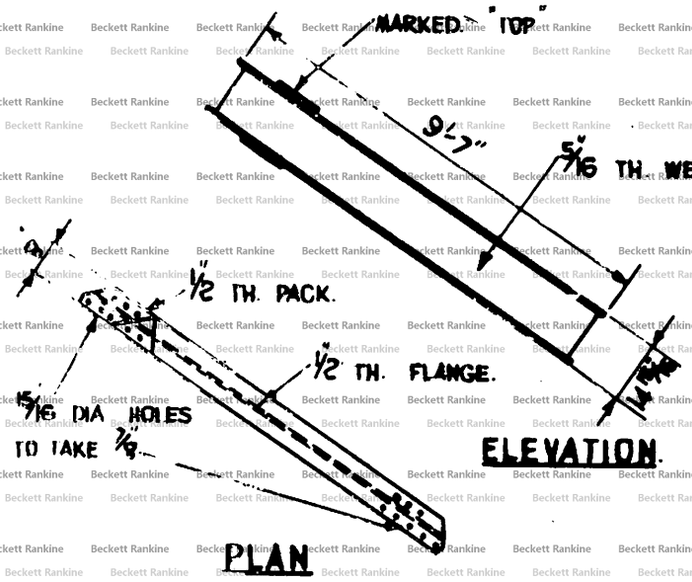
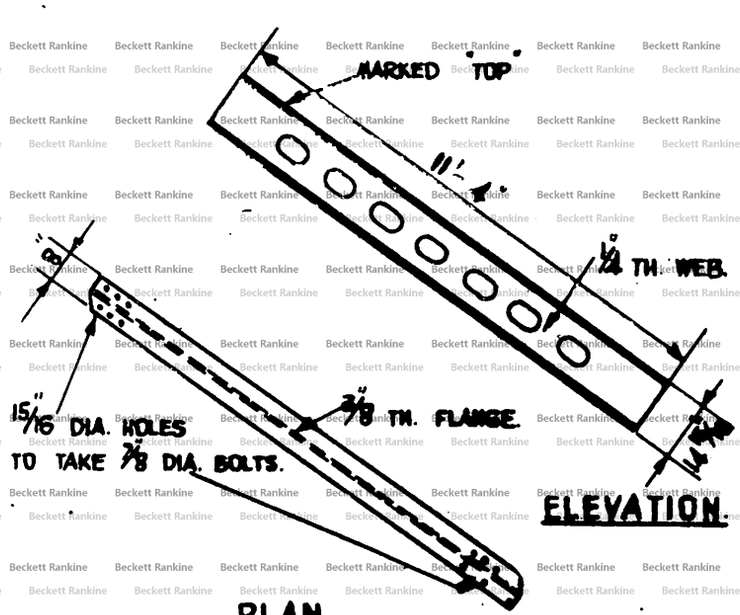
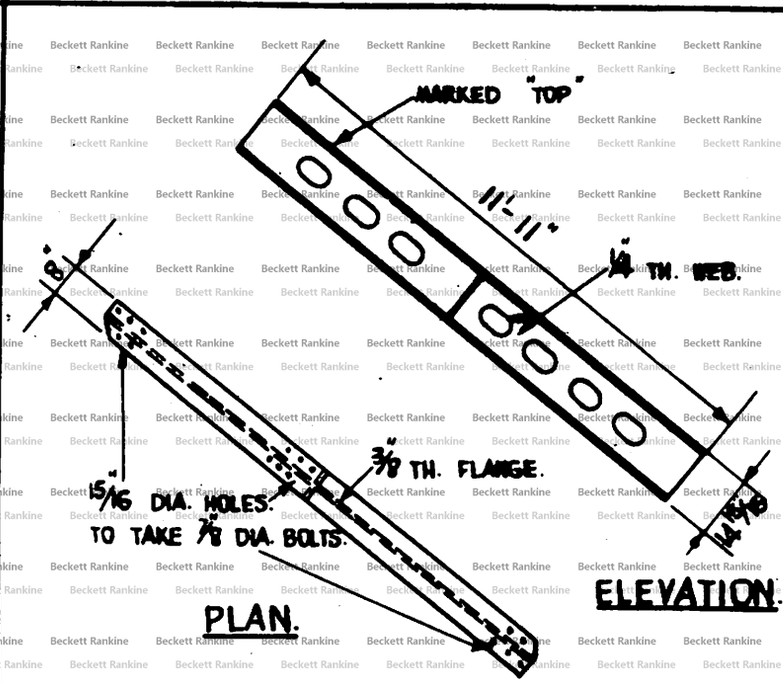
SKETCH 89

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W7	MAIN GIRDER. END VERTICAL. Nº 4. REQD. PER STANDARD SPAN Nº 2. REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	214.	
W8	MAIN GIRDER. VERTICAL. Nº 4. REQD. PER STANDARD SPAN.	357.	
W9	MAIN GIRDER. CENTRE VERTICAL. Nº 2. REQD. PER STANDARD SPAN	346.	

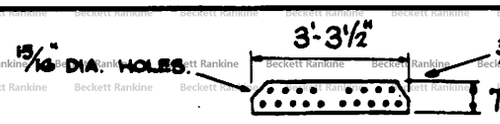
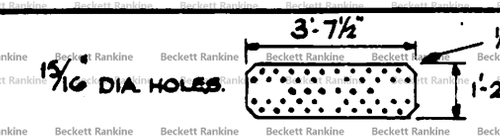
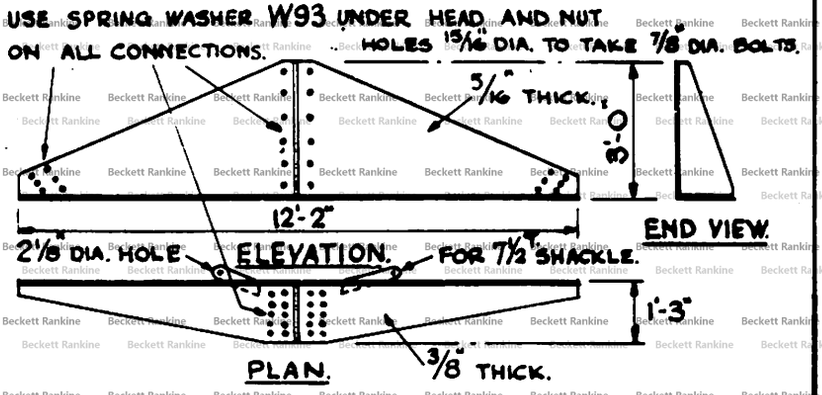
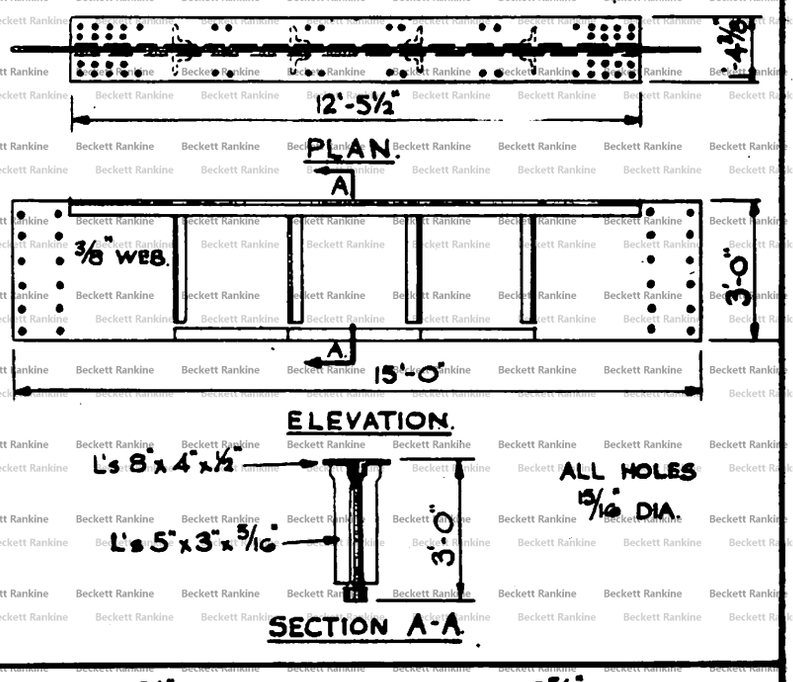
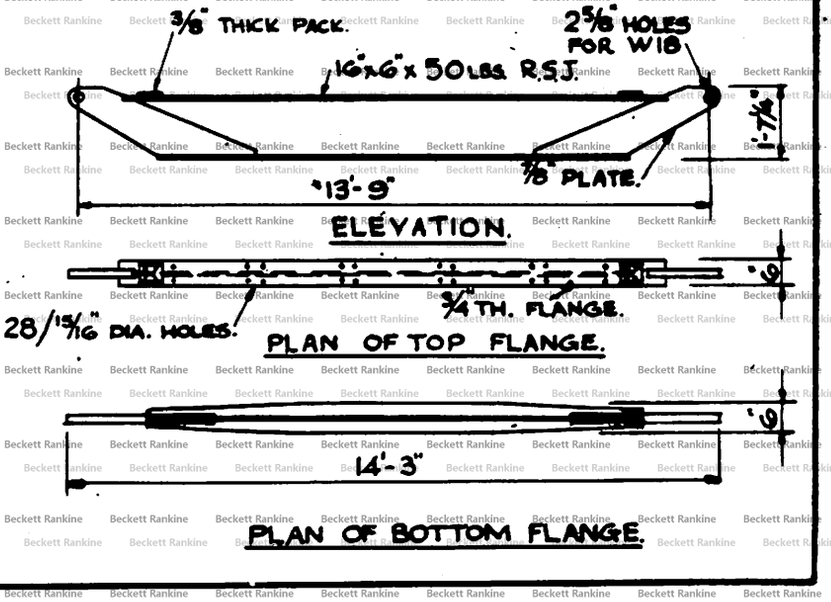
SKETCH 90

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT IN LBS	DIAGRAM OF UNIT
W10	MAIN GIRDER END DIAGONAL No 4 REQD. PER STANDARD SPAN No 2 REQD PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	398	
W11	MAIN GIRDER DIAGONAL. No 4. REQD PER STANDARD SPAN.	341	
W12	MAIN GIRDER CENTRE DIAGONAL. No 4. REQD PER STANDARD SPAN.	369.	

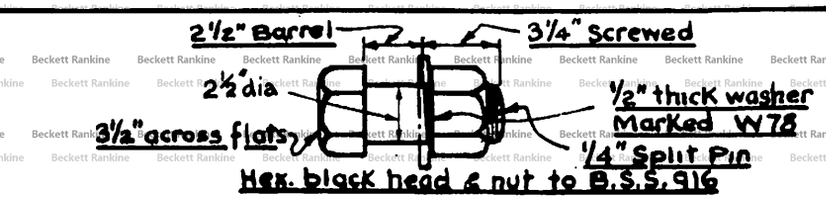
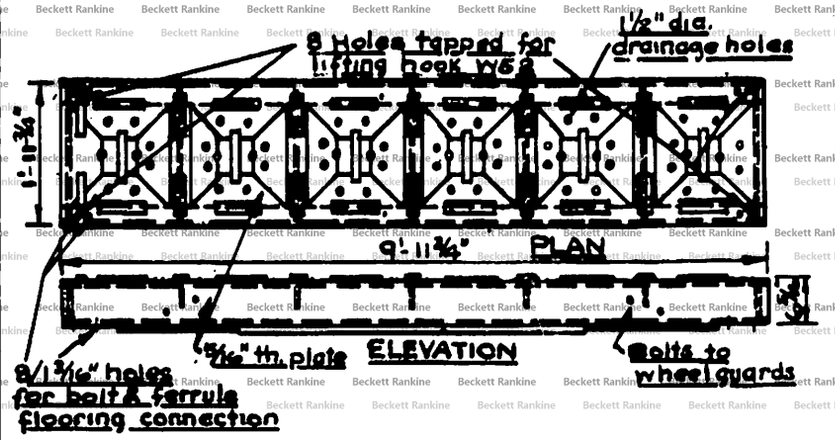
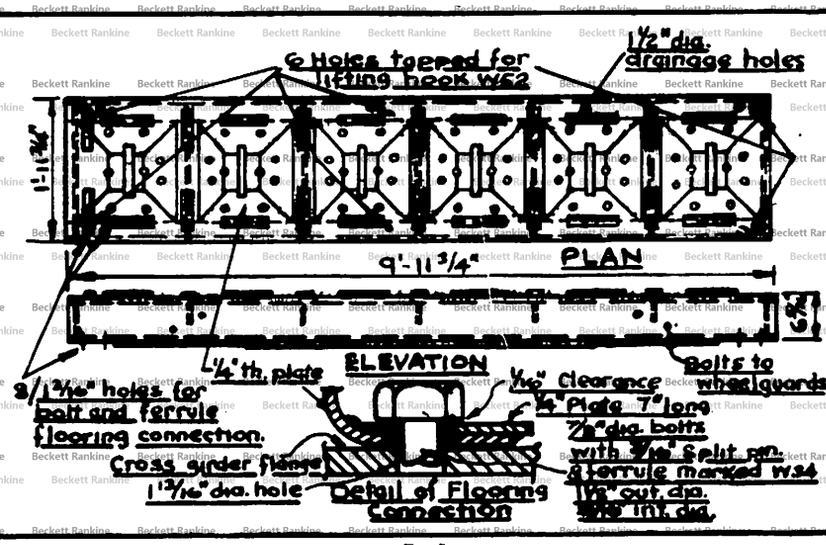
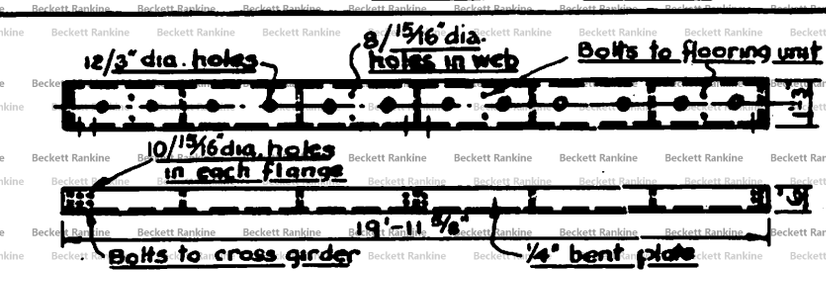
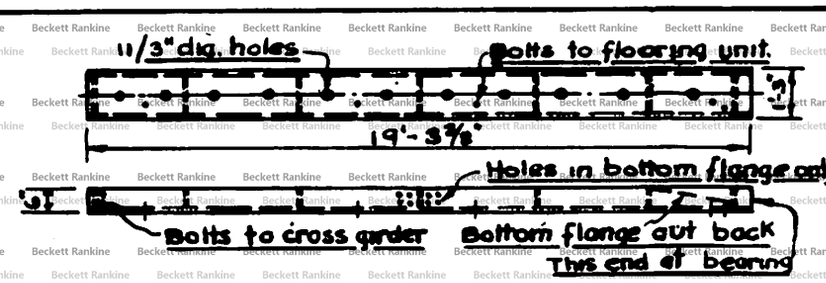
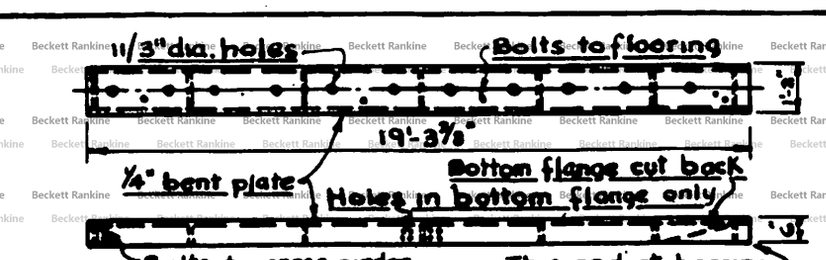
SKETCH 91.

FLOATING BRIDGE MARK II (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 13.	MAIN GIRDER. WEB COVER. No. 32 REQD. PER STANDARD SPAN.	27.	
WH 14.	MAIN GIRDER FLANGE COVER. NO 16 REQD. PER STANDARD SPAN.	82	
W 15.	FLOORING CENTRE BRACKET No. 2 REQD. PER STANDARD SPAN.	468.	
W 16.	FLOORING. CENTRE CROSS GIRDER. No. 1 REQD. PER STANDARD SPAN.	1430.	
WH 17	FLOORING CROSS GIRDER. No. 5 REQD. PER STANDARD SPAN. No. 4 REQD. PER TELESCOPIC SPAN. No. 5 REQD. PER TELESCOPIC END SPAN.	635.	

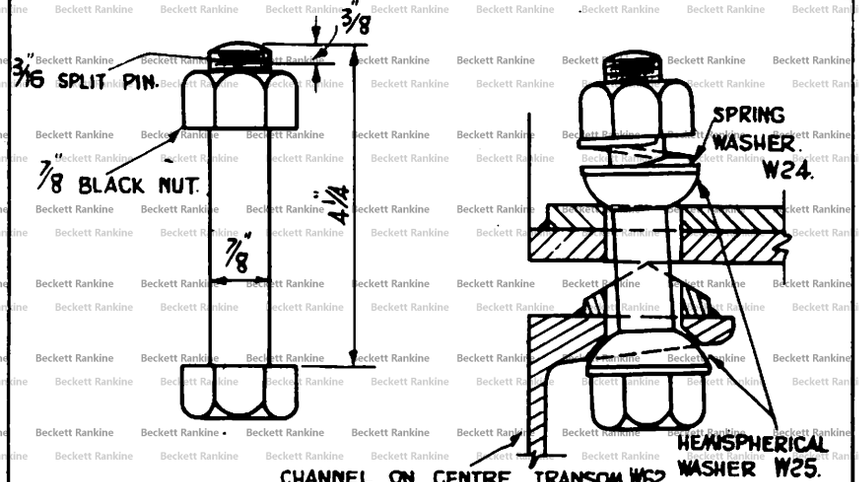
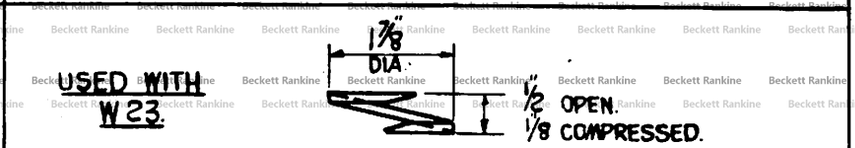
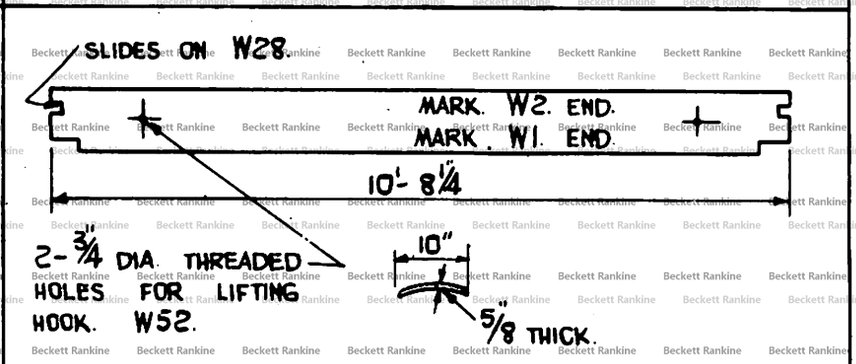
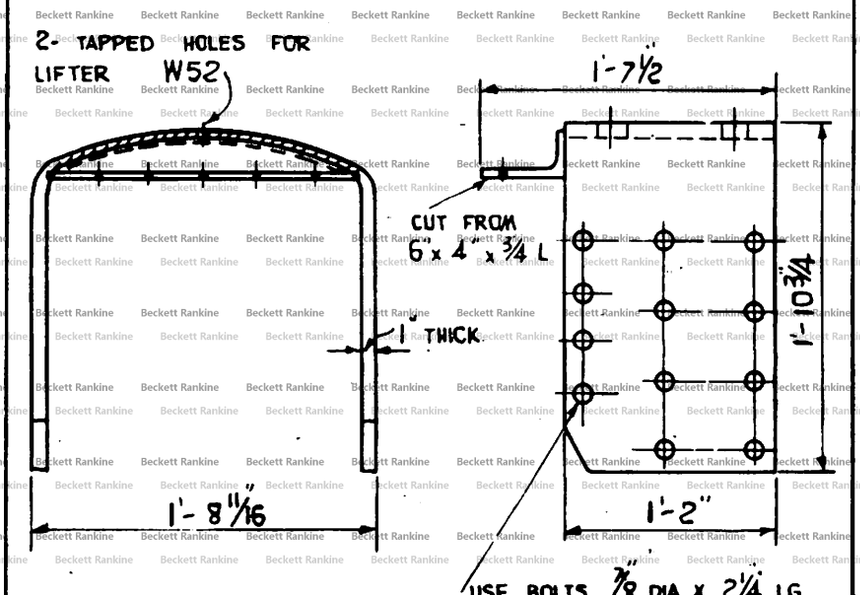
SKETCH 92

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W18	FLOORING MACHINED PIN FOR CROSS GIRDER CONNECTIONS NO. 12 REQD. PER SPAN	10	
WH 19	FLOORING FLOORING UNIT NO. 16 REQD. PER STANDARD SPAN. NO. 12 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN		
W19	FLOORING FLOORING UNIT NO. 16 REQD. PER STANDARD SPAN. NO. 12 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN	484	
W20	FLOORING WHEEL GUARDS NO. 4 REQD. PER STANDARD SPAN NO. 2 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN	493	
W21	FLOORING WHEEL GUARDS AT ENDS NO. 2 REQD. PER SPAN	471	
W22	FLOORING WHEEL GUARDS AT ENDS OPP. W21 NO. 2 REQD. PER SPAN	471	

SKETCH 93.

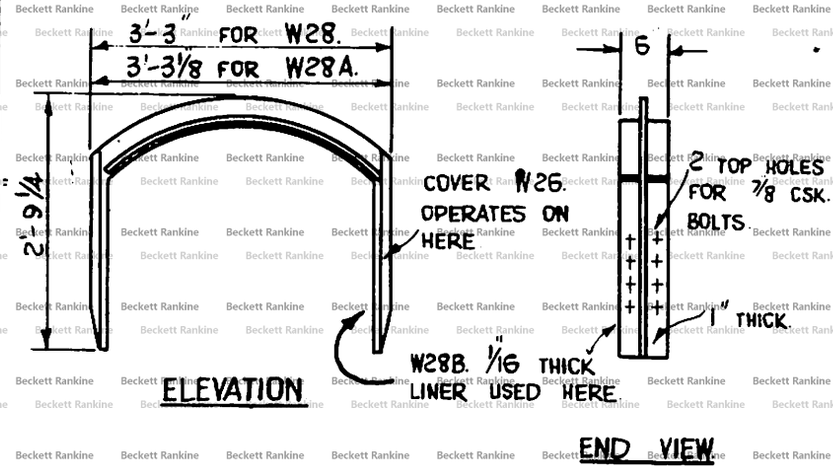
FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

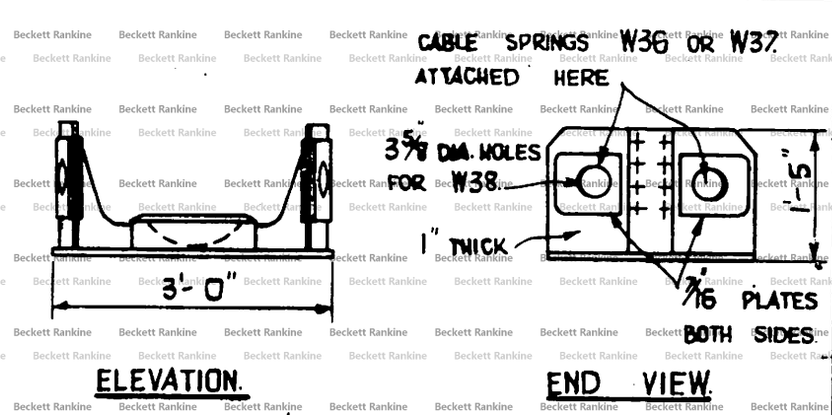
UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W23.	FLOORING. BOLT WITH 3/16 SPLIT PIN. Nº 20. REQD. PER SPAN. CONNECTION END FLOORING TO TRANSOM.	1·5	
W24	FLOORING. SPRING WASHER. Nº 20. REQD. PER. SPAN.		
W25	FLOORING. HEMISPHERICAL WASHER. Nº 40. REQD. PER. SPAN.		
W26	FLOORING. DISHED COVER. Nº 1. PER. FLOAT.	231.	
W27	MAIN GIRDER. KEEPER. FOR OUTER BEARING. Nº 2. REQD. PER. STANDARD SPAN & TELESCOPIC SPAN. Nº 4. REQD. PER. TELESCOPIC END SPAN. USED ON W2. BOX ENDS.	278	

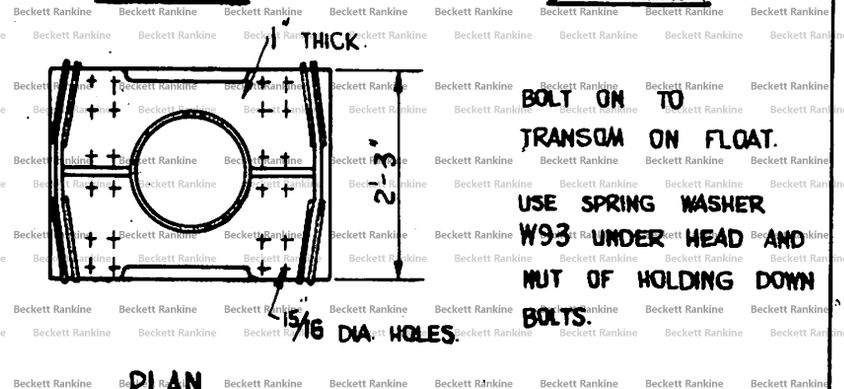
SKETCH 94.

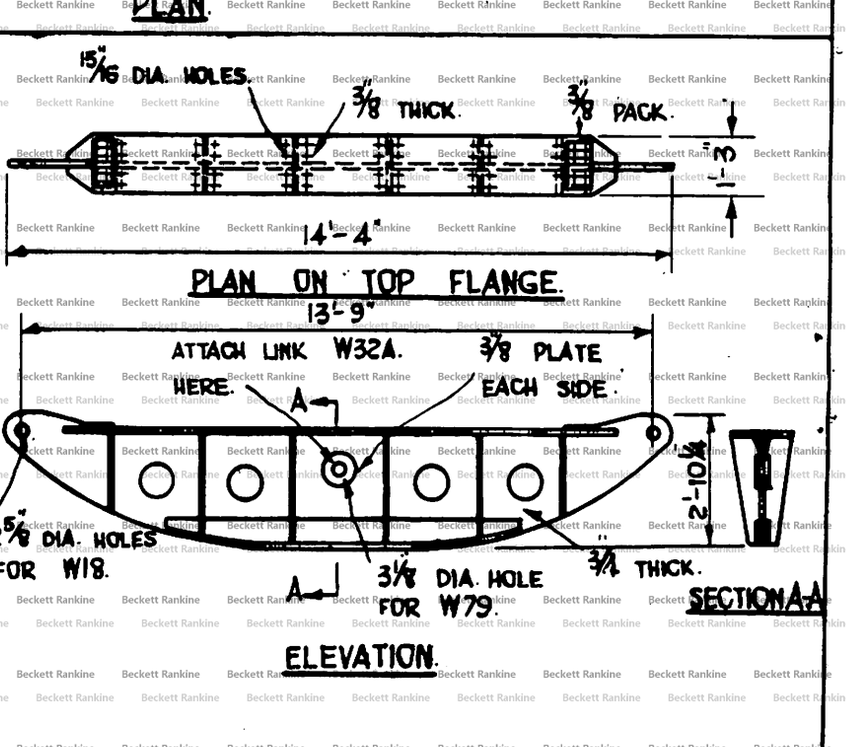
FLOATING BRIDGE MK II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W28	MAIN GIRDER	189	
	MAIN KEEPER.		
W28A	NO 2 REQD.		
	PER FLOAT.		
W28B	USED ON W29.		
	No 2 REQD. OF W28A & No 4 REQD. OF W28B. PER SHORE RAMP FLOAT.		
W29	MAIN GIRDER.	693	
	BEARING SEATING.		
	No 2. REQD.		
	PER FLOAT.		
W30A	FLOORING.	1284.	
	END CROSS GIRDER.		
	No 1. REQD.		
	PER STD. SPAN & TELESCOPIC SPAN		
	ON W2. END.		



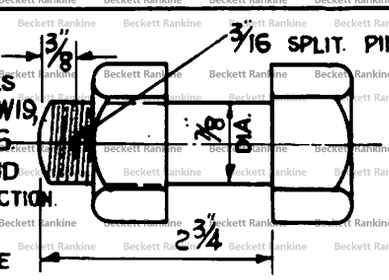
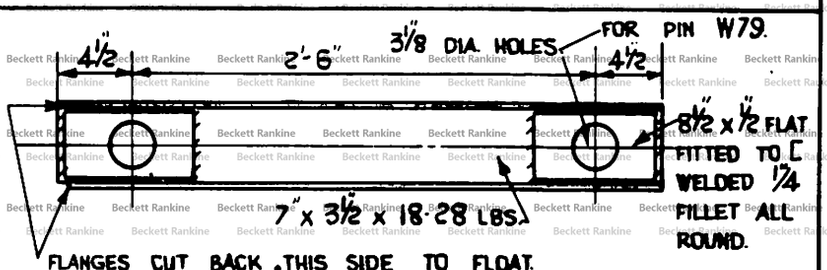
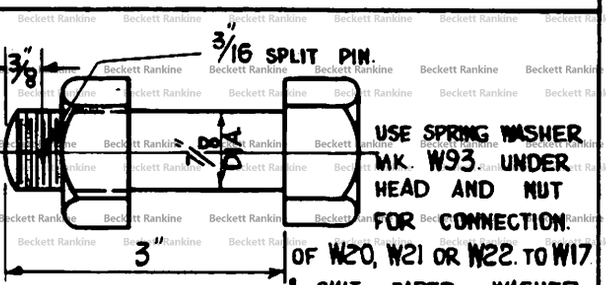
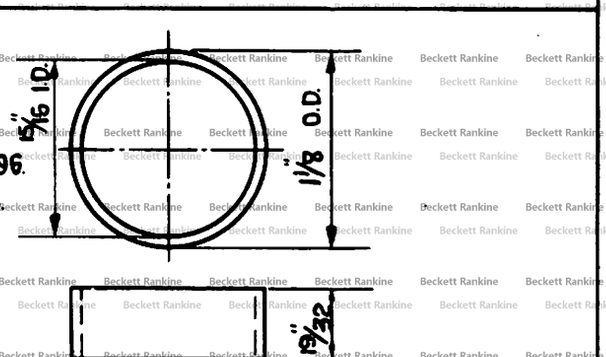
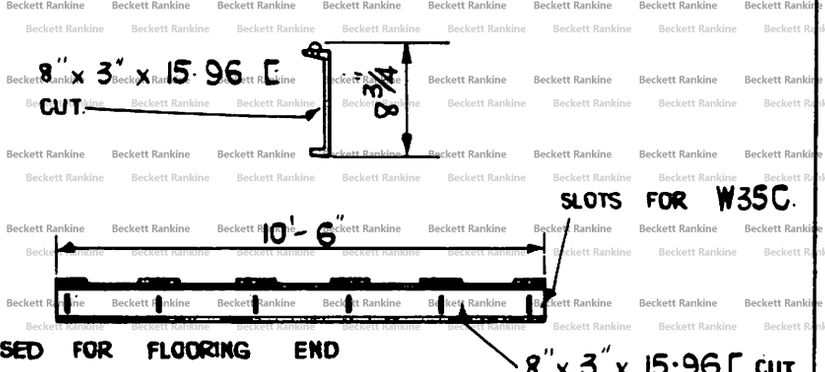
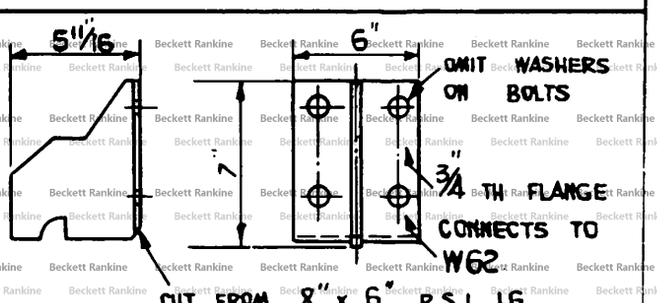






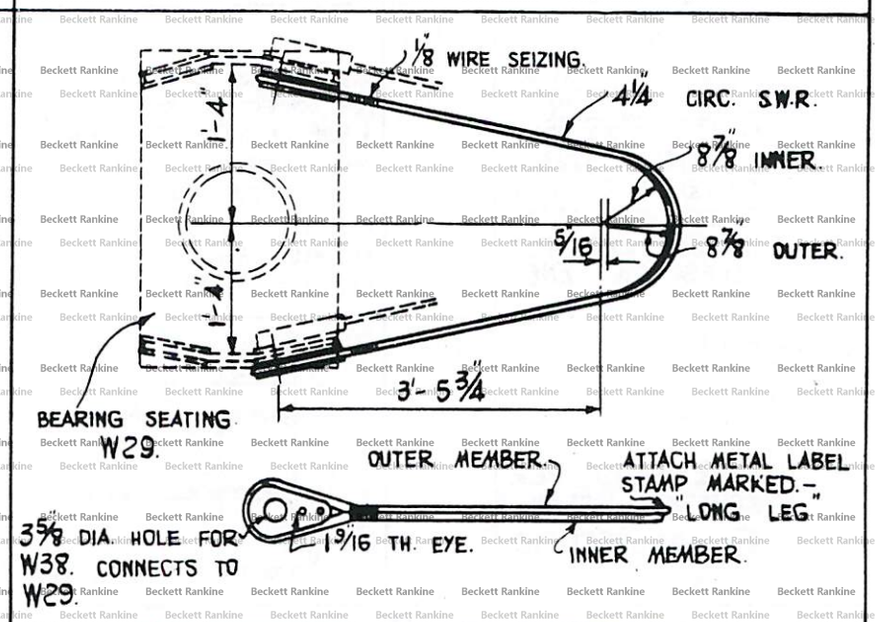
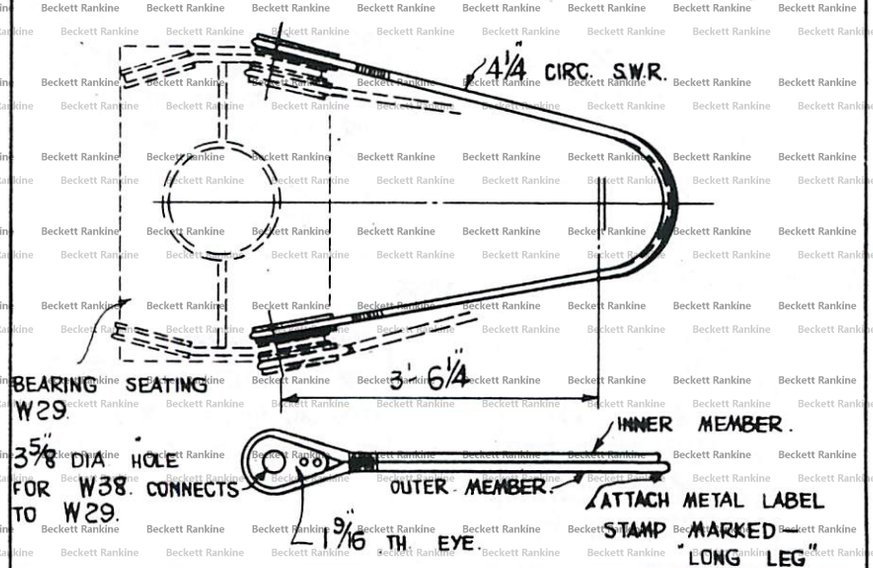
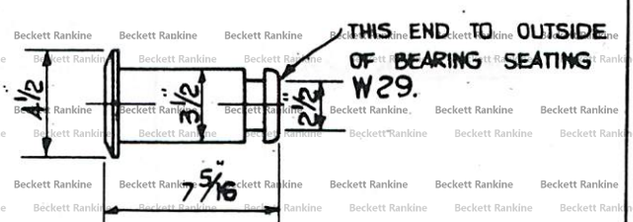
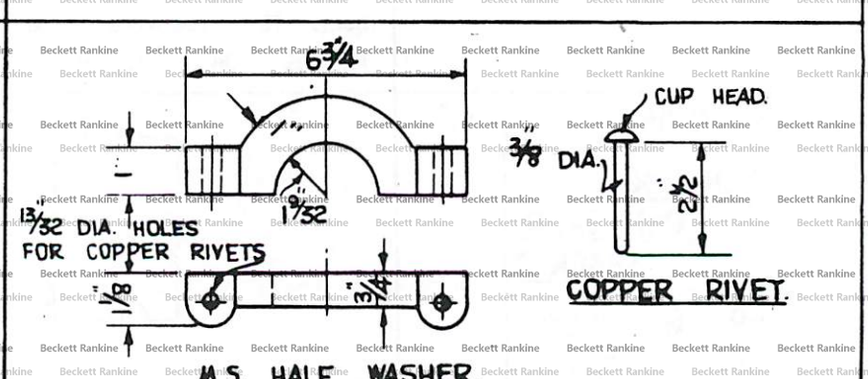
SKETCH 95.

FLOATING BRIDGE MK.II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS	DIAGRAM OF UNIT.
W31.	FLOORING. 7/8 DIA. BOLT WITH 3/16 SPLIT PIN. Nº 160. REQD. PER. STANDARD SPAN. Nº 180. REQD. PER. TELESCOPIC SPAN. Nº 200. REQD. PER. TELESCOPIC END SPAN.	1·157	 USE 2 ROUND WASHERS FOR CONNECTIONS OF W19 & W96 TO W30A & W16. OMIT TAPER & ROUND WASHERS FOR CONNECTION OF W19 TO W17. IN ALL CASES USE FERRULE W34.
W32A.	FLOATS. LINK. Nº 2. REQD. PER. STANDARD SPAN. & TELESCOPIC SPAN.	62	
W33.	FLOORING. 7/8" DIA. BOLTS. WITH 3/16 SPLIT PIN. Nº 80. REQD. PER. SPAN.	1·242	 USE SPRING WASHERS MK. W93. UNDER HEAD & NUT & TWO ROUND FOR CONNECTION OF W20 TO W16 AND W21 OR W22 TO W30A. USE SPRING WASHER MK. W93. UNDER HEAD AND NUT FOR CONNECTION OF W20, W21 OR W22 TO W17 & OMIT TAPER WASHER
W34.	FLOORING. FERRULE. Nº 160. REQD. PER. STANDARD SPAN. Nº 180. REQD. PER. TELESCOPIC SPAN. Nº 200. REQD. PER. TELESCOPIC END SPAN.	·053	 USED WITH W31 FOR CONNECTING FLOORING UNIT W19, W96 TO CROSS GIRDERS.
W35B.	FLOORING. CONNECTOR LEAF. Nº 1. REQD. PER. FLOAT.	150	 USED FOR FLOORING END PANELS ON TRANSOM.
W35C.	FLOORING. FLOORING CONNECTOR BRACKET. Nº 6. REQD. PER. FLOAT.	10	

SKETCH 96.

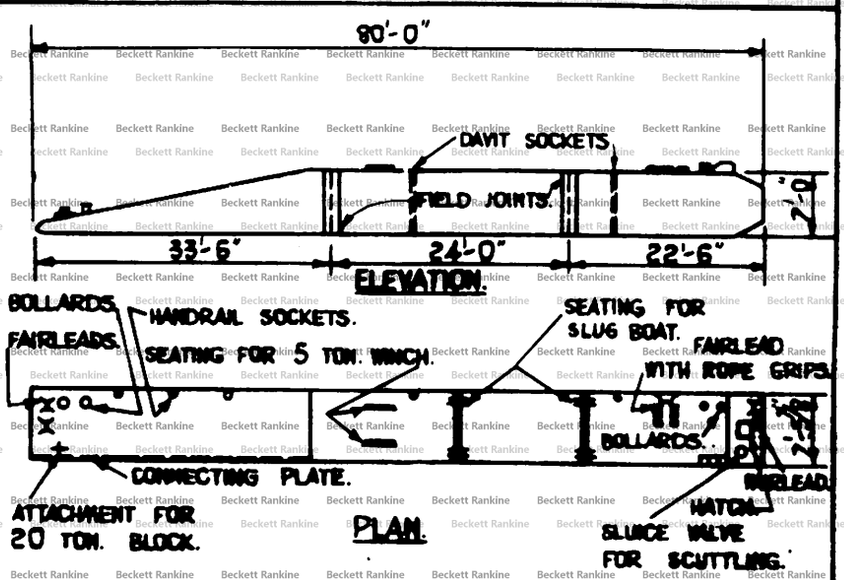
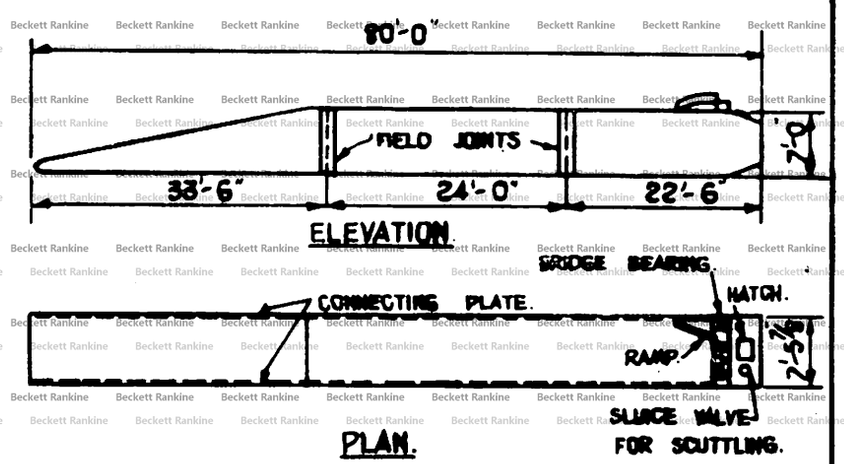
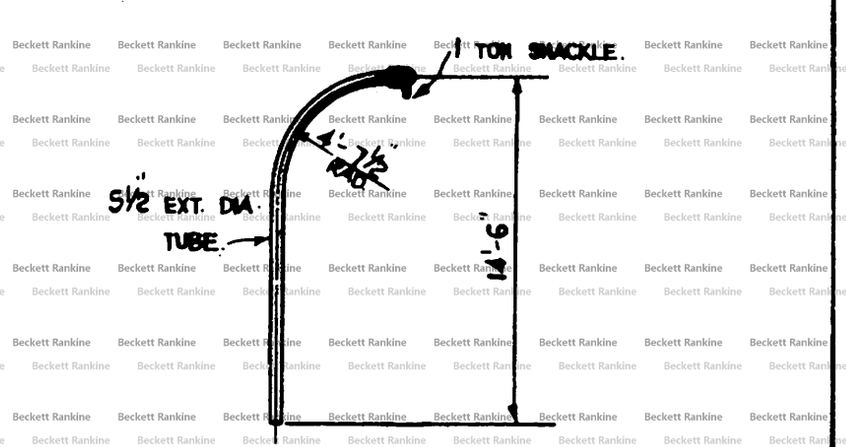
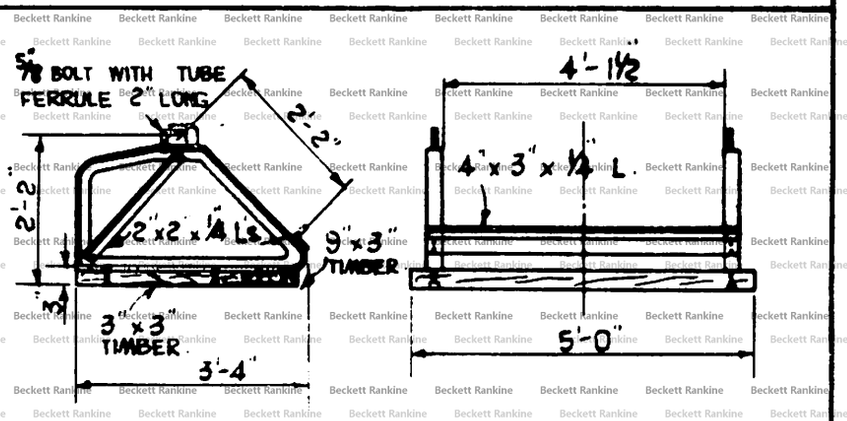
FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W36	MAIN GIRDER CABLE SPRING. No 2. REQD. PER W2. END. UNPAINTED.	100	
W37	MAIN GIRDER. CABLE SPRING. No 2. REQD. PER W1 END. PAINTED RED.	100	
W38	MAIN GIRDER. M.S. MACHINED PIN. No 8. REQD PER SPAN.	21	
W39	MAIN GIRDER. M.S. HALF WASHER & COPPER RIVET. No 16. OF EACH REQD. PER. SPAN.	3	

W40, W41 & W42. ARE OBSOLETE UNITS

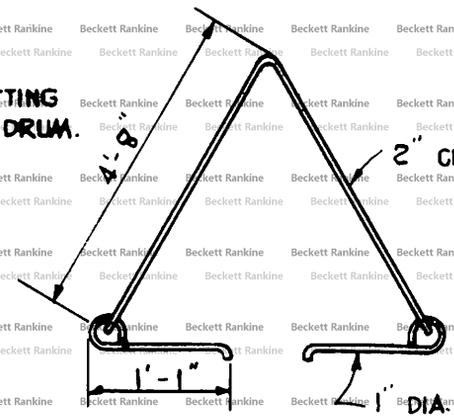
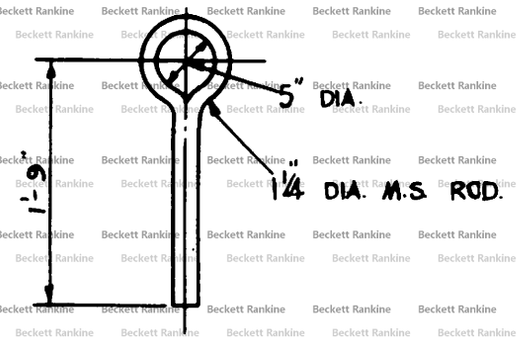
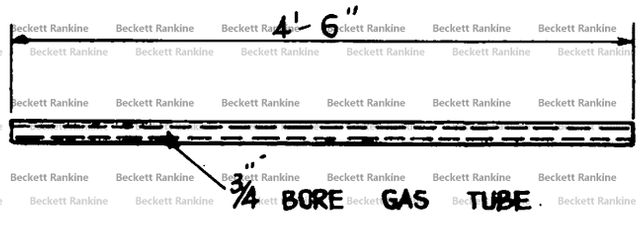
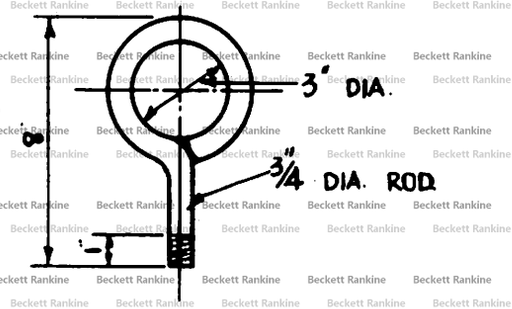
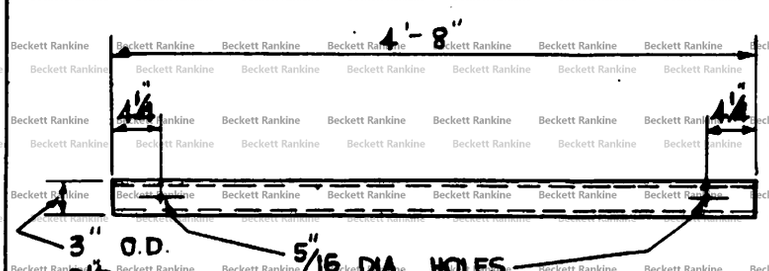
SKETCH 97.

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 43A. TO PAIR WITH W 46A.	SHORE RAMP FLOAT. **FLOAT UNIT.** No 1. REQUIRED OF W43A. No 1. REQUIRED OF W46A. PER. SHORE RAMP FLOAT.		
W 44A TO PAIR WITH W 45A.	SHORE RAMP FLOAT. **FLOAT UNIT.** No. 1 REQUIRED OF W44A. No. 1. REQUIRED OF W45A. PER. SHORE RAMP FLOAT.		
W 47A.	SHORE RAMP FLOAT. **DAVITS.** No 4. REQUIRED PER SHORE RAMP FLOAT.	334.	
W 48A.	MOORINGS **CRADLE FOR CABLE W115A.** No 1. REQUIRED PER CABLE DRUM.		

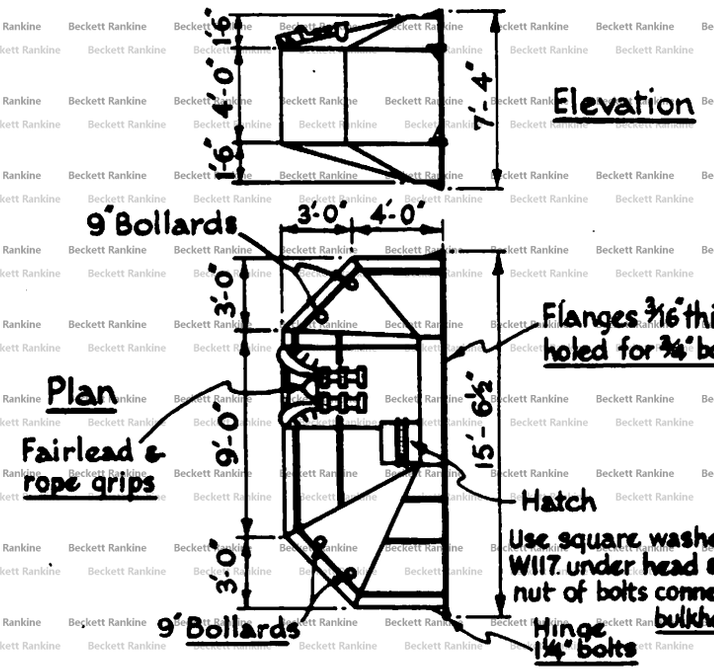
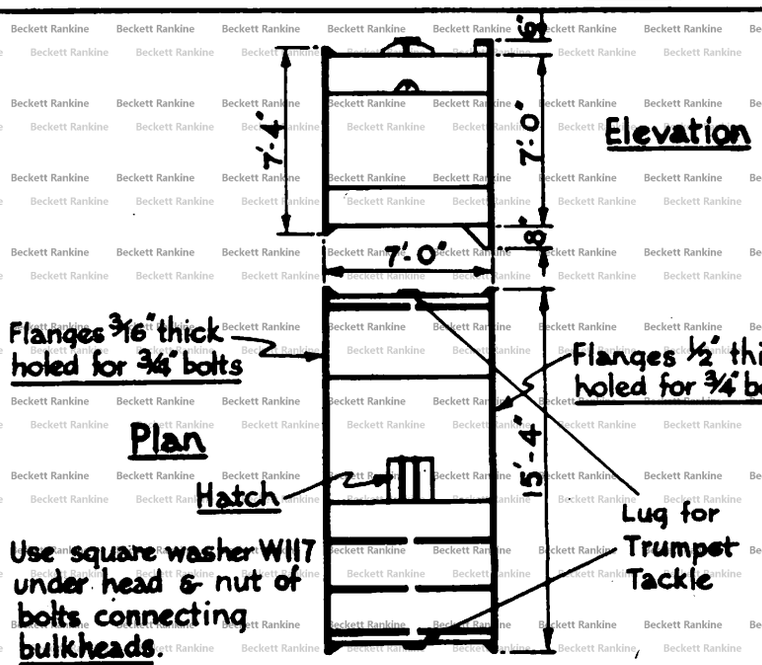
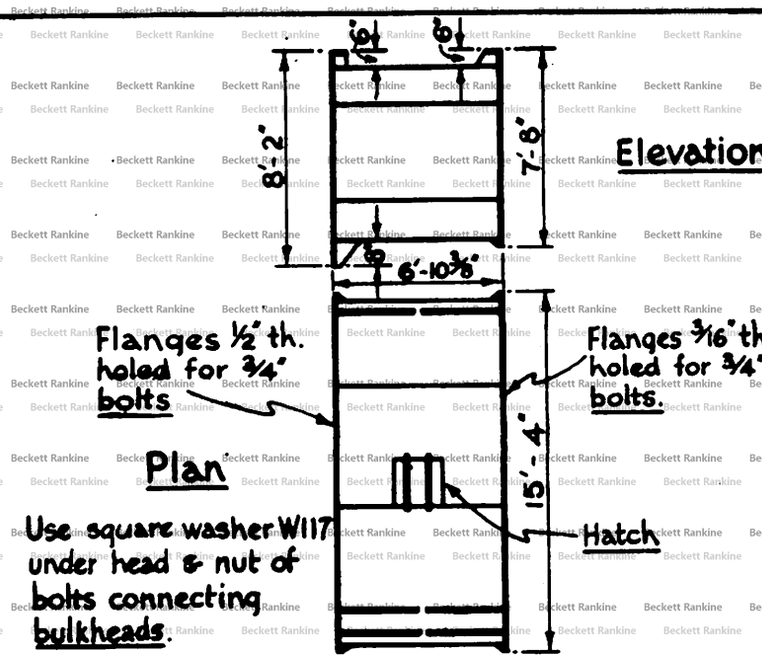
SKETCH. 98.

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 49A.	MOORINGS. SLING FOR CABLE DRUM. W115A. Nº 1. REQUIRED PER. CABLE DRUM.		
W 50A.	MOORINGS. ROCK ANCHOR BOLT. Nº 1. REQD. PER MOORING FOR ROCKY GROUND.		
W 51A.	MOORINGS. HANDSPIKE Nº 1 REQD. PER CABLE DRUM.		
W 52.	ASSEMBLY. LIFTING HOOK. Nº 6. REQD. PER. SET.		
W 53A.	MOORINGS. SPINDLE FOR CABLE DRUM. W115A. Nº 1. REQD. PER CABLE DRUM.		

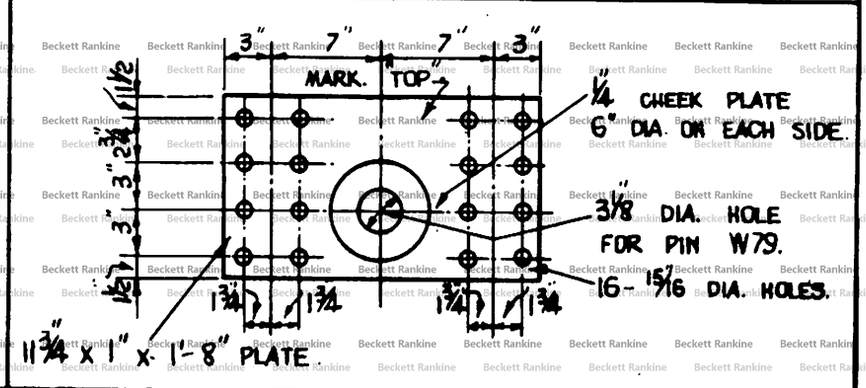
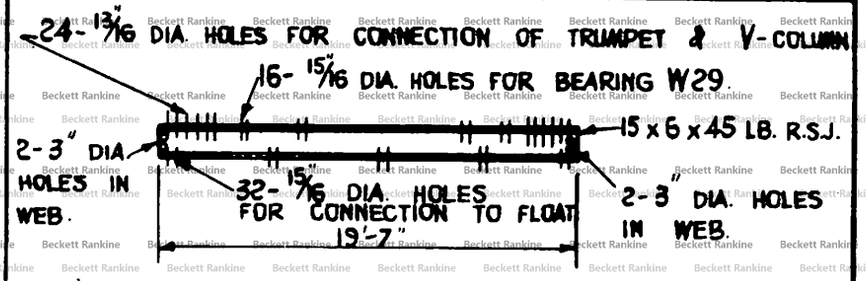
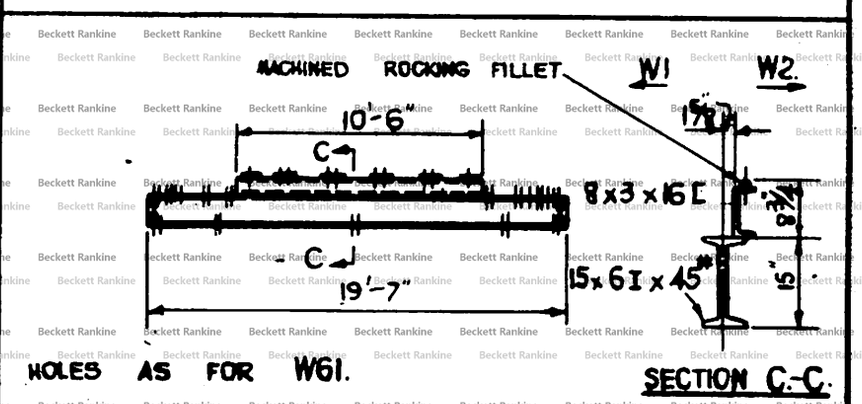
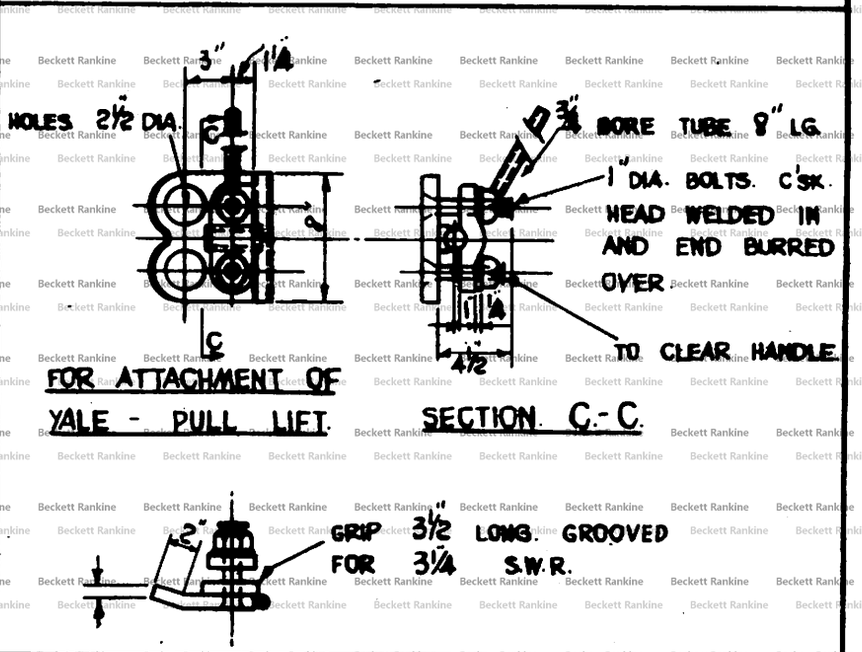
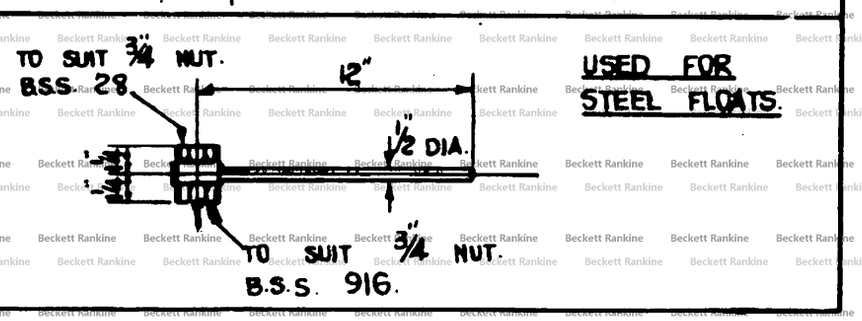
SKETCH 99.

FLOATING BRIDGE MK. II. (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W54 TO PAIR WITH W59	STEEL FLOAT FLOAT UNIT Nº 1 W54 REQD PER STEEL FLOAT Nº 1 W59 REQD PER STEEL FLOAT.	4704	
W55 TO PAIR WITH W58	STEEL FLOAT FLOAT UNIT Nº 1 W55 REQD PER STEEL FLOAT Nº 1 W58 REQD PER STEEL FLOAT	6062	
W56 TO PAIR WITH W57	STEEL FLOAT FLOAT UNIT Nº 1 W56 REQD PER STEEL FLOAT Nº 1 W57 REQD PER STEEL FLOAT	5845	

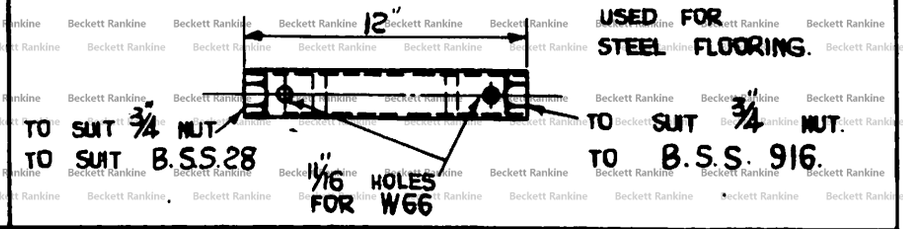
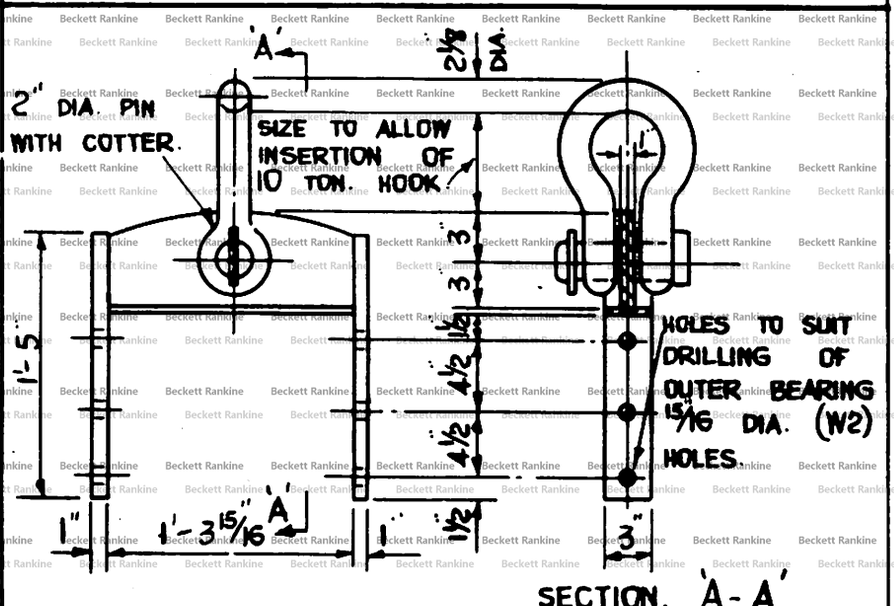
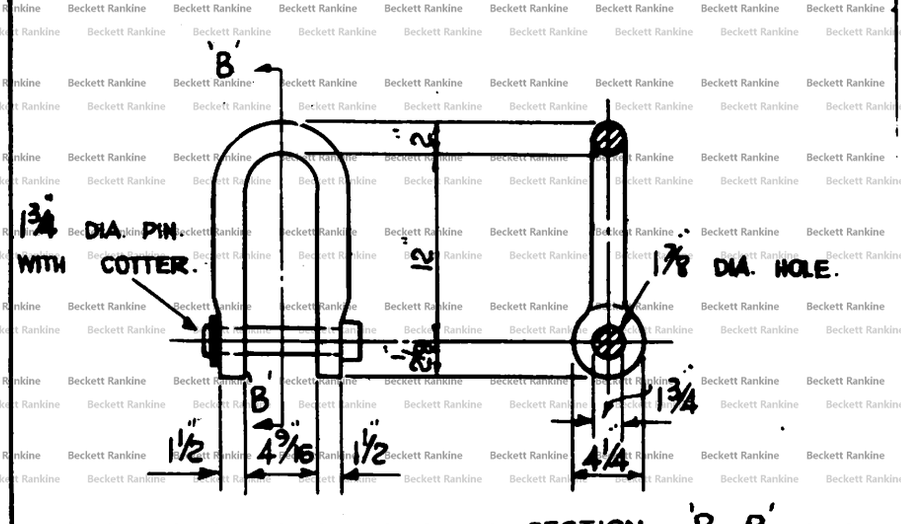
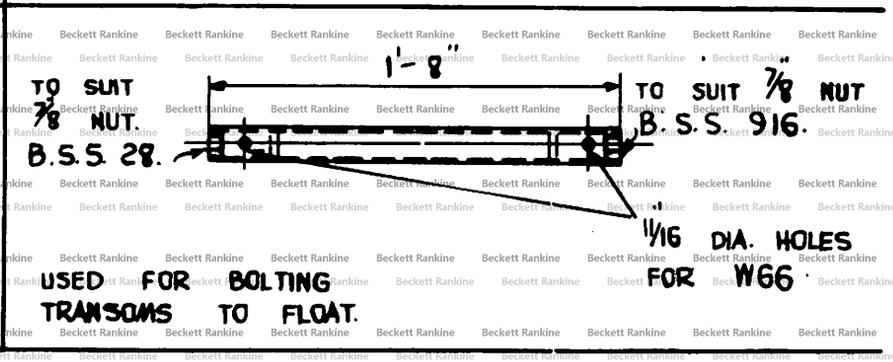
SKETCH. 100.

FLOATING BRIDGE MK II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W60	STEEL FLOAT LINK PLATE No 1. REQD. PER. STEEL FLOAT.	68.	
W61	FLOAT. TRANSOM JOIST. No 2. REQD. PER. FLOAT.	1154.	
W62	FLOAT. CENTRE TRANSOM JOIST. No 1. REQD. PER. FLOAT.	1854.	
W63	FLOAT. ROPE GRIPS. No 1. REQD. PER. FLOAT. TO BE CARRIED ON FLOAT.	38	
W64	ASSEMBLY 3/4 SPANNER. No 6. REQD. PER. SET.		

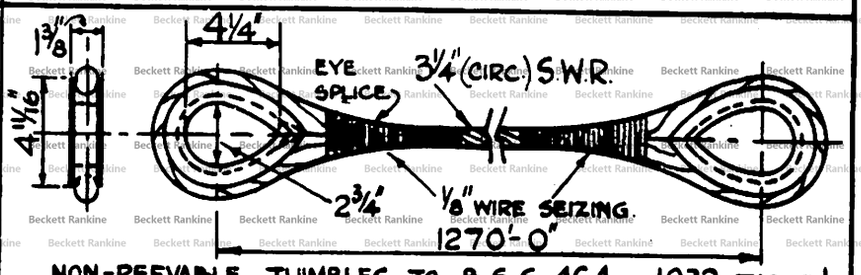
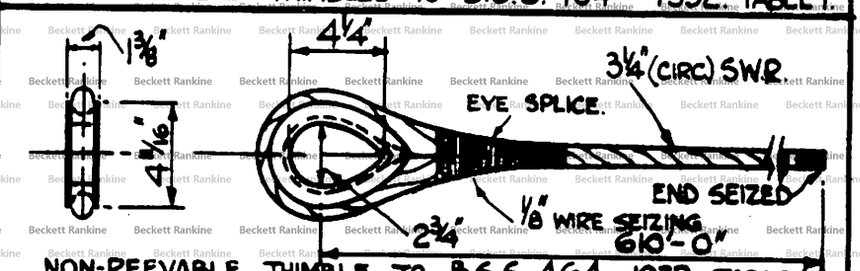
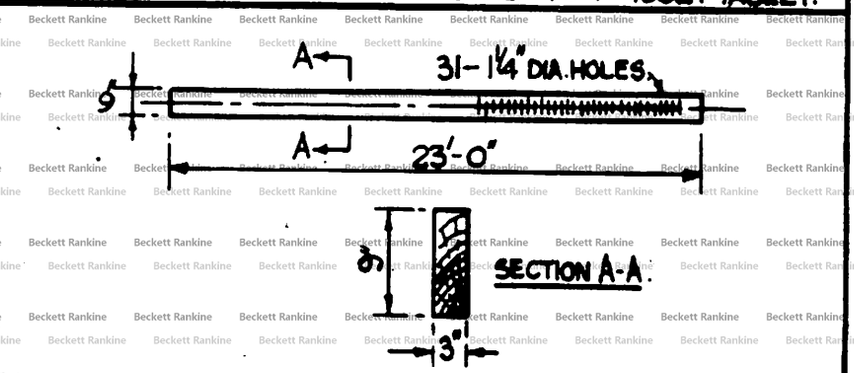
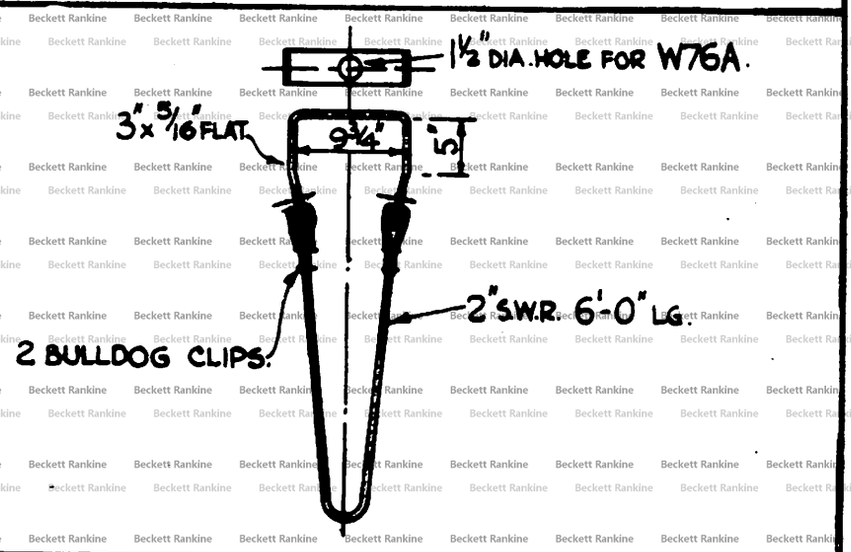
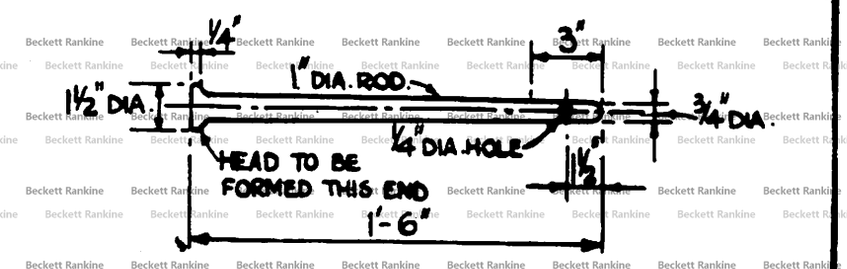
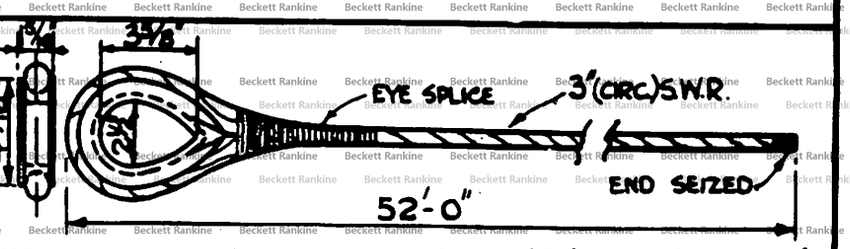
SKETCH. 101.

FLOATING BRIDGE MK II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION & USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W65	ASSEMBLY. 3/4 BOX SPANNER. No 6. REQD. PER. SET.		
W66	ASSEMBLY. TOMMY BAR. No 12. REQD. PER. SET.		
W67	ASSEMBLY. LIFTING SHACKLE FOR W2. GIRDER END. No 2. REQD. PER. SET.	82.	
W68 A.	ASSEMBLY LIFTING SHACKLE FOR W1. GIRDER END. No 2. REQD. PER. SET.	32.	
W69	ASSEMBLY. 7/8 BOX SPANNER. No 6. REQD. PER. SET.		

SKETCH 102.

FLOATING BRIDGE MK.II (PAINTED GREY UNLESS NOTED)

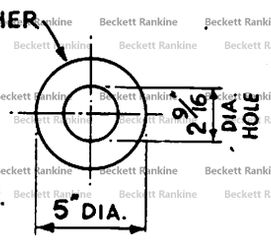
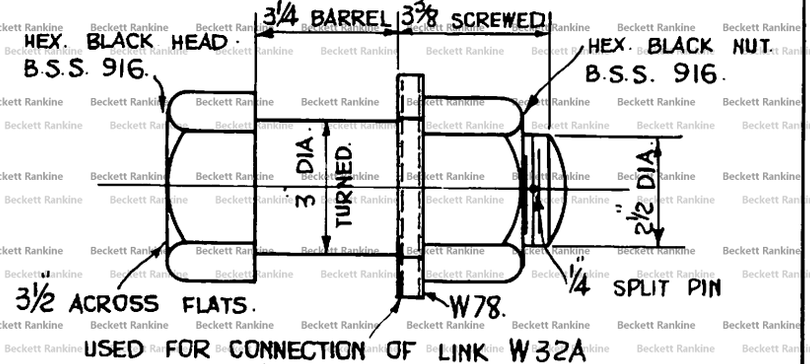
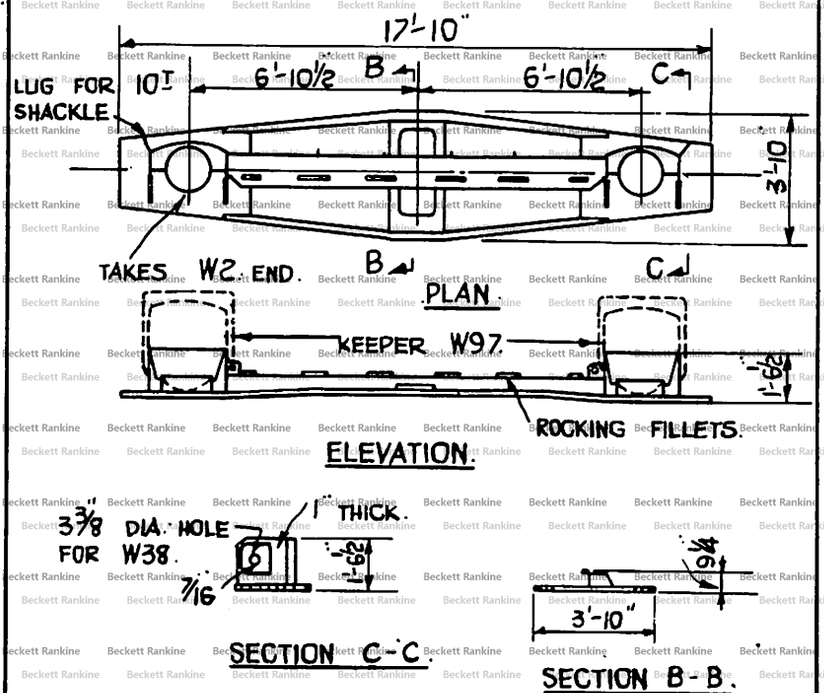
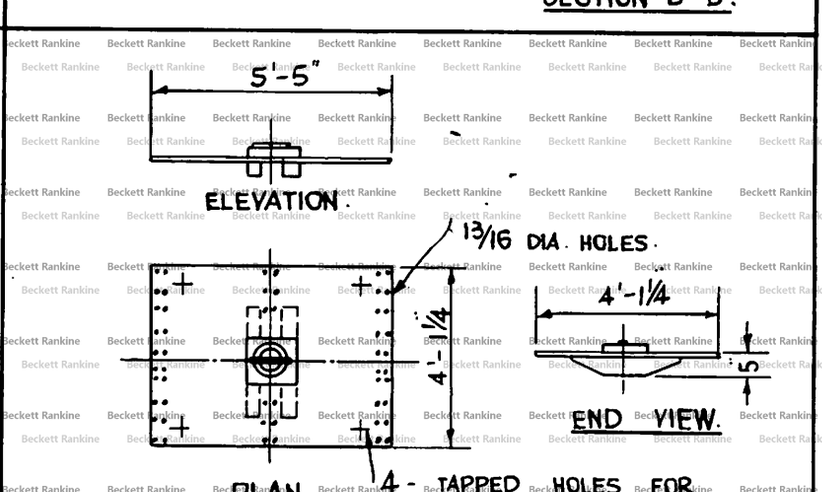
UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W 70A	MOORINGS LONG MOORING No.1 REQUIRED PER FLOAT		 NON-REEVABLE THIMBLES TO B.S.S. 464 - 1932. TABLE 1.
W 71A	MOORINGS. SHORT MOORING		 NON-REEVABLE THIMBLE TO B.S.S. 464.-1932. TABLE 1.
W 74A	TOWING TIMBER STEERING VANES No.16 REQD. PER TOWING TRAIN A.B.C.D.E.F.G & J.		
W 75A	TOWING SLINGS FOR STEERING VANES No.2 REQD. PER STEERING VANE.		
W 76A	TOWING. FIXING PIN FOR STEERING VANES No1. REQD. PER STEERING VANE.		
W 77A	TOWING. 3" (CIRC) RACKING CABLE SPRING. No 4. REQD. PER SPAN.		 NON-REEVABLE THIMBLE TO B.S.S. 464 - 1932. TABLE 1.

W72 AND W73 ARE OBSOLETE UNITS

SKETCH. 103.

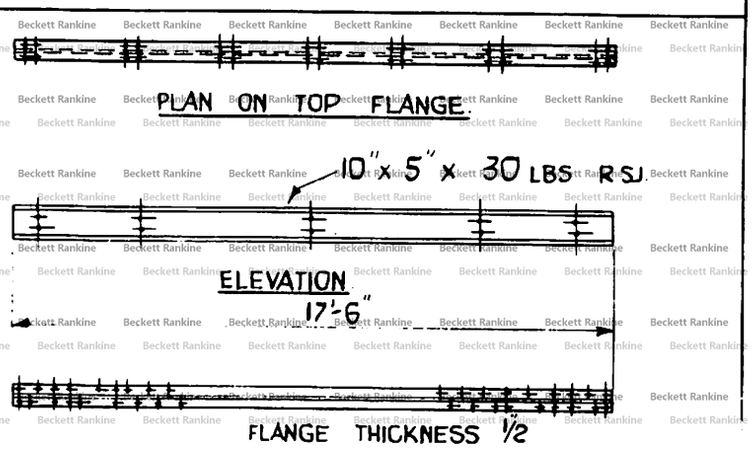
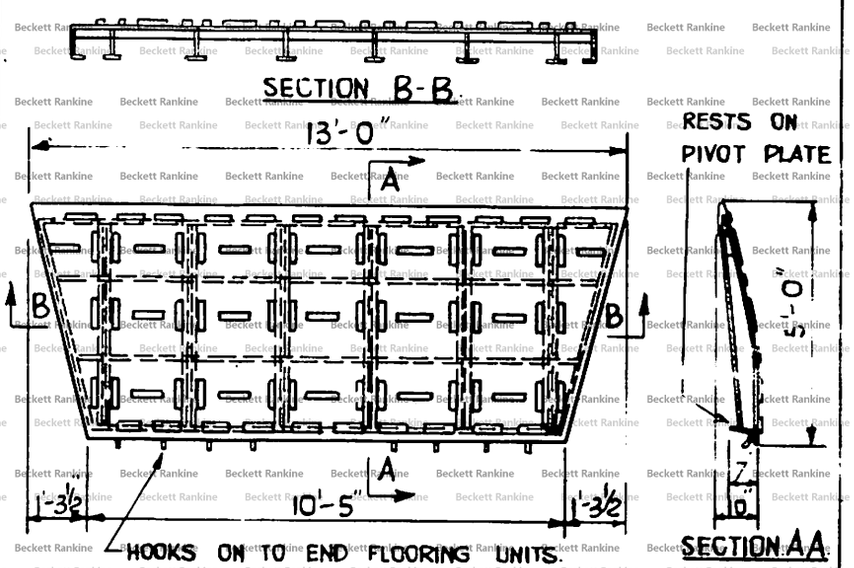
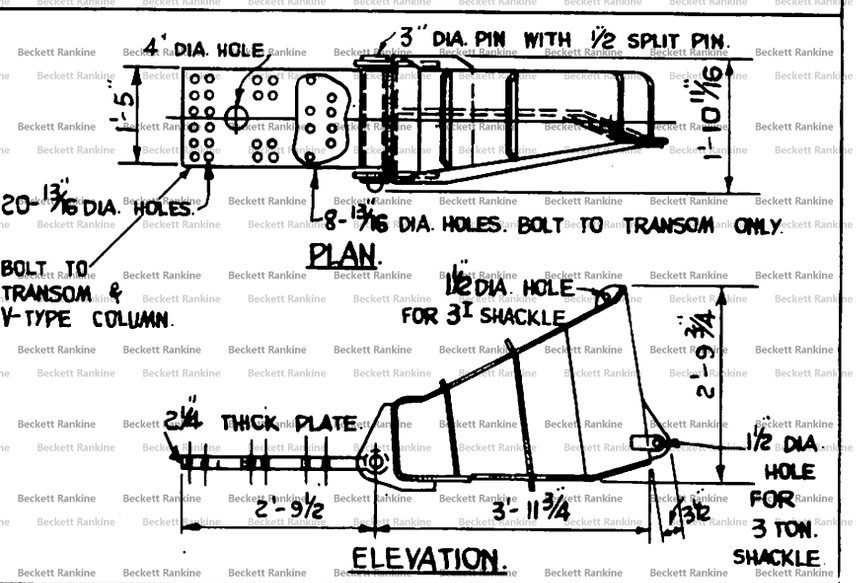
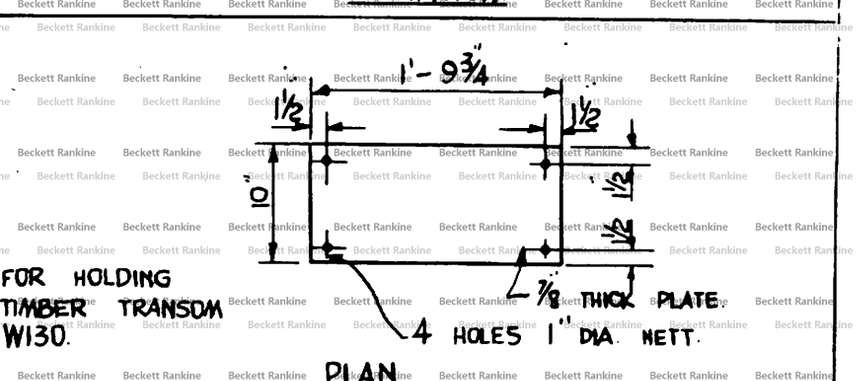
FLOATING BRIDGE MK. II

PAINTED GREY UNLESS NOTED.

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W78.	FLOORING WASHER Nº 14 REQD. PER STANDARD SPAN & TELESCOPIC SPAN Nº 12 REQD. PER TELESCOPIC END SPAN		
W79.	FLOORING PIN USED WITH ONE WASHER MK 78. Nº 2 REQD. PER STANDARD SPAN & TELESCOPIC SPAN.		
W80.	PIVOT PLATE.	4459.	
	PIVOT PLATE. Nº 1. REQD. PER. PIER HEAD & V- TYPE TRESTLE APPROACH. Nº 2. REQD. PER. TELESCOPIC END SPAN.		
W81.	PIVOT PLATE. PIVOT BED PLATE. FOR V- TYPE TRESTLE APPROACH Nº 1. REQD. PER V-TYPE. TRESTLE APPROACH.		

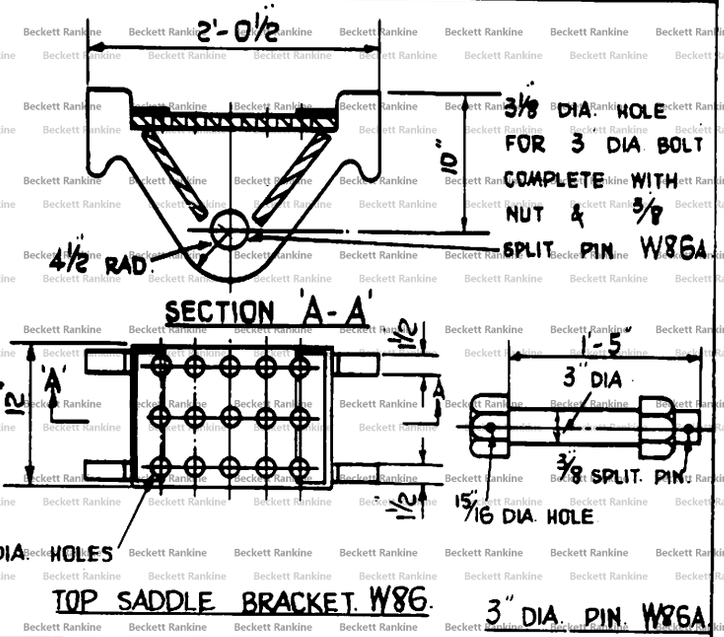
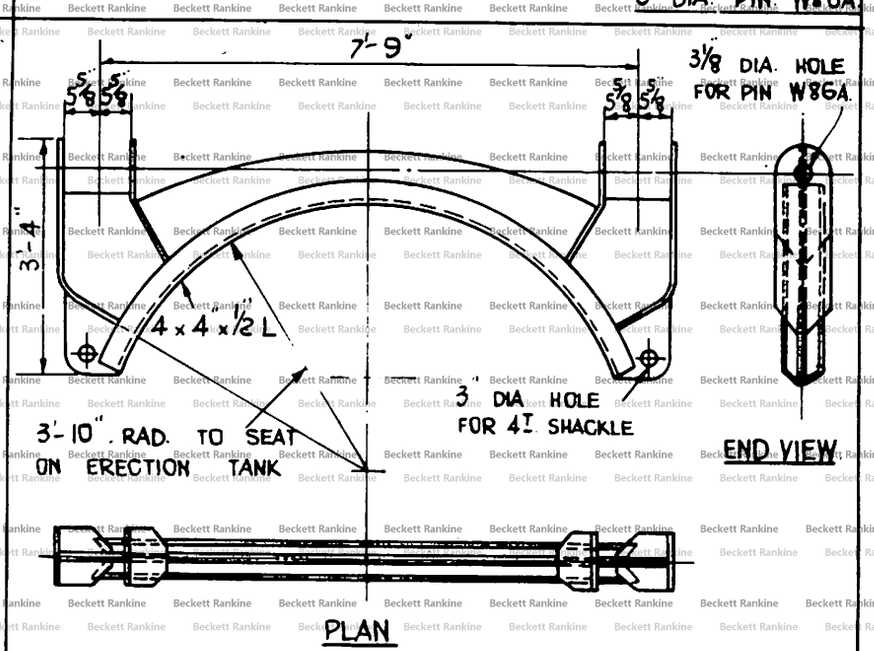
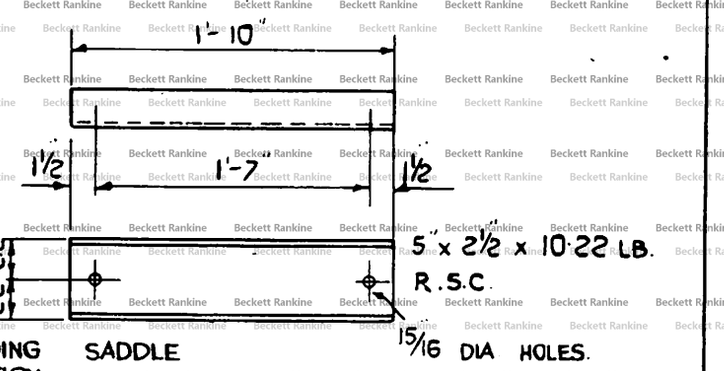
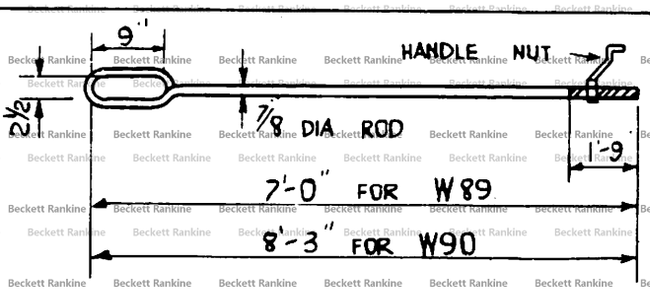
SKETCH. 104.

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W82.	PIVOT PLATE ON V-TRESTLE APPROACH CILL JOIST Nº 5. REQD PER V-TRESTLE APPROACH.	525	
W83	PIVOT PLATE. RAMP. Nº 1. REQD PER PIVOT PLATE.	1589.	
W84 TO PAIR WITH. W84A.	ERECTION. TRUMPET. Nº 1. W84. REQD. PER TOWING UNIT. Nº 1. W84A. REQD. PER. TOWING UNIT.	827.	
W85	ERECTION HOLDING PLATE FOR TIMBER Nº 1. REQD. PER W84. Nº 1. REQD. PER W84A.	54.	

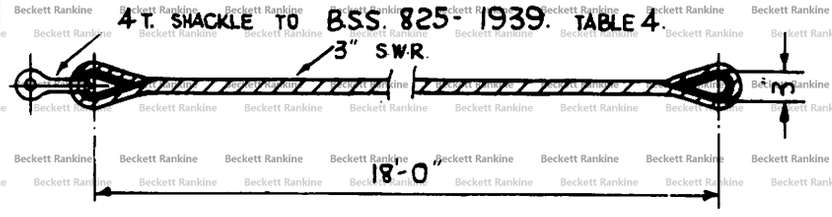
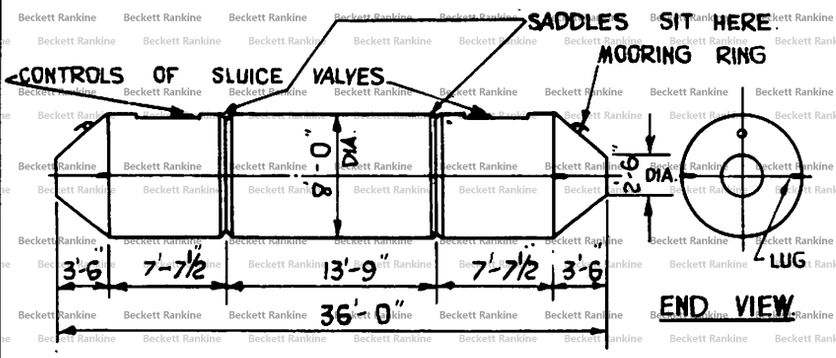
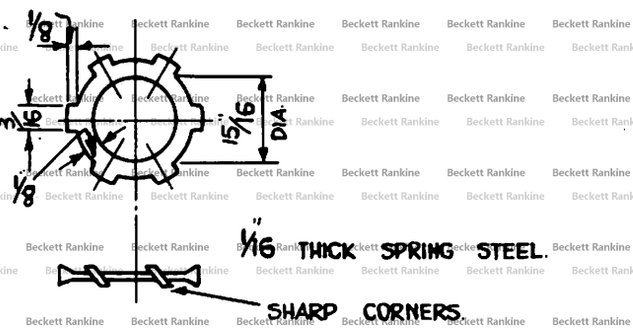
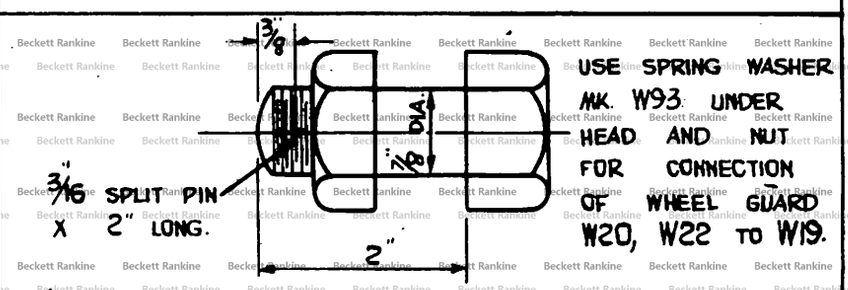
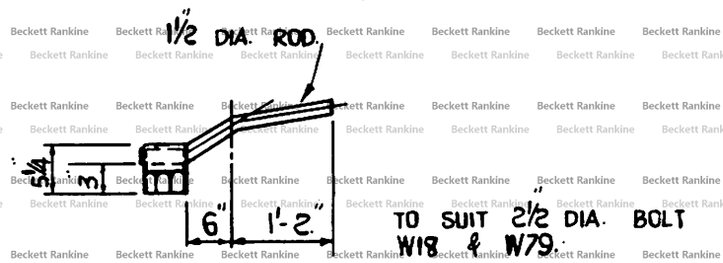
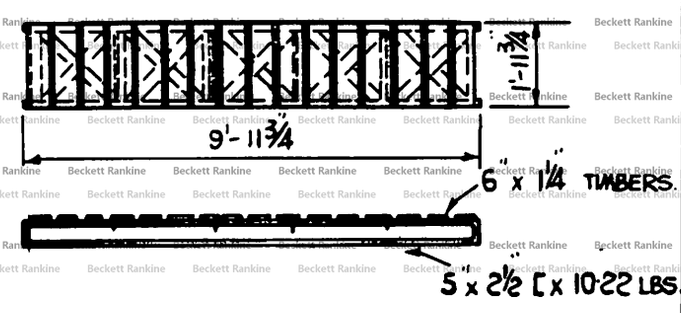
SKETCH. 105.

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W86 W86A	ERECTION. TOP SADDLE BRACKET FOR ERECTION TANK. № 4. REQD. PER ERECTION TANK.		
W87.	ERECTION. BOTTOM SADDLE BRACKET FOR ERECTION TANK № 2. REQD. PER ERECTION TANK.		
W88.	ERECTION CLAMP. № 4. REQD PER. ERECTION TANK		
W89. W90	ERECTION EYE BOLTS. № 4. REQD. MK. W89. № 4 REQD. MK. W90 REQD. PER. ERECTION TANK.		

SKETCH. 106.

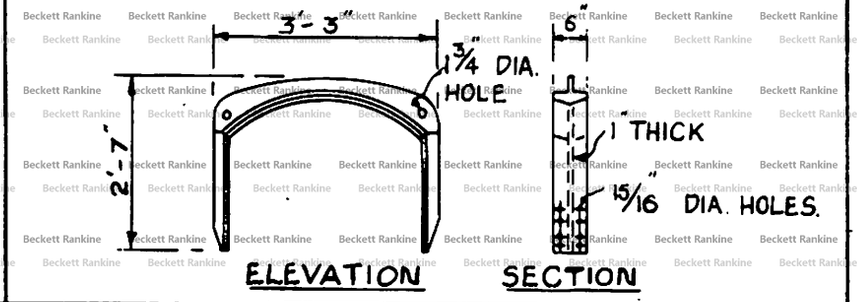
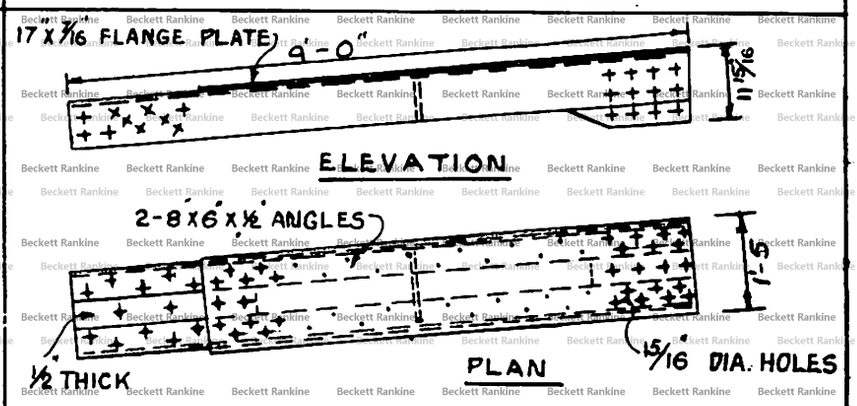
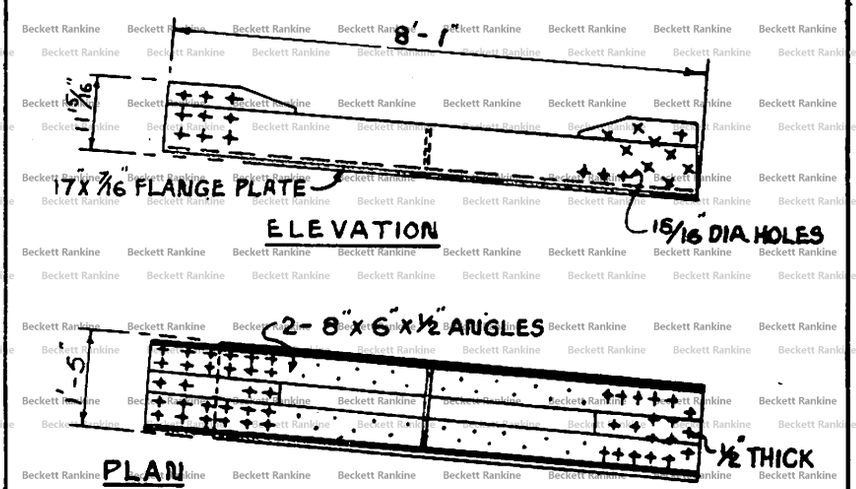
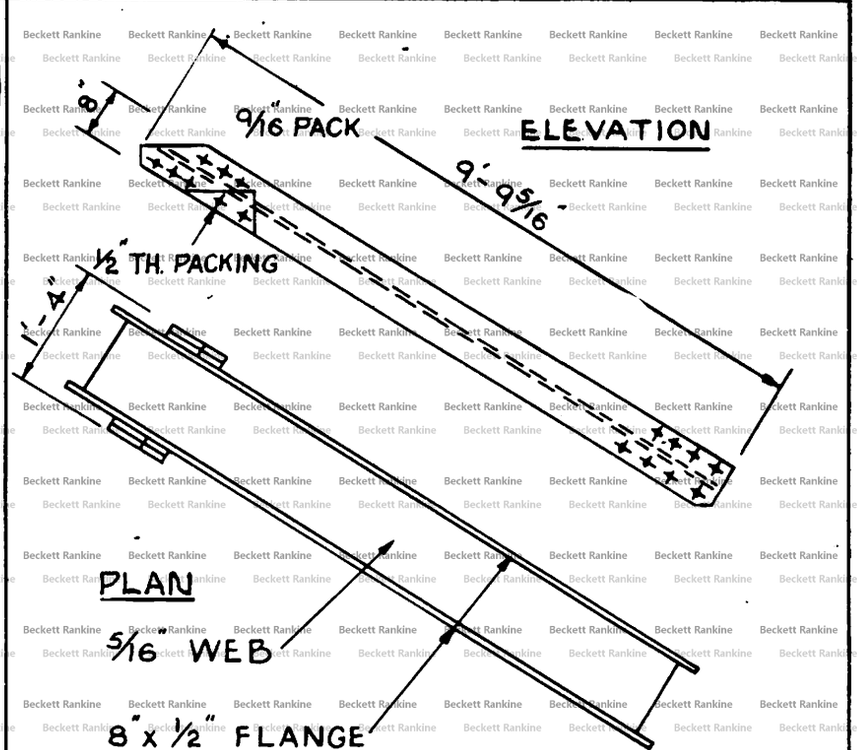
FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN. LBS.	DIAGRAM OF UNIT.
W91.	ERECTION. 3" S.W.R. No 4. REQD. PER. ERECTION TANK.		
W92.	ERECTION. ERECTION TANK. No 1. REQD. PER. TOWING TRAIN. No 2. REQD. PER TELESCOPIC END SPAN.	123200 (5·5 TONS)	
W93	FLOORING. SPRING WASHER. No 380. REQD PER STANDARD SPAN. No 350. REQD. PER TELESCOPIC & TELESCOPIC END SPAN.		
W94	FLOORING. ⅞" DIA. BOLT. No 32. REQD. PER SPAN.	1·05.	
W95	ASSEMBLY RING SPANNER. FOR W18 BOLT. No 6. REQD. PER. SET.		
W96	FLOORING. CENTRE FLOORING PANEL. No 8. REQD. PER. STANDARD SPAN. No 6. REQD. PER. TELESCOPIC SPAN & TELESCOPIC END SPAN.	397.	

SKETCH 107.

FLOATING BRIDGE. MK. II.

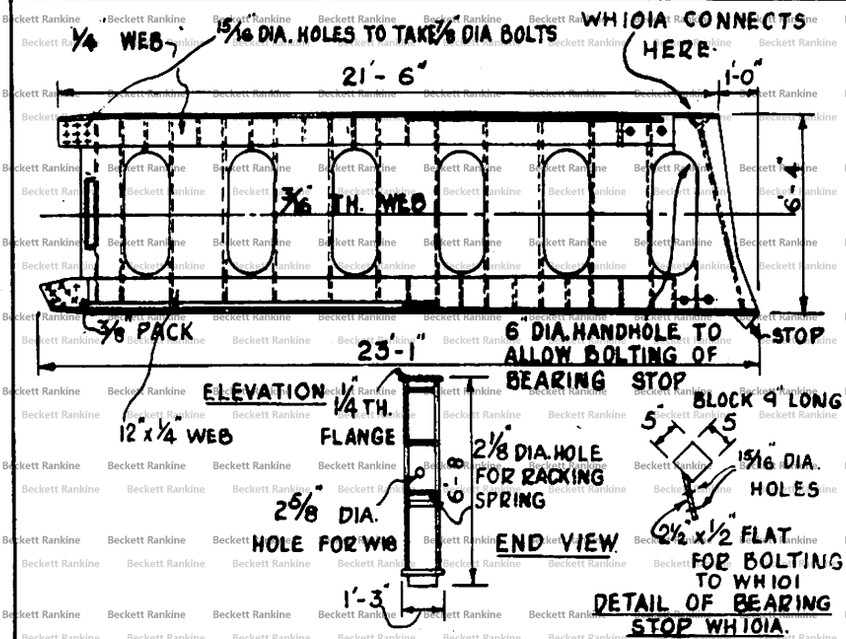
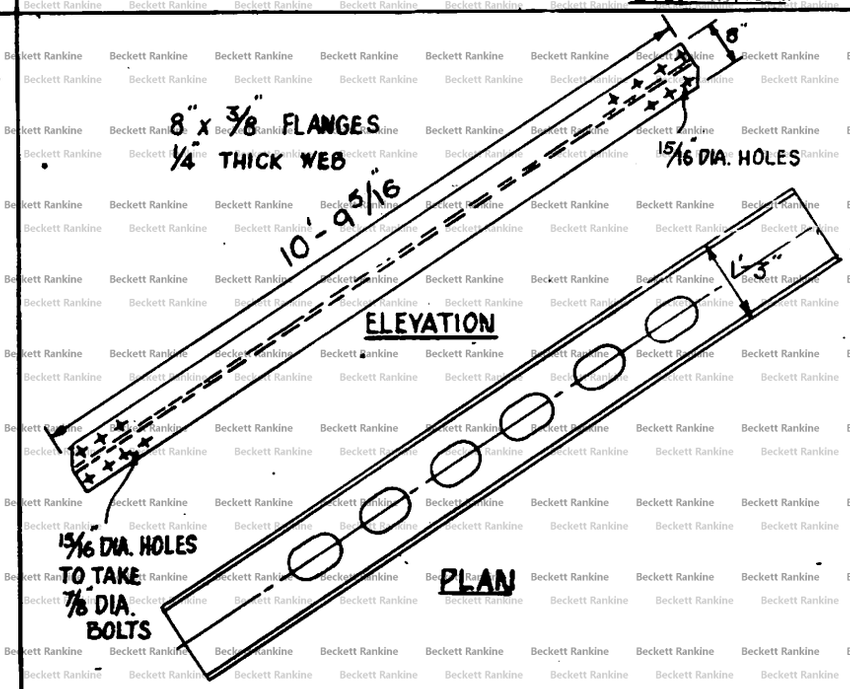
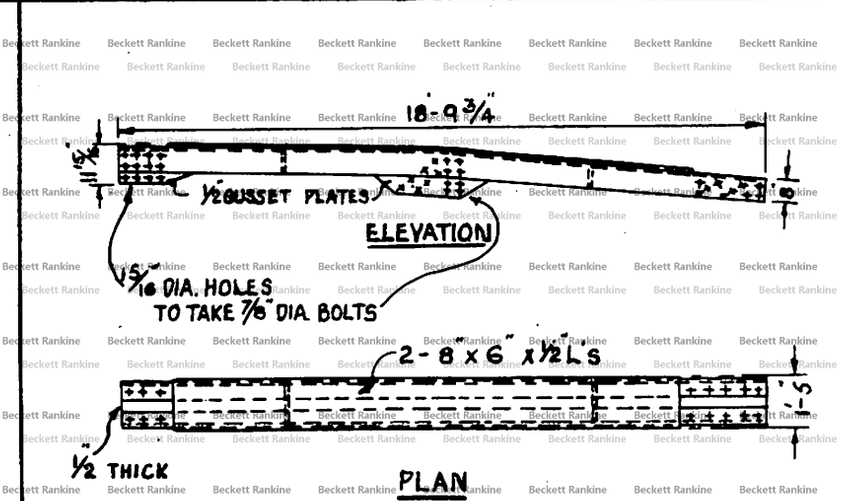
(PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 97	PIVOT PLATE MAIN KEEPER. NO.2 REQD PER PIVOT PLATE.	196	
WH 98	MAIN GIRDER (TELESCOPIC SPAN) TOP CHORD NO.2. REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		
WH 99	MAIN GIRDER (TELESCOPIC SPAN) BOTTOM CHORD. No 2 RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		
W 100	MAIN GIRDER (TELESCOPIC SPAN) DIAGONAL No 2. RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN	409	

SKETCH 108.

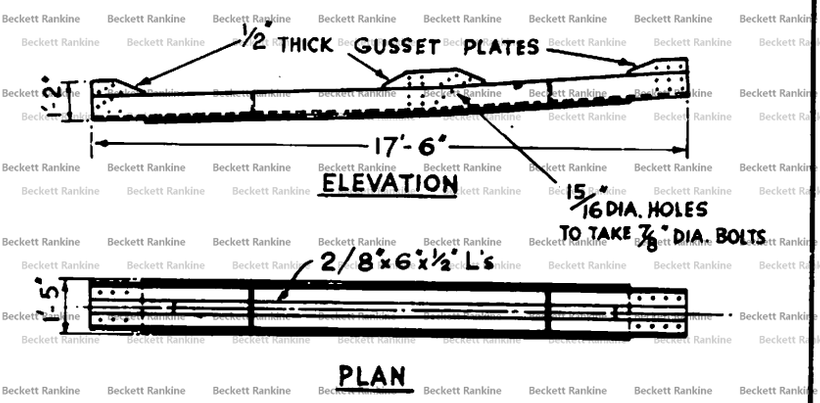
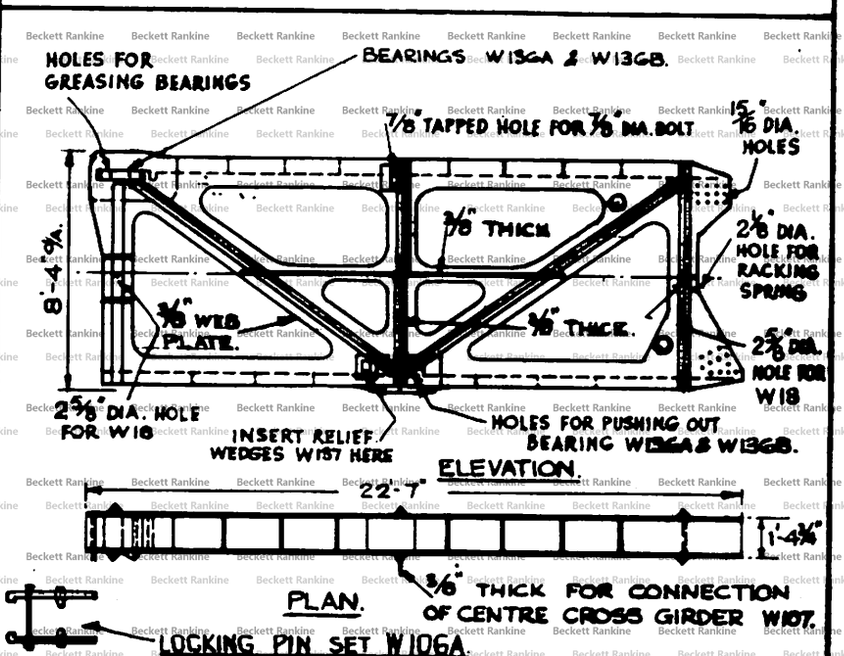
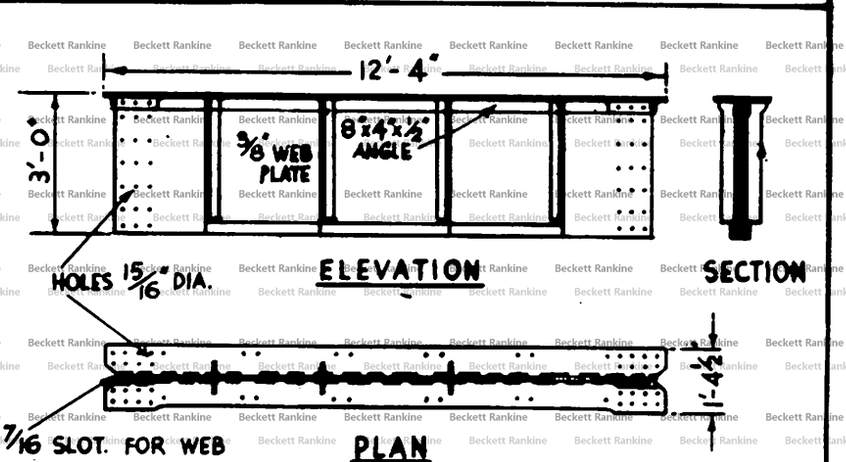
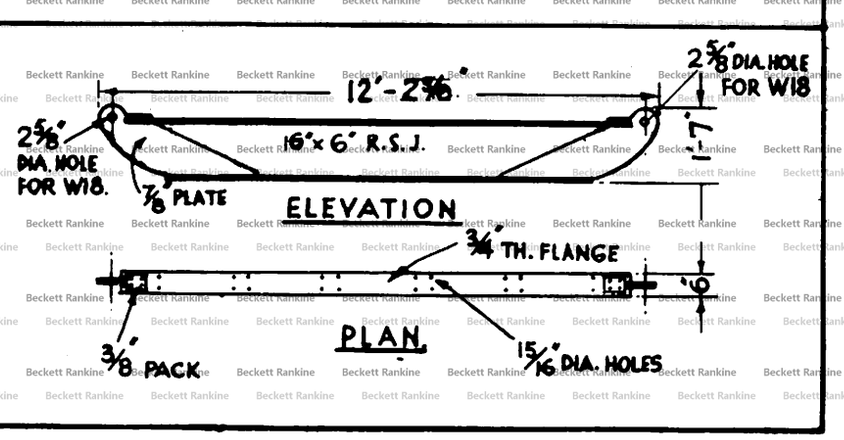
FLOATING BRIDGE MK. II

(PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION & USE	WT. IN LBS.	DIAGRAM OF UNIT.
WH 101 & WH 101A	MAIN GIRDER (TELESCOPIC SPAN) INNER BOX Nº 2 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		
W 102	MAIN GIRDER (TELESCOPIC SPAN) DIAGONAL Nº 2 REQD. PER TELESCOPIC SPAN AND TELESCOPIC END SPAN	348.	
WH 103	MAIN GIRDER (TELESCOPIC SPAN) TOP CHORD Nº 2 REQD. PER TELESCOPIC SPAN AND TELESCOPIC END SPAN.		

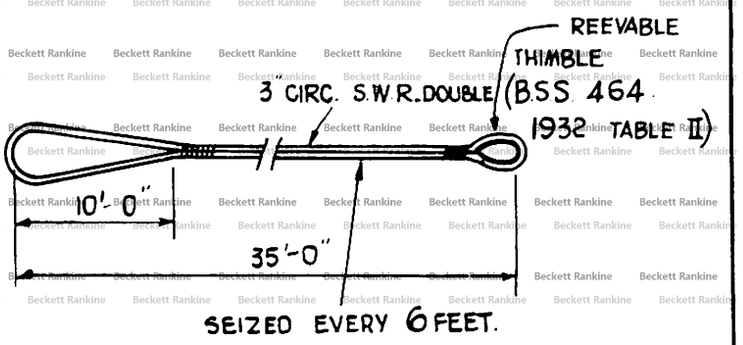
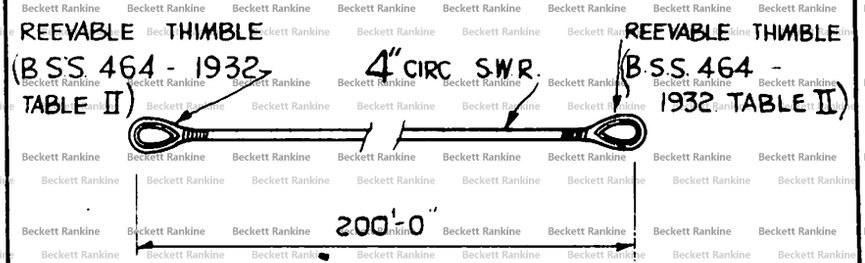
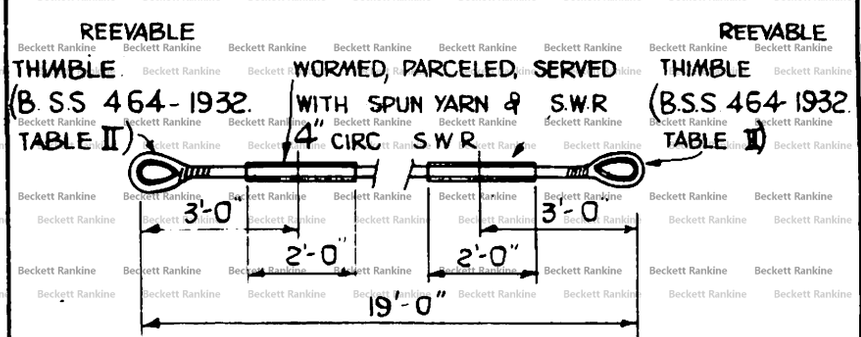
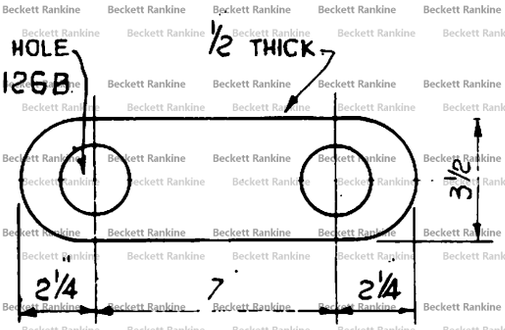
SKETCH 109.

FLOATING BRIDGE. MARK II (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
WH 104	MAIN GIRDER (TELESCOPIC SPAN) BOTTOM CHORD Nº 2 REQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.		
WH 105 TO PAIR WITH WH 106 & W 106A	MAIN GIRDER (TELESCOPIC SPAN.) OUTER BOX. Nº 2. REQD. PER TELESCOPIC SPAN. & TELESCOPIC END SPAN. Nº 4. SETS. REQD. OF W106A. PER. TELESCOPIC SPAN & TELESCOPIC END SPAN.		
W 107	FLOORING (TELESCOPIC SPAN) CENTRE CROSS GIRDER Nº 1. RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	1323.	
WH 108	FLOORING. (TELESCOPIC SPAN) CROSS GIRDER Nº 1 RQD. PER TELESCOPIC SPAN & TELESCOPIC END SPAN.	563	

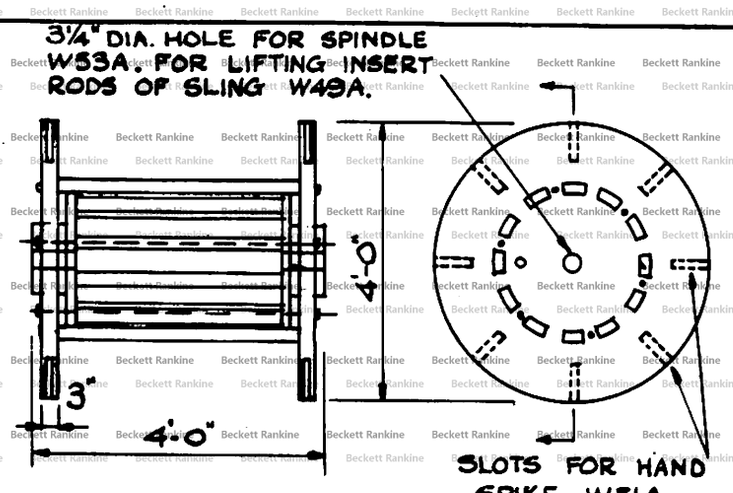
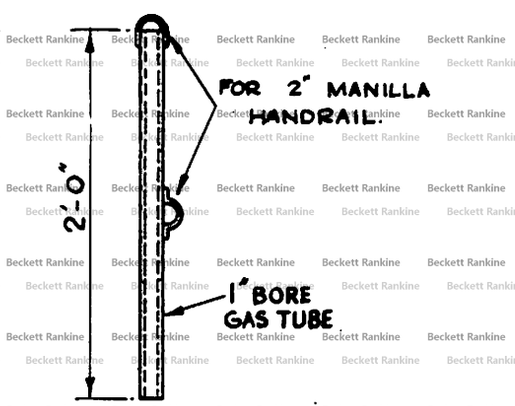
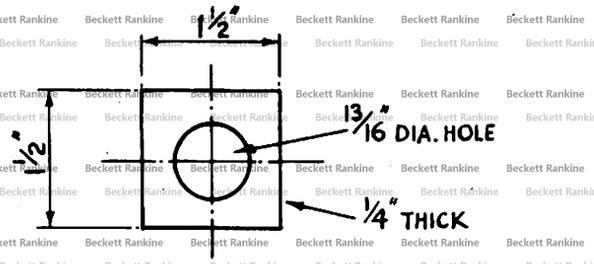
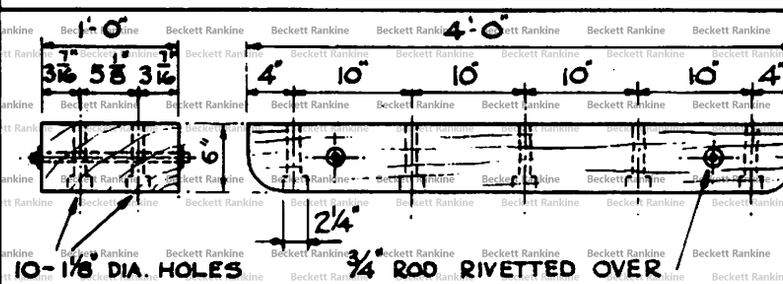
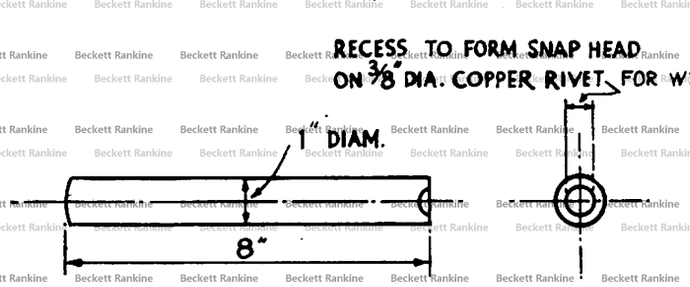
SKETCH. 118

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 154.	TOWING TOW - ROPE WITH LOOP Nº 6. REQD. PER TOWING TRAIN M. Nº 2. REQD. PER TOWING TRAIN H. & K.		
W 155.	TOWING TOW ROPE. (200 FT.) Nº 1 REQD. PER TOWING TRAIN M		
W 156.	TOWING TOW ROPE (PARCELED) Nº 2. REQD PER TOWING TRAIN D.		
W 157.	MOORING MOORING LINK TO COUPLE MOORINGS Nº 2 REQD. PER CONNECTION.		

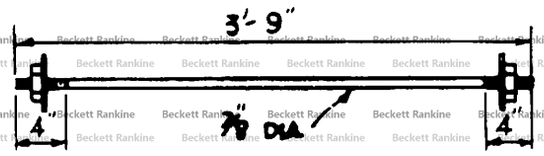
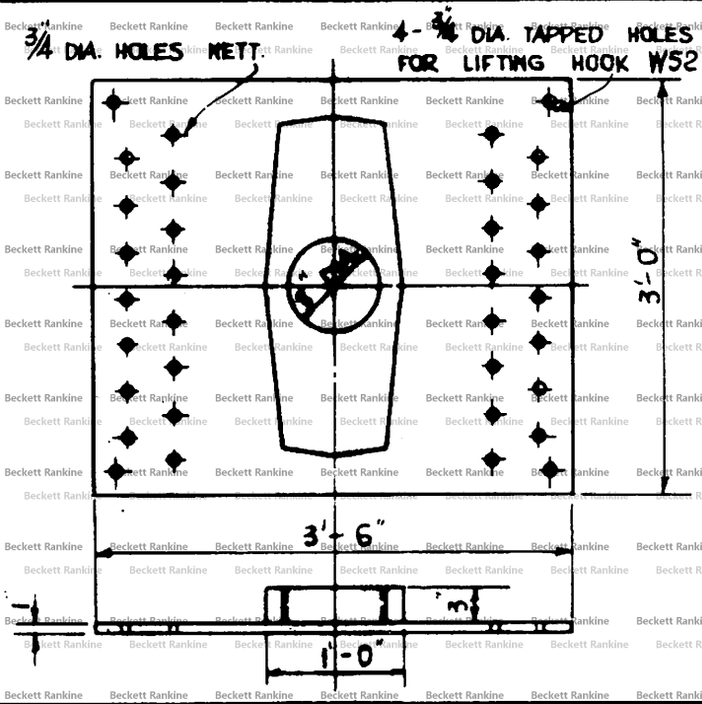
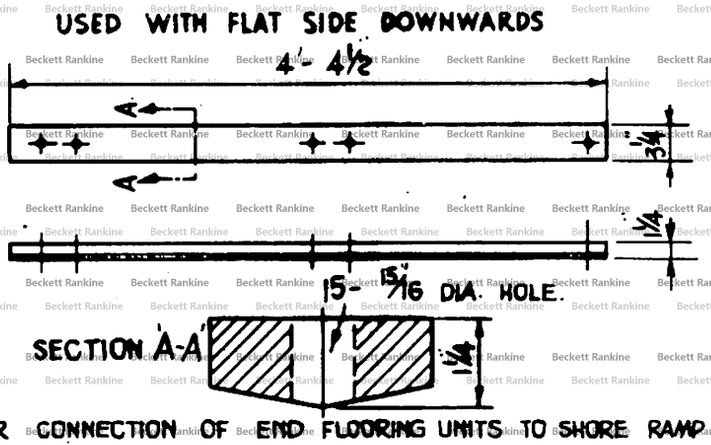
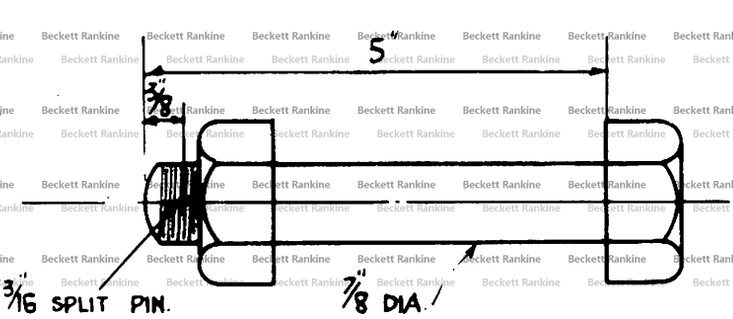
SKETCH. 111

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W 115 A	MOORINGS CABLE DRUM NO. 1. REQD. PER MOORING W70 A & W71A.		
W 116	STEEL FLOAT. HANDRAIL STANDARD. No. 22 REQD. PER SHORE RAMP FLOAT. No. 12 REQD. PER STEEL FLOAT.		
W 117	STEEL FLOAT. SQUARE WASHER. No. 560 REQD. PER STEEL FLOAT. No. 250 REQD. PER ROCK INSERTION IN ADDITION TO ABOVE.		
W 118	STEEL FLOAT. HARDWOOD BUMPER. BOLTS TO UNDERSIDE OF FLOAT ON BULKHEADS UNDER MAIN BEARINGS.		
W 119	ERECTION & ASSEMBLY. RIVET SNAP USED FOR FORMING HEAD ON COPPER RIVETS. No. 4 REQD. PER SET.		

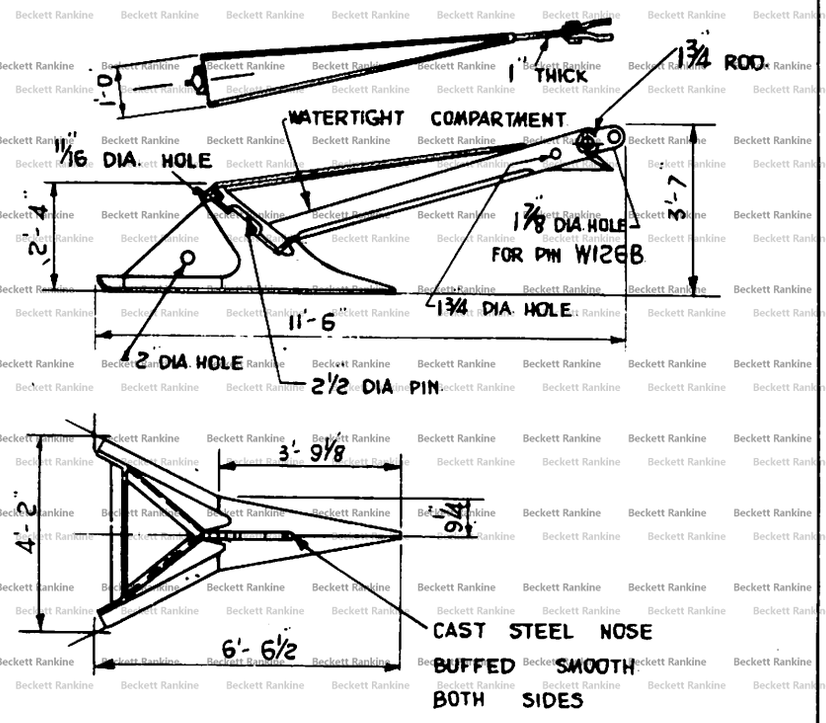
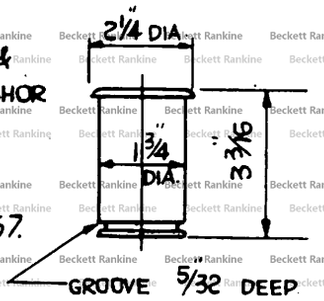
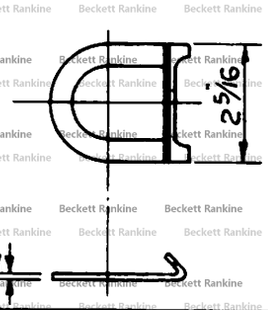
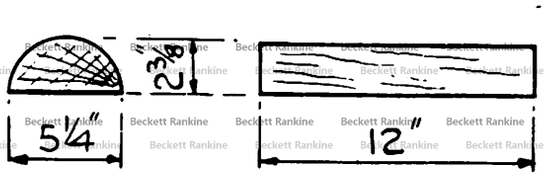
SKETCH. 112

FLOATING BRIDGE MK II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 120	ERECTION. RODS FOR HOLDING PLATE W85. Nº 8. REQD. PER TIMBER TRANSOM W130.	8	
W 121	PIVOT PLATE. PIVOT BED PLATE. (DIRECT SEATING) Nº 1 REQD. PER PIER HEAD. Nº 2. REQD. PER TELESCOPIC END SPAN.		
W 122	SHORE RAMP FLOAT. ROCKING FILLET. Nº 2 REQD. PER. SHORE RAMP FLOAT.		 FOR CONNECTION OF END FLOORING UNITS TO SHORE RAMP FLOAT.
W 123	SHORE RAMP FLOAT BOLT 7/8 DIA. WITH NUT AND 3/16 SPLIT PIN USED WITH W122. Nº 10 REQD PER. SHORE RAMP FLOAT		 USED WITH 2 HEMISPHERICAL WASHERS W25 & 1 SPRING WASHER W24.

SKETCH. 113.

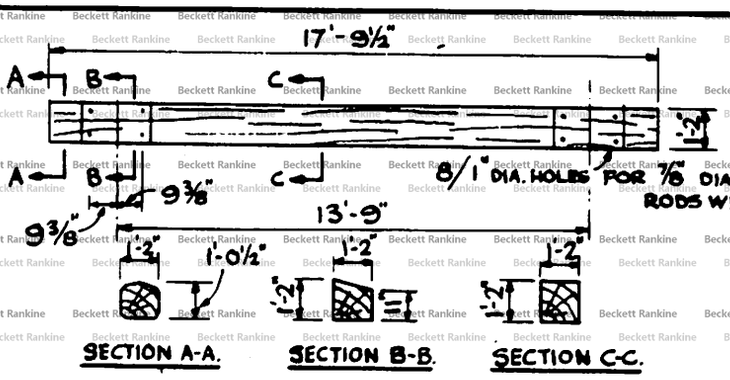
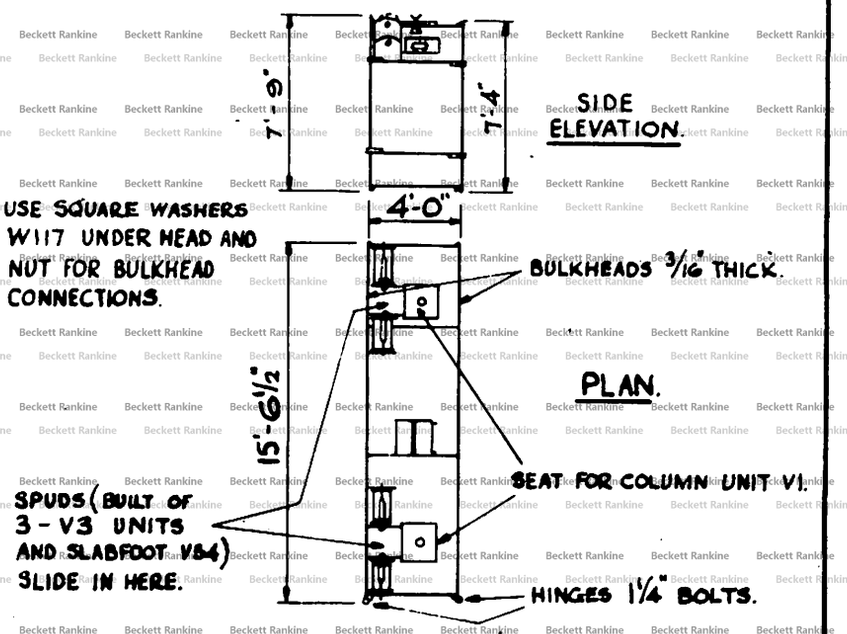
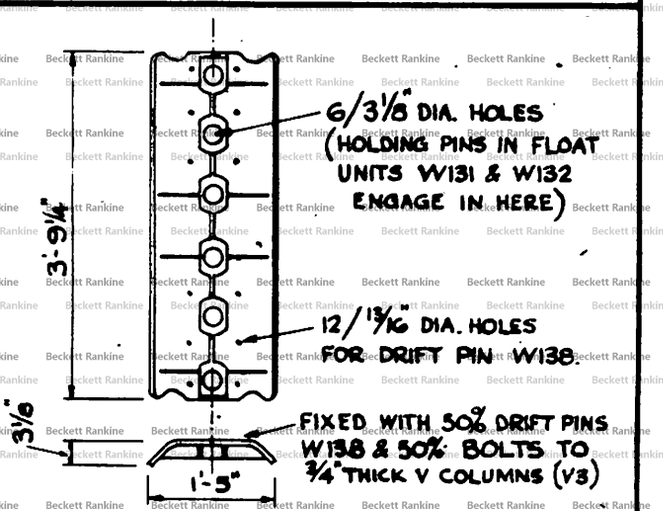
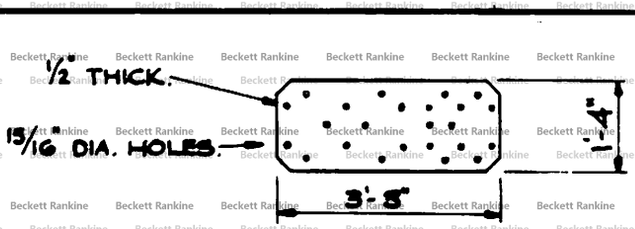
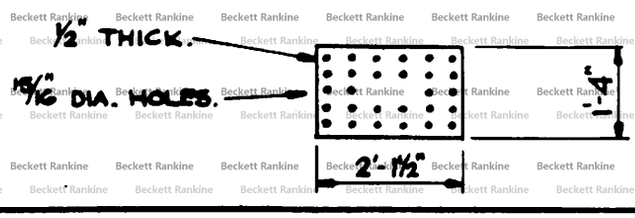
FLOATING. BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 124B.	MOORINGS. KITE ANCHOR. Nº 2. REQD. PER. FLOAT. PAINTED WITH RED LEAD ONLY.		
W 126B.	MOORINGS. PIN. FOR USE WITH W124B. Nº 1. REQD. PER. ANCHOR. Nº 1. REQD. PER. MOORING LINK W157.		USED FOR FIXING MOORINGS W70A & W71A. TO KITE ANCHOR W124B & FOR JOINING 2 MOORINGS TOGETHER WITH MOORING LINK W157. 
W 127B.	MOORINGS. SOFT IRON KEEPER. NO1 REQD PER PIN W126B.		FOR USE WITH PIN W126B. 
W 128	FLOAT REPLACEMENT LOW HEADROOM SADDLE No.4 REQD. PER ERECTION TANK USED ON FLOAT REPLACEMENT.		
W 129	ERECTION SOFTWOOD PACK FOR TOP OF TRESTLE UNIT. Nº4 REQD. PER. TRUMPET & ROCK INSERTION.		

W125 IS AN OBSOLETE UNIT

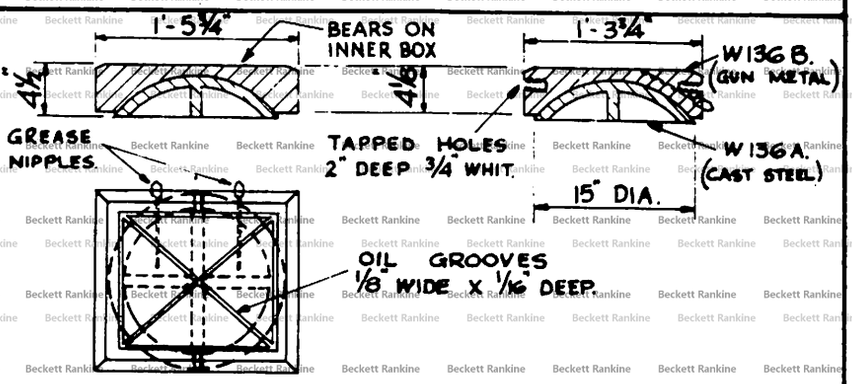
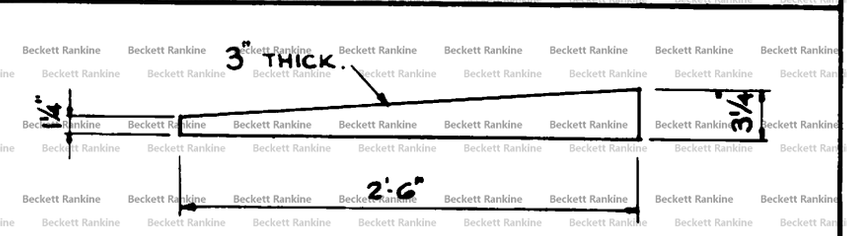
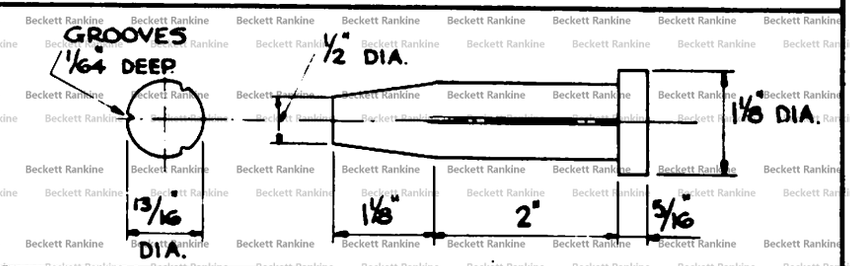
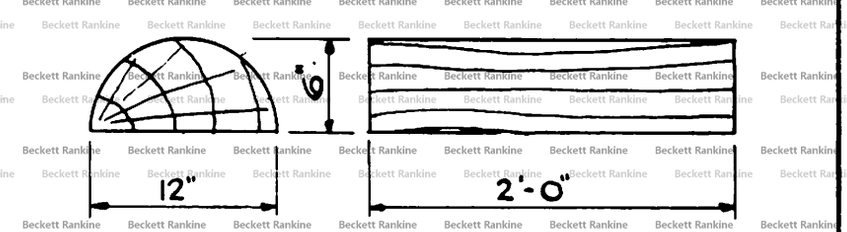
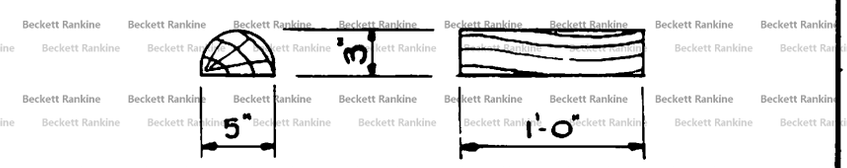
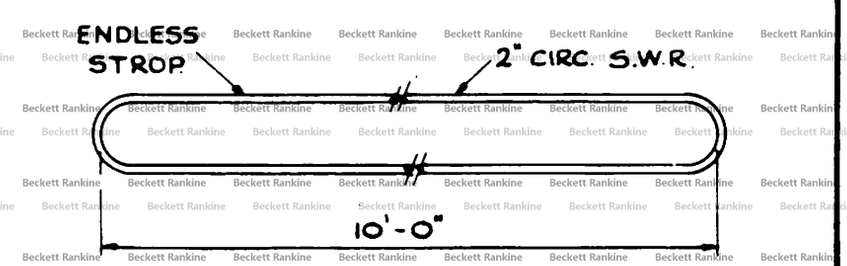
SKETCH 114

FLOATING BRIDGE MARK II (PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 130	ERECTION. HARDW. TRANSOM. No. 1 REQD. PER TOWING TRAIN B, C, D, F, G, H, & K.		
W 131 TO PAIR WITH W 132.	STEEL FLOAT. FLOAT UNIT. No. 1 REQD. OF W131. No. 1 REQD. OF W132. PER STEEL FLOAT	4480.	
W 133	ROCK INSERTION (STEEL FLOAT) GUIDE UNIT. No. 24 REQD. PER STEEL FLOAT FOR BEACHING ON ROCKY GROUND.	128	
WH 134	MAIN GIRDER COVER PLATE. No. 4 REQD. PER SPAN.	69	
WH 135.	MAIN GIRDER COVER PLATE No. 4 REQD. PER STANDARD SPAN. No. 8 REQD. PER TELESCOPIC SPAN AND TELESCOPIC END SPAN.	53.	

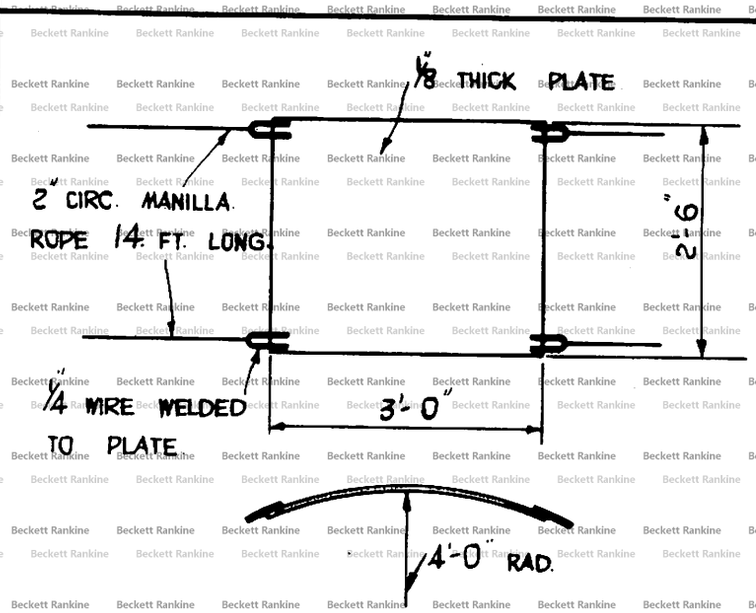
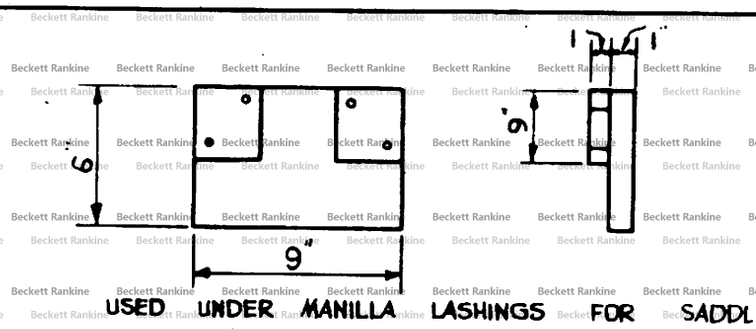
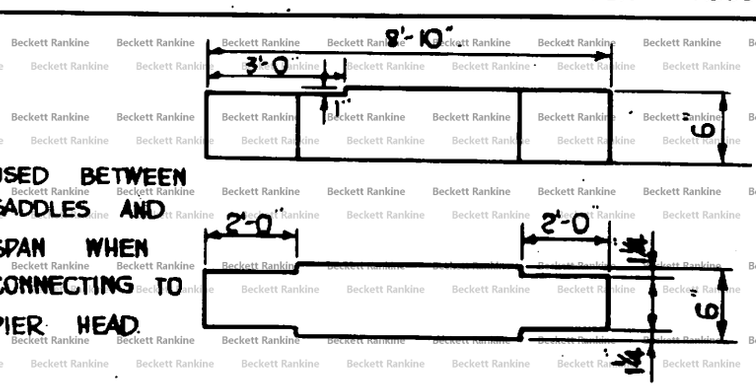
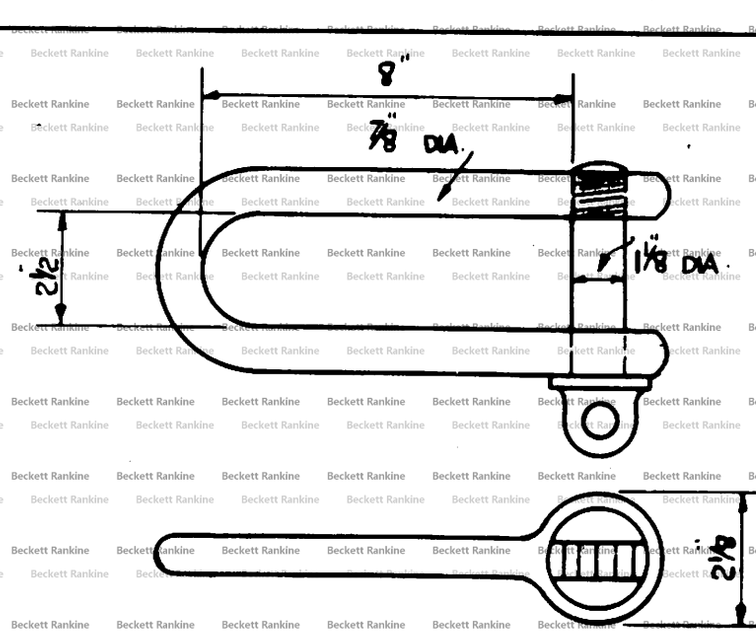
SKETCH 115

FLOATING BRIDGE MARK II. (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 136A & W 136B.	MAIN GIRDER. BEARING BLOCKS. No. 4 REQD. OF W136A No. 4 REQD. OF W136B PER TELESCOPIC SPAN AND TELESCOPIC END SPAN.		
W 137	TELESCOPIC SPAN RELIEF WEDGE. USED WHEN CHANGING OR GREASING BEARINGS. No. 2 REQD. PER BEARING BLOCK.	57	
W 138	ROCK INSERTION (STEEL FLOAT) DRIFT PIN. USED TO ATTACH W133 TO COLUMN. No 120 REQD. PER ROCK INSERTION SET.		
W 139.	FOR SCALING SEA WALL. No. 1 REQD. PER BRIDGE LENGTH.		20 RUNG LADDER.
W 140.	BAILEY BRIDGE RAMP. TIMBER CHOCK. USED ON TOP OF SEA WALL TO CARRY 20 TON BLOCKS. No. 2 REQD. PER BRIDGE LENGTH.		
W 141.	BAILEY BRIDGE RAMP. TIMBER CHOCK. USED UNDER LIFTING TRANSOM FOR BAILEY BRIDGE. No 2 REQD. PER BRIDGE LENGTH.		
W 142.	ERECTION. S.W.R. STROP. USED FOR ATTACHMENT OF SNATCH BLOCKS TO GIRDER MEMBERS. No 3 REQD. PER TOWING TRAIN.		

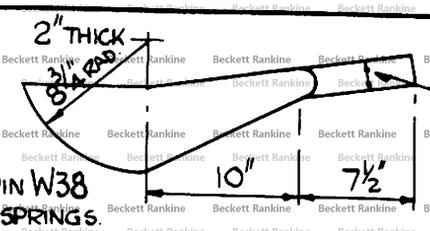
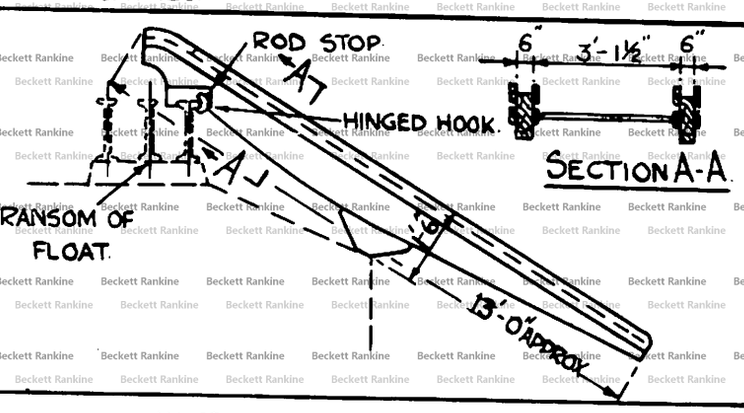
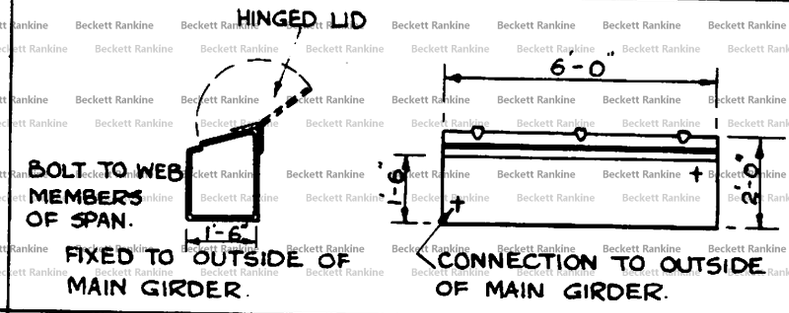
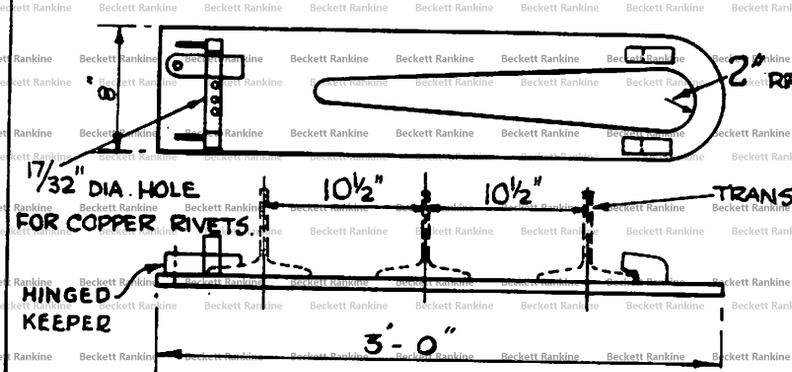
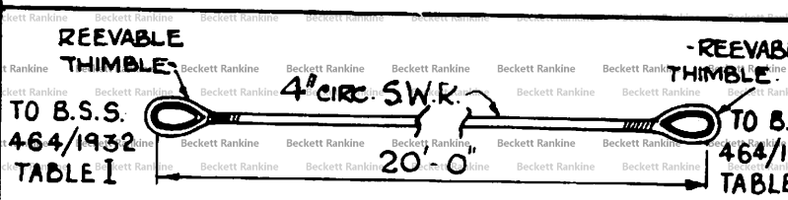
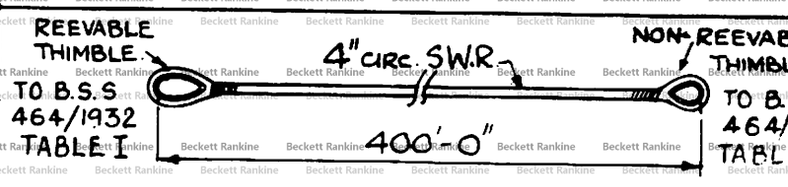
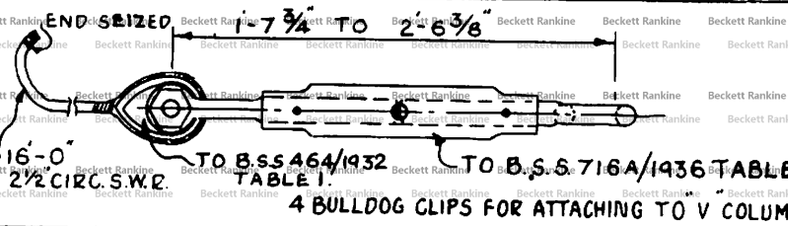
SKETCH. 116

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN. LBS	DIAGRAM OF UNIT.
W143.	ERECTION. INLET COVER. FOR ERECTION TANK. W92. Nº 2. REQD. PER. ERECTION TANK. FOR MUDDY GROUND TO PROTECT STRAINER BOX.	40.	
W144.	ERECTION. TIMBER PACK. Nº 2. REQD. PER. ERECTION TANK.		
W145	ERECTION. SOFT WOOD PACK. Nº 2. REQD. PER. TOWING TRAIN D. Nº 4. REQD. PER. TELESCOPIC END SPAN.		
W146	ERECTION. STIRRUP EXTENSION. Nº 8 REQD. PER TOWING TRAIN D. Nº 24. REQD. PER. TELESCOPIC END SPAN (TOWING TRAIN L)		

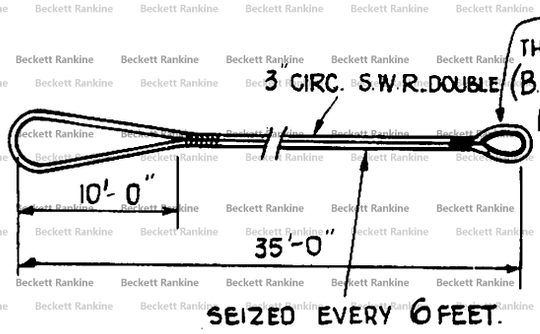
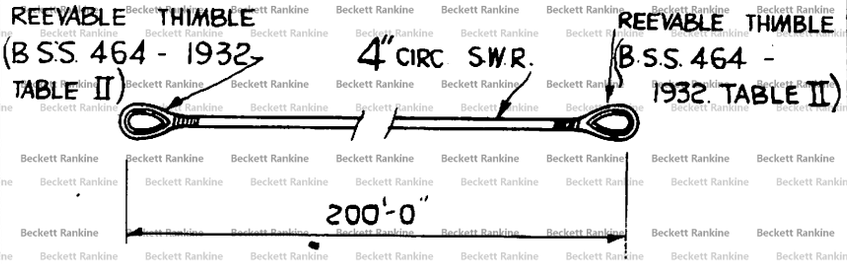
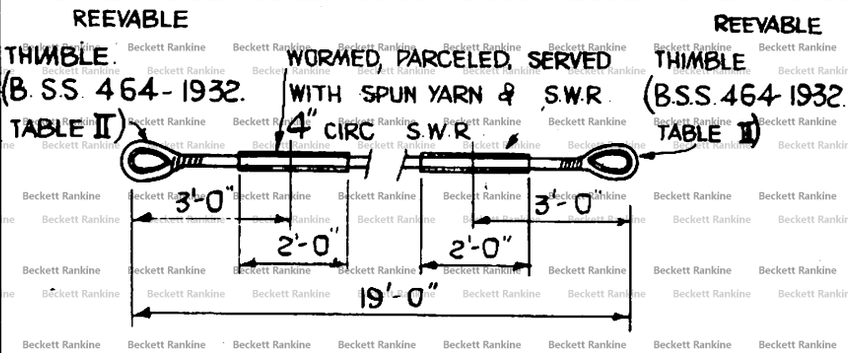
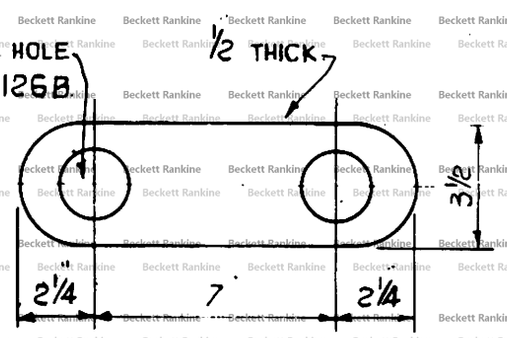
SKETCH 117

FLOATING BRIDGE MK II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 147	ERECTION **PIN LEVER** No 2 REQD PER TOWING TRAIN.		 USED FOR INSERTING PIN W38 FOR CABLE SPRINGS.
W 148	MOORING **SHUTTLE SKID (TIMBER)** No 1. REQD. PER TOWING TRAIN.		
W 149	ERECTION. **TOOL BOX.** No 1 REQD. PER TOWING TRAIN		
W 150	TOWING **QUICK RELEASE ATTACHMENT** No 2 REQD. PER TOWING TRAINS A.B.C.E.F.G & J.		
W 151	TOWING **TOW ROPE.** No 2 REQD. PER TOWING TRAINS A B C E F G H J & K.		
W 152	TOWING **TOW ROPE.** No 1 REQD PER TOWING TRAIN.		
W 153	ERECTION **GUY FOR TRUMPET COLUMN** NO. 1 REQD. PER TRUMPET.		 4 BULLDOG CLIPS FOR ATTACHING TO V COLUMN.

SKETCH 118

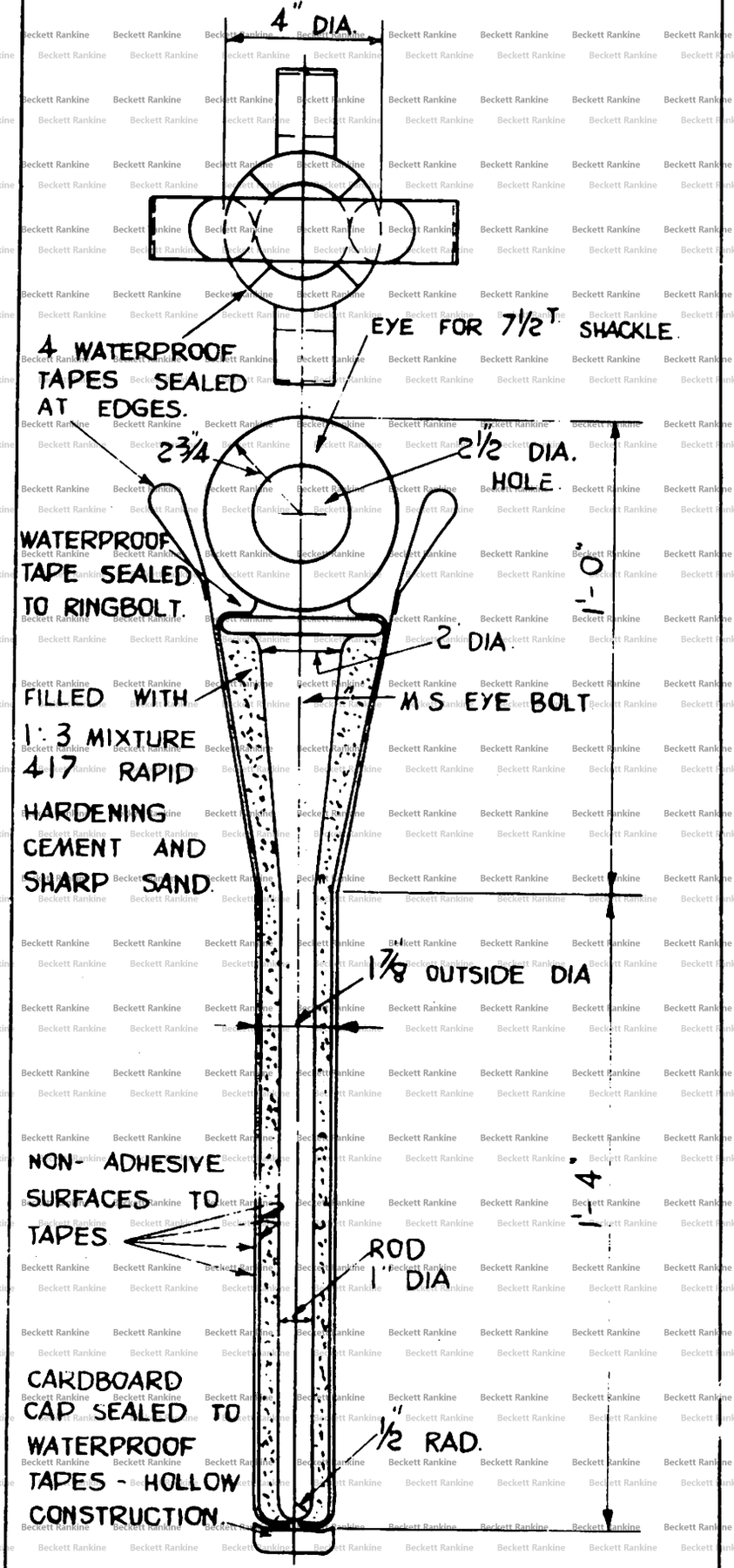
FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK.	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 154.	TOWING TOW - ROPE WITH LOOP Nº 6. REQD. PER. TOWING TRAIN M. Nº 2. REQD. PER. TOWING TRAIN H. & K.		
W 155.	TOWING. TOW ROPE. (200 FT.) Nº 1. REQD. PER. TOWING TRAIN M		
W 156.	TOWING. TOW ROPE. (PARCELED) Nº 2. REQD. PER. TOWING TRAIN D.		
W 157.	MOORING MOORING LINK TO COUPLE MOORINGS. Nº 2 REQD. PER. CONNECTION.		

SKETCH 119.

FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT
W 158	MOORINGS. SELF-GROUTING ROCK ANCHOR.		

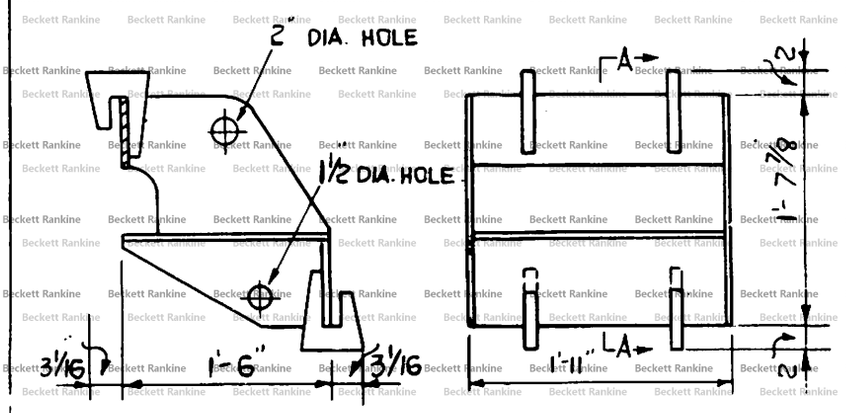
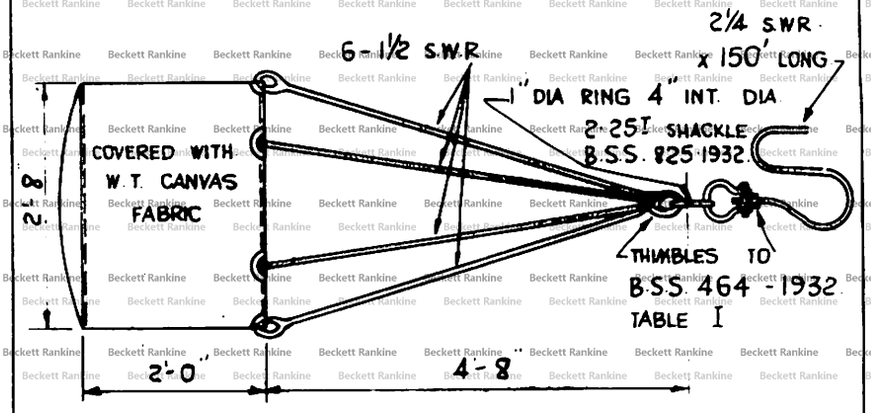
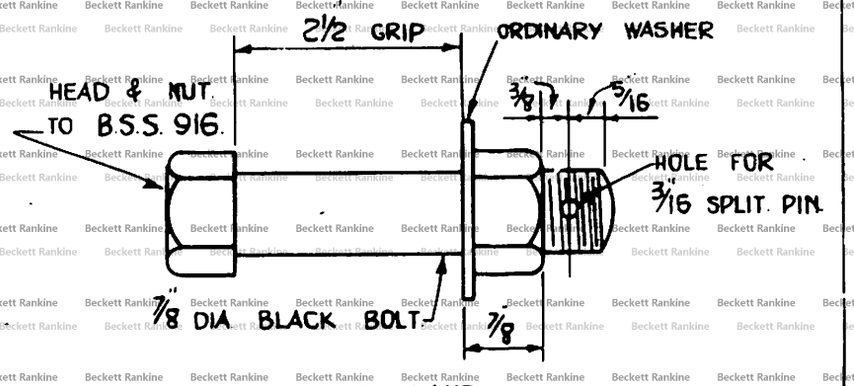
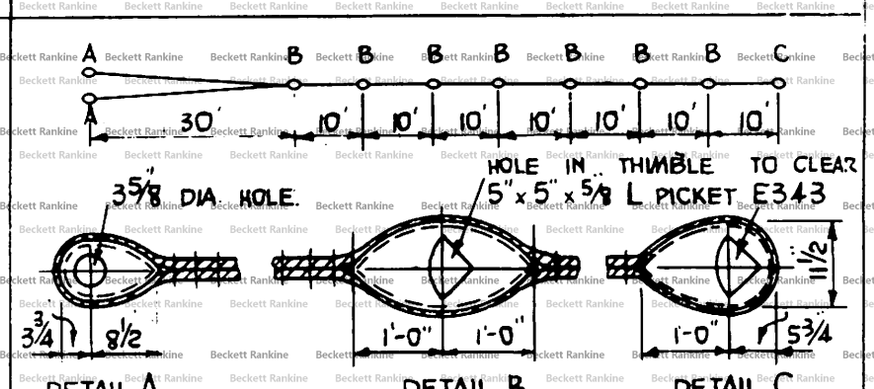


NOTE: TAPES LAID ON DOUBLE & TO BE SEALING WITH PARAFFIN WAX TO BE DESPATCHED IN LIGHT WOODEN BOX. THICKNESS OF TRACING LINEN ALL OVER

W 159. IS AN OBSOLETE UNIT.

SKETCH 120.

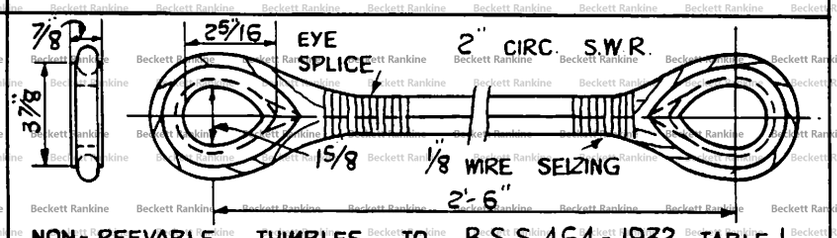
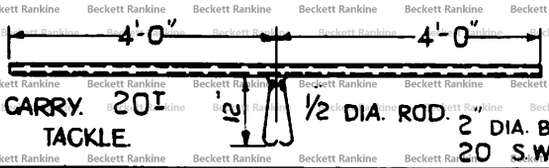
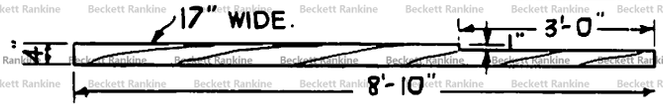
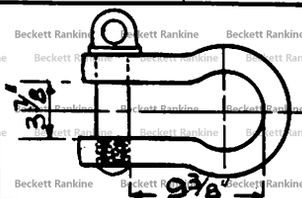
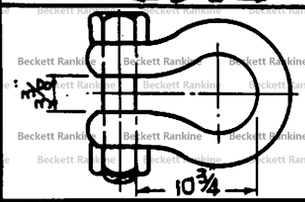
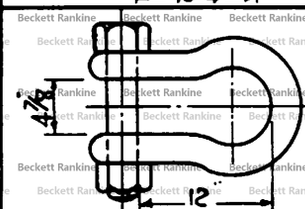
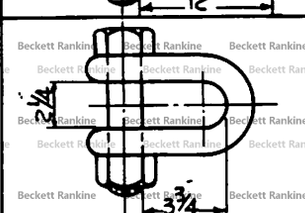
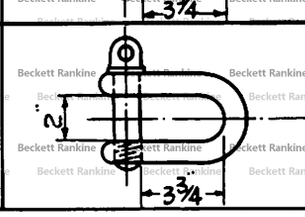
FLOATING BRIDGE MK. II (PAINTED GREY UNLESS NOTED)

UNIT MARK	DESCRIPTION AND USE.	WT. IN LBS.	DIAGRAM OF UNIT.
W 160	TELESCOPIC SPAN. CRADLE. FOR CHANGING METAL BEARING BLOCKS W H136A AND B.		 SECTION. A-A.
W 161	TOWING. TOWING DROGUE. No 2. REQD ON END OF TOWING TRAIN WHEREVER DEPTH OF WATER MAKES IT NECESSARY.		
W 162	SHORE RAMP FLOAT CONNECTING BOLT. No 132. REQD PER FLOAT COMPLETE		 FOR BOLTING SHORE RAMP FLOAT UNITS TOGETHER
W 163	MOORING SHORE ANCHORAGE. No 8 ANGLE PICKETS E343 REQD PER ANCHORAGE No 2. REQD ON GOOD GROUND No 6 REQD ON POOR GROUND-PER SHORE RAMP FLOAT		 DETAIL A. DETAIL B. DETAIL C.

SKETCH. 121.

FLOATING BRIDGE MK II

(PAINTED GREY UNLESS NOTED.)

UNIT MARK	DESCRIPTION AND USE	WT. IN LBS.	DIAGRAM OF UNIT.
W 164.	ERECTION. STROP FOR TRUMPET. Nº 2. REQUIRED PER TRUMPET.		 NON-REEVABLE THIMBLES TO B.S.S. 464-1932. TABLE 1.
W 165	MOORINGS. SLUG BOAT. Nº 4 REQUIRED PER SHORE RAMP FLOAT.		SEE SKETCH Nº 21.
W 166.	MOORINGS. SHUTTLE. Nº 1. REQD. PER. FLOAT		SEE SKETCH Nº 22.
W 167.	ERECTION. LIFTING BAR. Nº 4. REQD. PER SHORE RAMP FLOAT.		 USED TO CARRY 20I BLOCKS & TACKLE.
WH 168	ERECTION. TIMBER PACK. Nº 2. REQD. PER. TOWING TRAIN. B2, C2, D2, E2, F2, G2, H2, J2 & K2.		 USED ON TOP OF SADDLES ON ERECTION TANK.
E 343.	SHORE ANCHORAGE. ANGLE PICKET. Nº 8. REQD. PER. SHORE ANCHORAGE.		
B.S. STANDARD SHACKLES.	TOWING. 12 TON. SHACKLE Nº 2. REQD. PER. TOW ROPE T.B & T.C Nº 4. REQD. PER. TOW ROPE T.A. & T.D Nº 3. REQD. PER. TOW ROPE T.E.		 12 TON LARGE BOW SHACKLE. WITH 2 1/4" DIAMETER SCREWED PIN. TO B.S.S. 825-1939. TYPE A.
	SHORE ANCHORAGE. 20. TON. SHACKLE. Nº 2. REQD. PER. SHORE RAMP FLOAT.		 20 TON. SMALL BOW SHACKLE WITH 3" DIA. BOLT AND HEXAGONAL NUT. TO B.S.S. 825-1939 TYPE D USED ON SEA END OF 20I TACKLE
	SHORE ANCHORAGE. 20. TON. SHACKLE. Nº 2. REQD. PER. SHORE RAMP FLOAT.		 20 TON. LARGE BOW. SHACKLE. WITH 2 7/8 DIA. BOLT AND HEXAGONAL NUT. TO B.S.S. 825-1939. TYPE D USED ON SHORE END OF 20I TACKLE
	TOWING & MOORING. 7½ TON. SHACKLE. Nº 1. REQD. PER. RACKING SPRING. Nº 2 REQD. PER. ROCK ANCHOR BOLT & TOW ROPE T.E.		 7½ TON D. SHAPED SHACKLE. WITH 1 5/8" DIA. BOLT AND HEXAGONAL NUT TO B.S.S. 825-1939 TYPE D OR SCREWED PIN - TYPE A
	ERECTION. 3 TON. SHACKLE. Nº 5. REQD. PER TRUMPET.		 3 TON. D. SHAPED SHACKLE. WITH 1 1/8 DIAMETER. SCREWED PIN. TO B.S.S. 825. - 1939. TYPE A.