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TABLES AND DIAGRAMS

FOR OBTAINING THE

Resisting Moments of Eccentric Riveted Connections

BY

E. A. REXFORD

NEW YORK

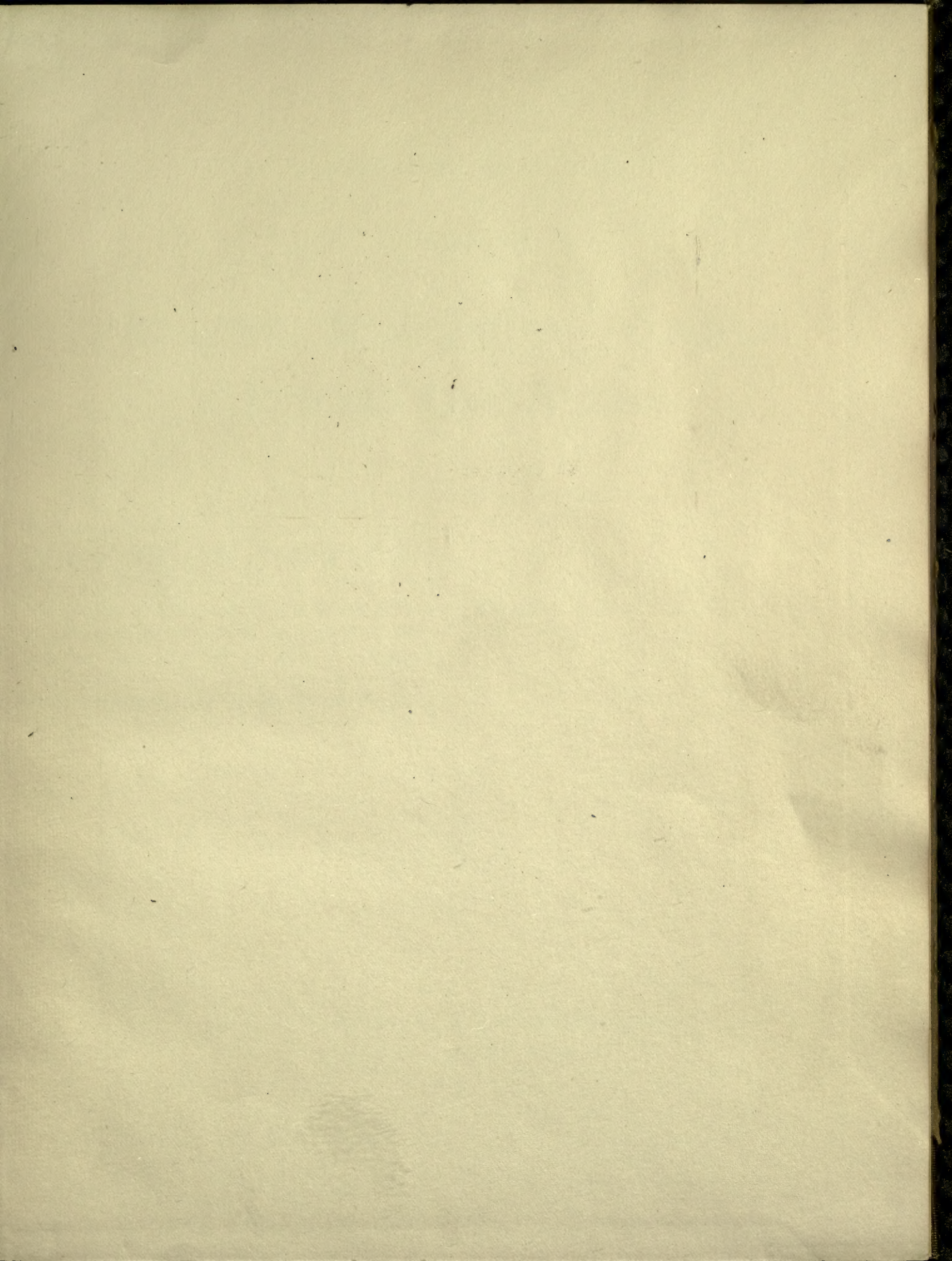
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TABLES AND DIAGRAMS

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RESISTING MOMENTS OF ECCENTRIC RIVETED CONNECTIONS

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TABLES AND DIAGRAMS

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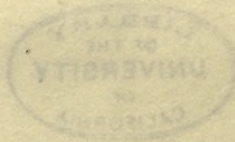
FOR OBTAINING THE

RESISTING MOMENTS OF ECCENTRIC
GENERAL
RIVETED CONNECTIONS

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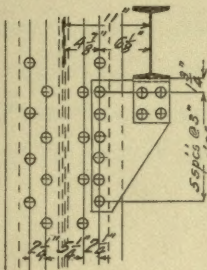
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HOW TO APPLY THE TABLES

The purpose of these tables is to facilitate the operations of obtaining the resisting moments of eccentric riveted connections, and is intended especially for use in designing connections to columns where eccentric loads are involved.

The following problem illustrates the application of the table:

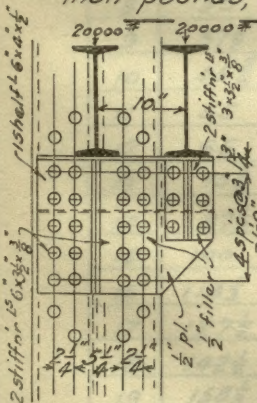


Suppose we have a beam framing to a column 11" off the center line of the column and that the reaction of the beam is 12000.#

Use a single row of rivets to connect the bracket to the column and the pitch of the rivets will be 3".

The load is $6\frac{1}{2}$ " from the center line of the rivets and the bending moment is therefore $6\frac{1}{2} \times 12000 = 73500$ inch lbs.

Assume that six rivets are required. - Turning to page 1 we find that for a single row of six rivets with a 3" pitch the coefficient is 21. The stress per rivet due to direct load is $12000 \div 6 = 2000$.# Referring to the sketch, page 1, and laying off the stress per rivet due to direct load on the vertical ordinate at the left and then moving parallel to the abscissae until reaching the 4420# curve, since the rivets are in single shear, thence vertically downward to the base line we find that the allowable bending stress on the extreme rivet is 3900.# Multiplying $21 \times 3900 = 81900$ inch pounds = the resisting moment of the connection. The bending moment is 73500 inch pounds, and therefore the connection is safe. $\frac{3}{4}$ " rivets were used.



Load = 40,000.#
 Rivets $\frac{3}{4}$ " dia.
 Assume 20 rivets.
 Stress per rivet due to direct load = 2000.#
 Bending stress on extreme rivet = 2900.#
 C = 86.2
 Resisting Moment =
 $86.2 \times 2900 = 249,980$ in lbs.
 Bending Moment =
 $10 \times 20,000 = 200,000$ in lbs.
 \therefore The connection is safe.

It may be noticed that the two $6 \times 3\frac{1}{2} \times \frac{3}{8}$ stiffener¹² under the beam on the column center extend the full length of the connection plate, and embrace all the rivets in the connection. This is done to distribute the shear due to direct load uniformly among all the rivets. In this particular case, where the resisting moment so greatly exceeds the bending moment, the four bottom rivets could be omitted from the stiffeners and the connection still be safe.

HOW TO APPLY THE TABLES

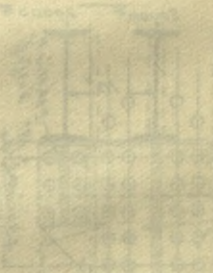
The purpose of these tables is to facilitate the designer of obtaining the resulting moments of eccentric riveted connections, and is intended especially for use in designing connections to columns where eccentric loads are involved.

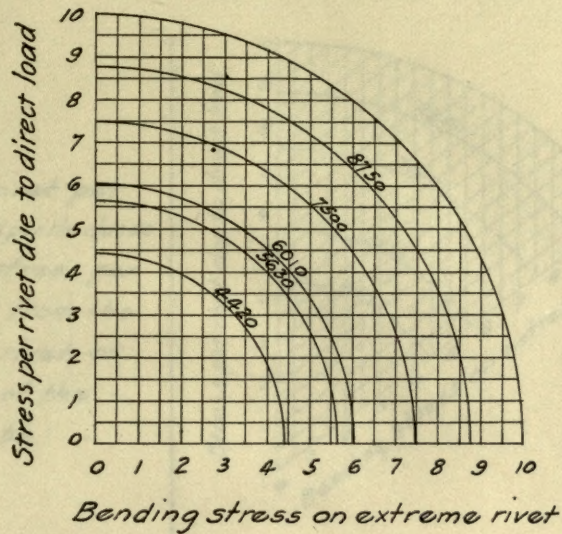
The following problem illustrates the application of the tables. Suppose we have a beam framing to a column 11 ft. to the center line of the column and that the location of the beam is 1200 mm less angle row of rivets to connect the bracket to the column and the pitch of the rivets will be 2". The load is 60 kips from the center line of the rivets and the bending moment is therefore 60 x 1200 = 72000 inch kips. Assume that six rivets are required. Turning to page 1 we find that for a single row of six rivets with a pitch the coefficient is 21. The stress per rivet due to direct load is 72000 / 21 = 3428.6 kips.



forming to the column. The direct load on the vertical center of the bracket and the distance until reaching the 4450 curve, single shear, these values vertically downward to the base line we find that the allowable bending stress on the extreme rivet is 3800. Multiplying 21 x 3800 = 81000 inch pounds = the resulting moment of the connection. The bending moment is 72000 inch pounds and therefore the connection is safe.

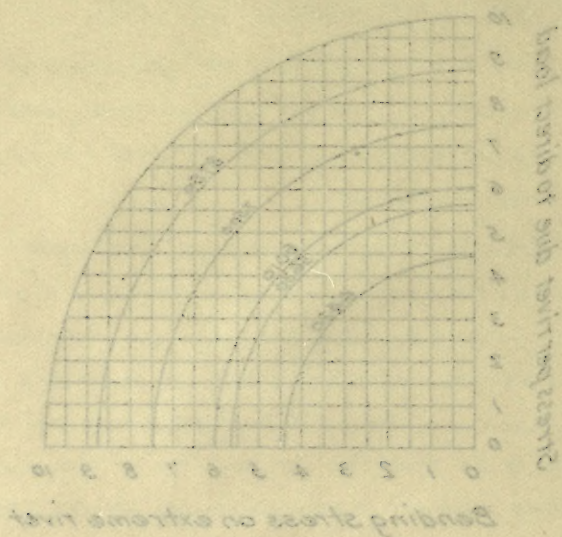
It may be noted that the two...
 11 ft. column height
 1200 mm beam offset
 60 kips load
 21 coefficient
 3428.6 stress per rivet
 72000 bending moment
 3800 allowable stress
 81000 resulting moment





One Row of Rivets - Uniform Pitch

No. Rivs.	2½"	3"	3½"	4"	4½"	5"	6"
1	0	0	0	0	0	0	0
2	2½	3	3½	4	4½	5	6
3	5	6	7	8	9	10	12
4	8½	10	11½	13½	15	16½	20
5	12½	15	17½	20	22½	25	30
6	17½	21	24½	28	31½	35	42
7	23½	28	32½	37½	42	46½	56
8	30	36	42	48	54	60	72
9	37½	45	52½	60	67½	75	90
10	45½	55	64½	73½	82½	91½	110
11	55	66	77	88	99	110	132
12	65	78	91	104	117	130	156
13	75½	91	106½	121½	136½	151½	182
14	87½	105	122½	140	157½	175	210
15	100	120	140	160	180	200	240
16	113½	136	158½	181½	204	226½	272
17	127½	153	178½	204	229½	255	306
18	142½	171	199½	228	256½	285	342
19	158½	190	221½	253½	285	316½	380
20	175	210	245	280	315	350	420

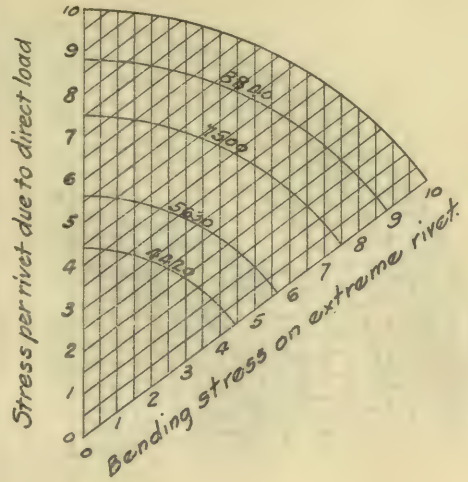


One Row of Rivets - Uniform Pitch

Number of Rivets	2 1/2"	3"	3 1/2"	4"	5"
1	0	0	0	0	0
2	2 1/2	3	3 1/2	4	5
3	5	6	7	8	10
4	8 1/2	10	11 1/2	12 1/2	15
5	12 1/2	15	17 1/2	20	25
6	17 1/2	21	24 1/2	28	35
7	23 1/2	28	32 1/2	37 1/2	45
8	30	36	42	48	60
9	37 1/2	45	52 1/2	60	75
10	45 1/2	55	64 1/2	75	90
11	55	66	77	88	110
12	65	78	91	102	135
13	75 1/2	91	106 1/2	120	165
14	87 1/2	105	123 1/2	140	210
15	100	120	140	160	270
16	115 1/2	136	158 1/2	185	345
17	132 1/2	153	178 1/2	208	435
18	150 1/2	171	199 1/2	238	555
19	180 1/2	190	223 1/2	275	720
20	210 1/2	210	252	320	960

Two rows of rivets - $2\frac{1}{4}$ " ctr. to ctr. of rows - Rivets spaced 3" ctr. to ctr. in the rows.
Rivets not staggered.

Where there is one rivet per row to obtain the stress per riv. due to bending subtract the stress per rivet due to direct load from the resisting value of the rivet, or from the bearing value of the plate as the case may be.

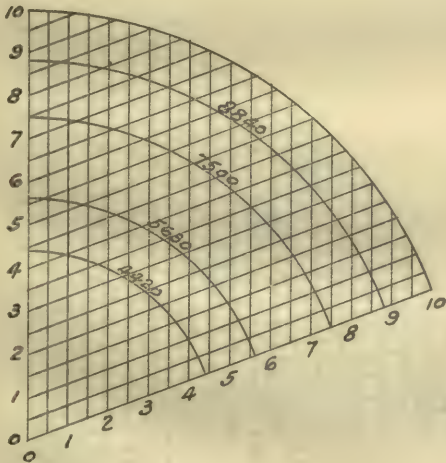


1 Rivet per row.

$C = 2.25$

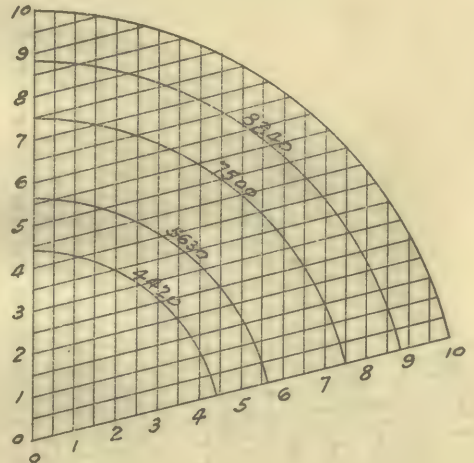
2 Rivets per row.

$C = 7.50$



3 Rivets per row.

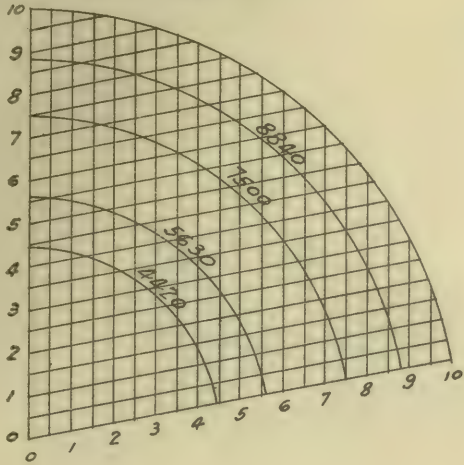
$C = 13.60$



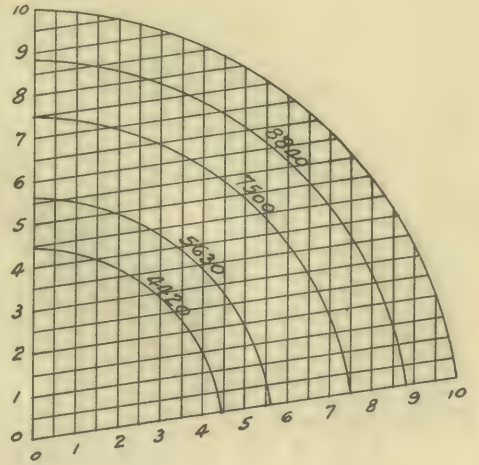
4 Rivets per row.

$C = 21.60$

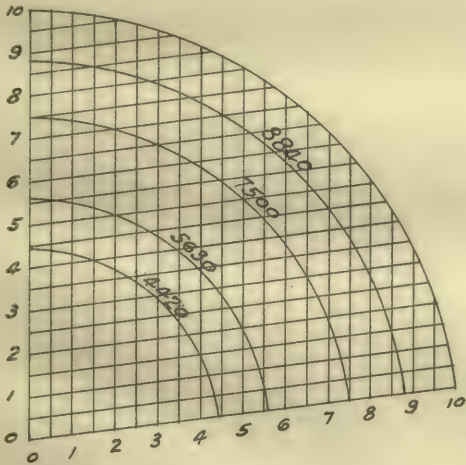
Two rows of rivets: - $2\frac{1}{4}$ " ctr. to ctr. of rows. Rivets spaced 3" ctr. to ctr. in the rows.
Rivets not staggered.



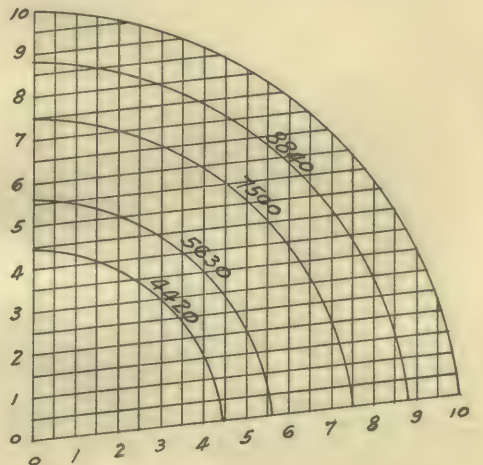
5 Rivets per row
 $C = 31.50$



6 Rivets per row.
 $C = 43.50$



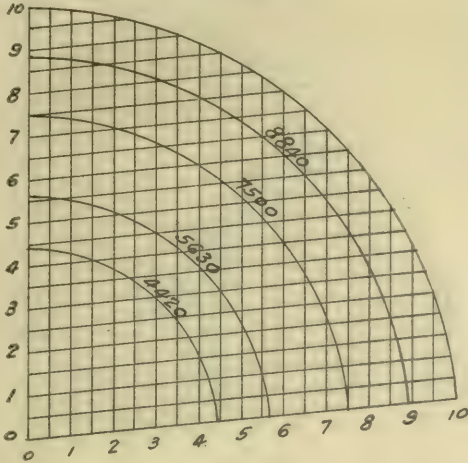
7 Rivets per row
 $C = 57.50$



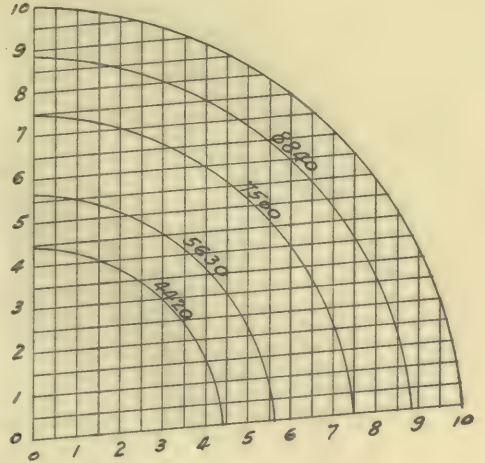
8 Rivets per row
 $C = 73.50$

PLATE 4.

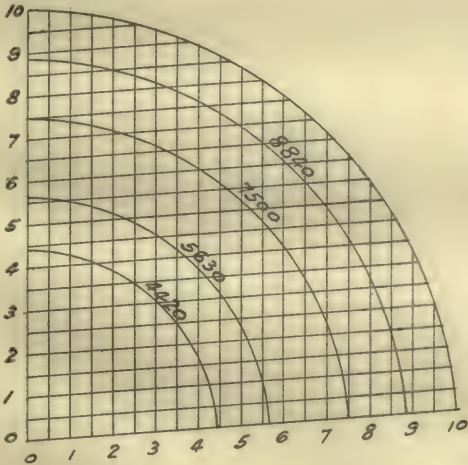
Two rows of rivets - $2\frac{1}{4}$ " ctr to ctr of rows - Rivets spaced 3" ctr to ctr. in the rows.
Rivets not staggered



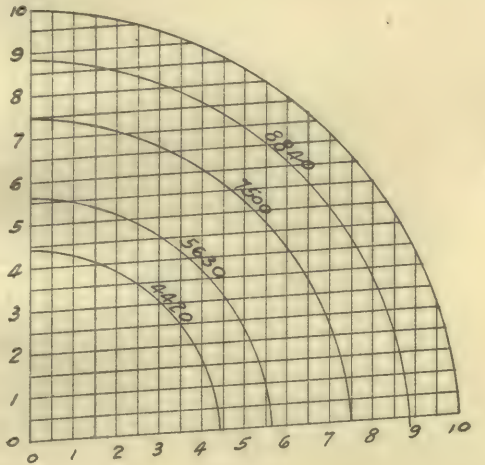
9 Rivets per row
C = 91.50



10 Rivets per row.
C = 111.50



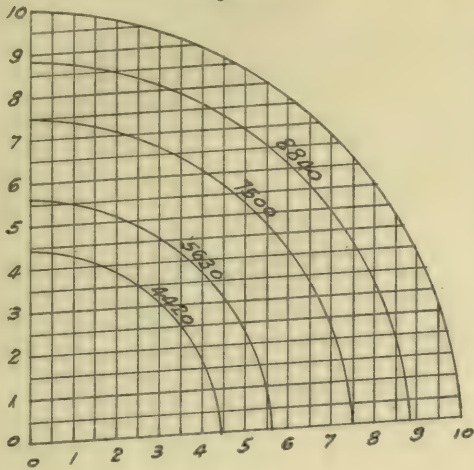
11 Rivets per row
C = 133.50



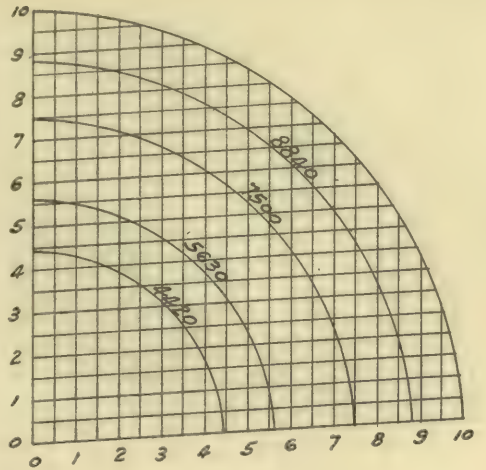
12 Rivets per row
C = 157.50

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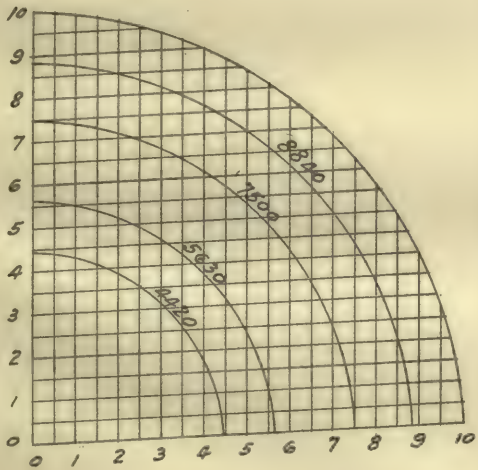
Two rows of rivets - $2\frac{1}{4}$ " ctr to ctr of rows - Rivets spaced 3" ctr to ctr in the rows.
Rivets not staggered.



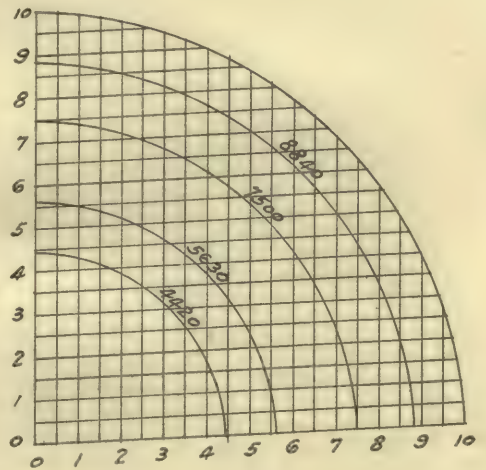
13 Rivets per row
C = 183.50



14 Rivets per row.
C = 211.50

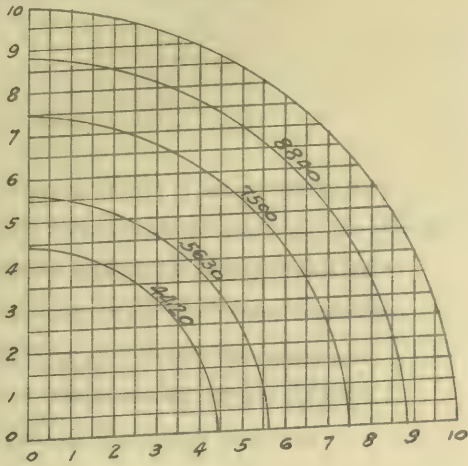


15 Rivets per row
C = 241.50

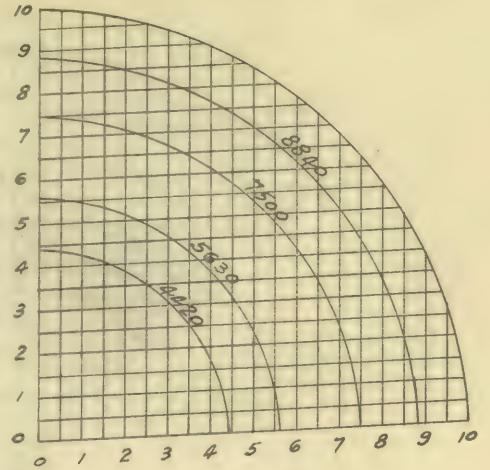


16 Rivets per row
C = 273.50

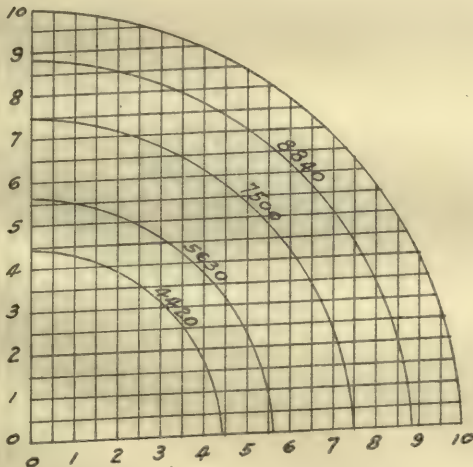
Two rows of rivets: $2\frac{1}{4}$ " ctr. to ctr. of rows. - Rivets spaced 3" ctr. to ctr. in the rows.
Rivets not staggered.



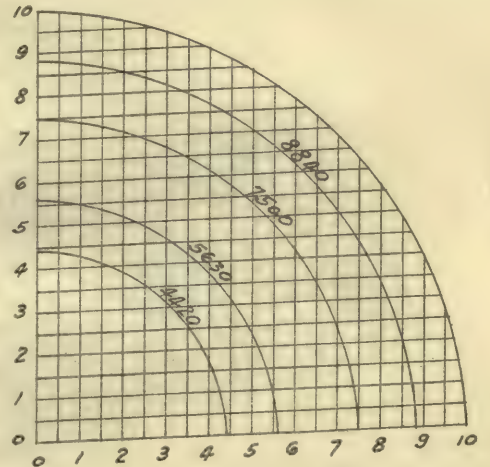
17 Rivets per row
C = 307.50



18 Rivets per row
C = 343.50



19 Rivets per row
C = 381.50

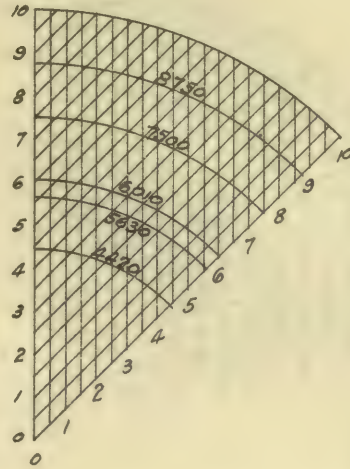


20 Rivets per row
C = 421.50

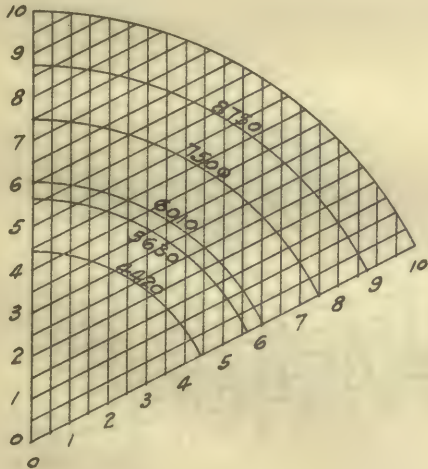
Two rows of rivets-3" ctr. to ctr. of rows. Rivets spaced 3" ctr. to ctr. in the rows.
Rivets not staggered.

Where there is one rivet per row to obtain the stress per riv. due to bending subtract the stress per rivet due to direct load from the resisting value of the rivet, or from the bearing value of the plate as the case may be.

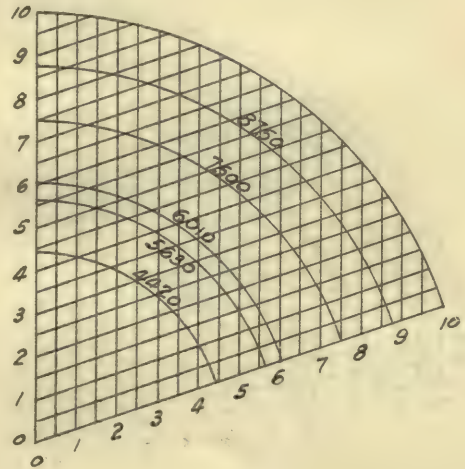
1 Rivet per row.
 $C=3$



2 Rivets per row
 $C=8.50$



3 Rivets per row
 $C=14.80$

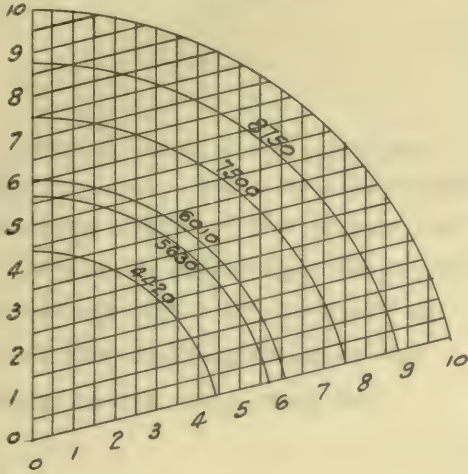


4 Rivets per row.
 $C=22.80$

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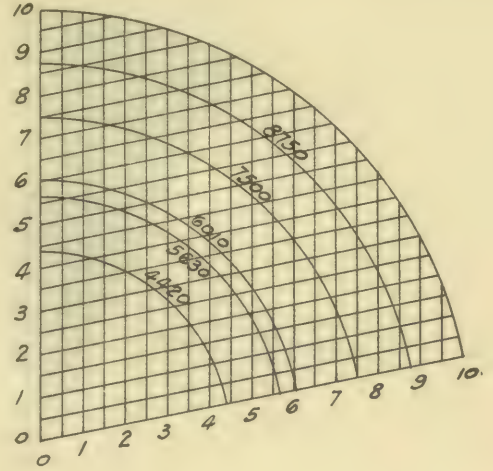
Two rows of rivets-3" ctr to ctr. of rows. Rivets spaced 3" ctr to ctr. in the rows.

Rivets not staggered.



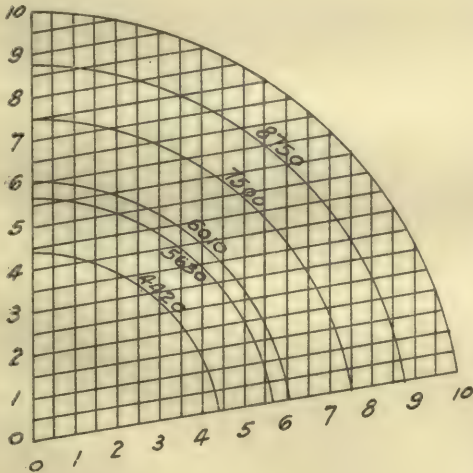
5 Rivets per row.

$C = 32.80$



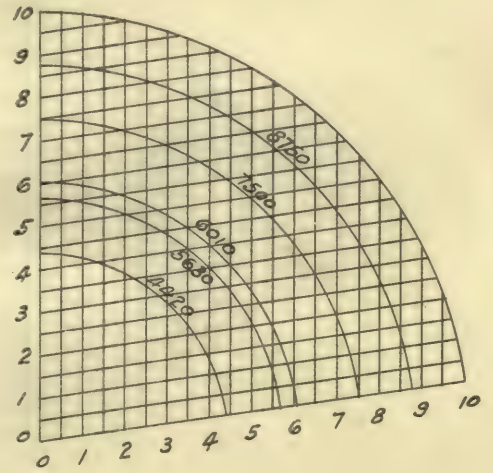
6 Rivets per row.

$C = 44.70$



7 Rivets per row.

$C = 58.70$



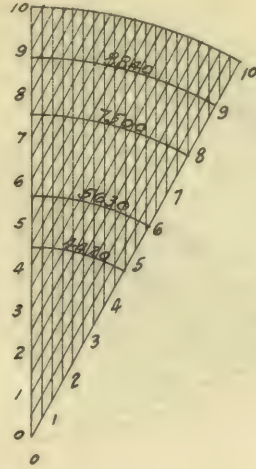
8 Rivets per row.

$C = 74.60$

Note. For more than 8 rivets per row use values for two rows of rivets $2\frac{1}{4}$ " c. to c. of rows pp 4-5-6.

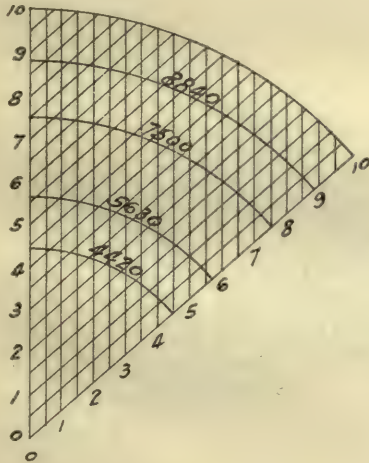
Two rows of rivets - $5\frac{1}{4}$ " ctr to ctr of rows - Rivets spaced 3" ctr to ctr in the rows.
Rivets not staggered

Where there is one rivet per row to obtain the stress per riv. due to bending subtract the stress per rivet due to direct load from the resisting value of the rivet, or from the bearing value of the plate as the case may be.

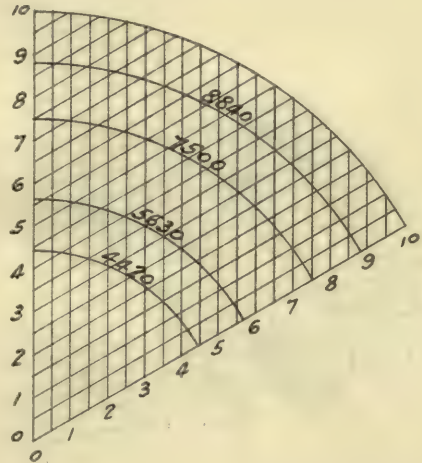


1 Rivet per row
 $C = 5.25$

2 Rivets per row
 $C = 12.10$

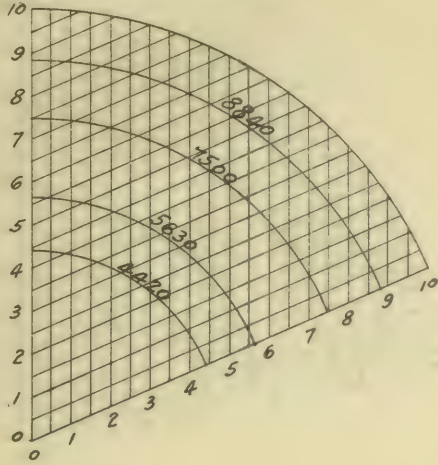


3 Rivets per row.
 $C = 19.40$

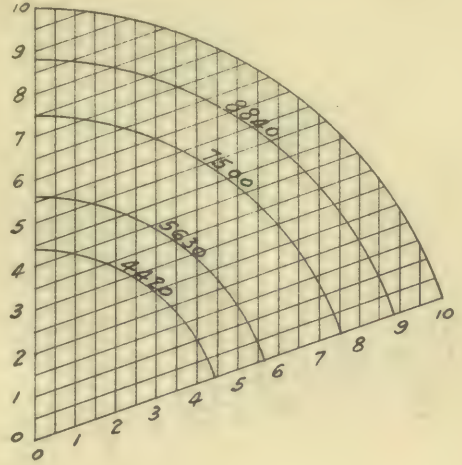


4 Rivets per row.
 $C = 27.80$

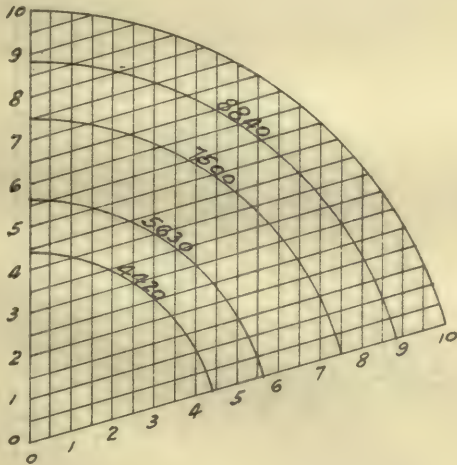
Two rows of rivets - $5\frac{1}{4}$ " ctr. to ctr. of rows - Rivets spaced 3" ctr. to ctr. in the rows
 Rivets not staggered.



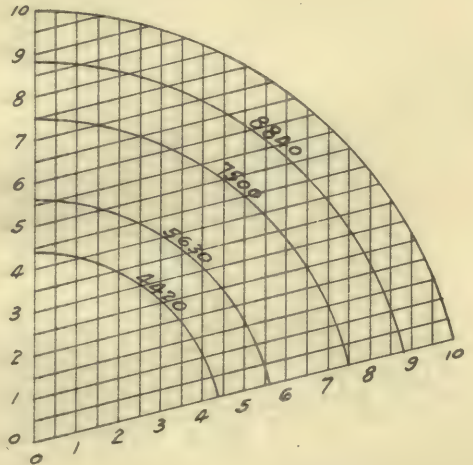
5 Rivets per row
 $C = 38$



6 Rivets per row
 $C = 50$

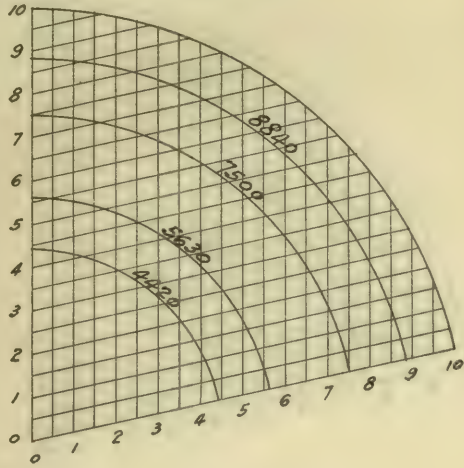


7 Rivets per row
 $C = 64$

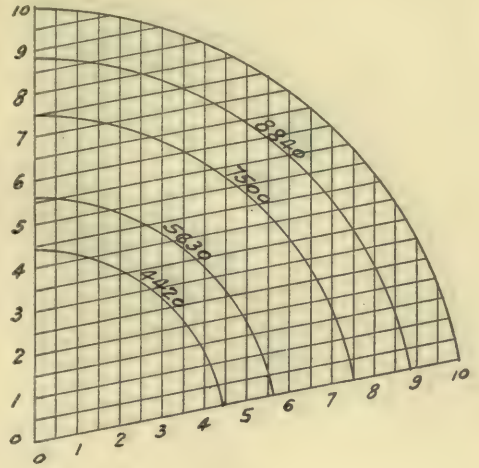


8 Rivets per row
 $C = 80$

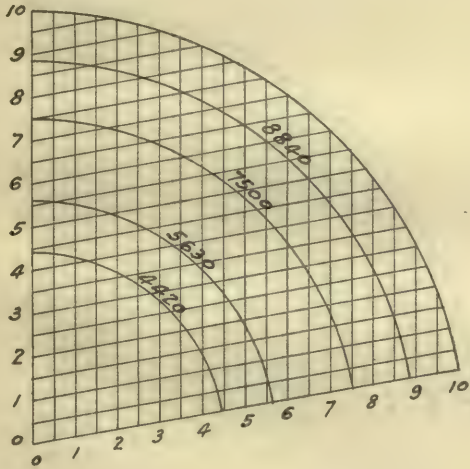
TWO rows of rivets - $5\frac{1}{4}$ " ctr. to ctr. of rows - Rivets spaced 3" ctr. to ctr. in the rows.
 Rivets not staggered



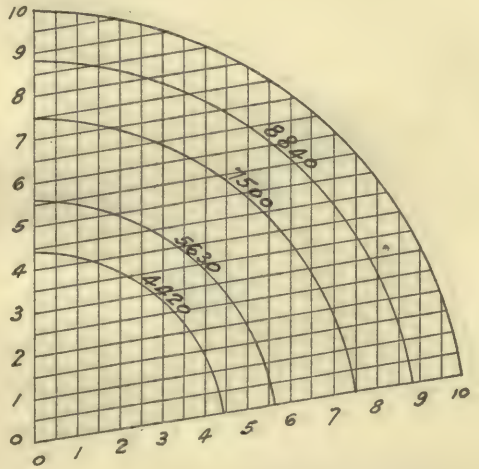
9 Rivets per row
 C = 98



10 Rivets per row
 C = 118



11 Rivets per row
 C = 140



12 Rivets per row
 C = 164.10

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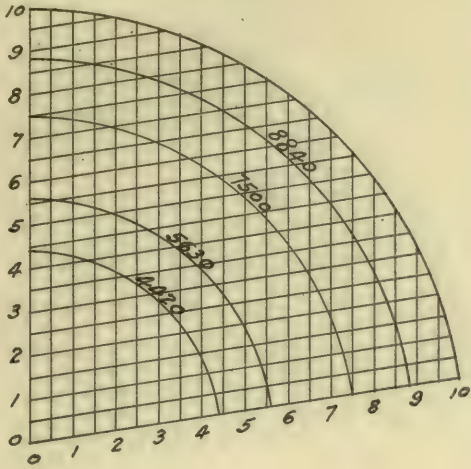


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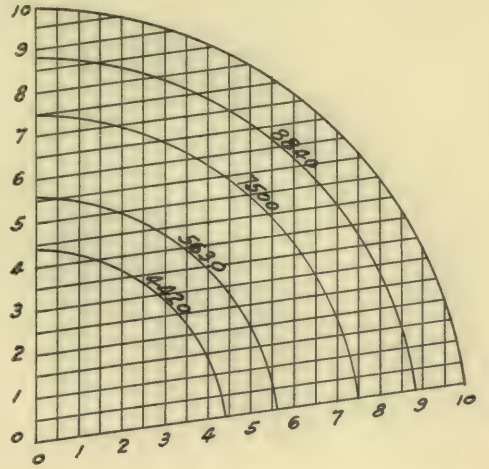


Two rows of rivets - $5\frac{1}{2}$ " ctr. to ctr. of rows. - Rivets spaced 3" ctr. to ctr. in the rows.

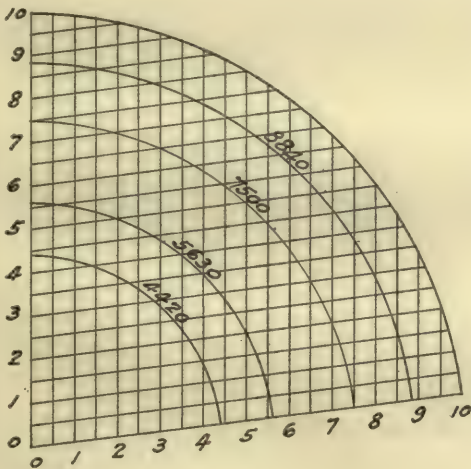
Rivets not staggered



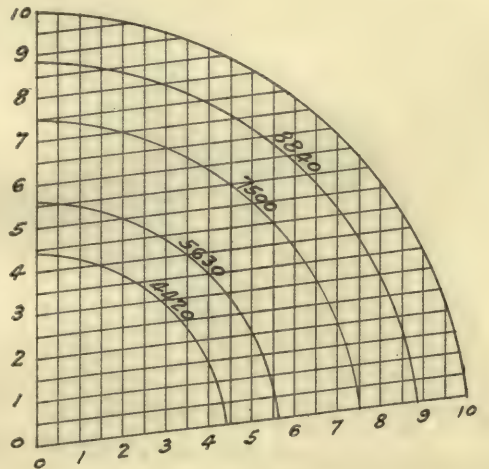
13 Rivets per row
C = 189.90



14 Rivets per row
C = 217.90

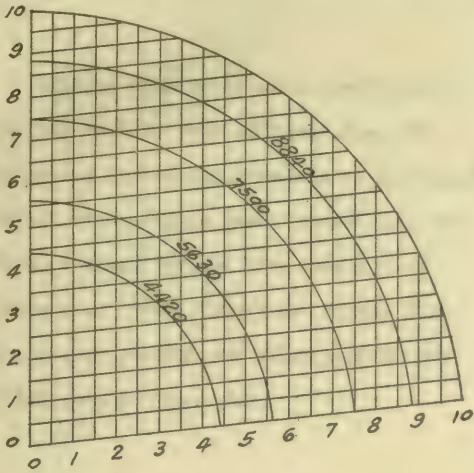


15 Rivets per row
C = 247.90

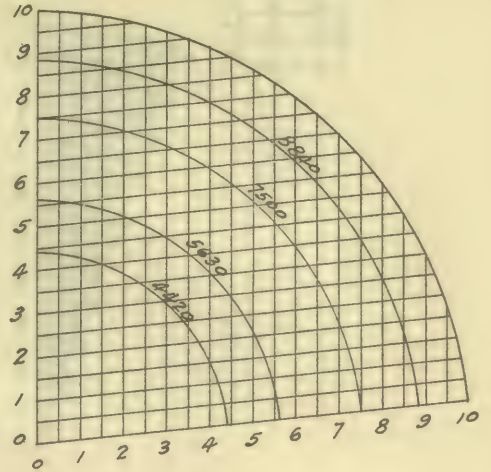


16 Rivets per row
C = 279.90

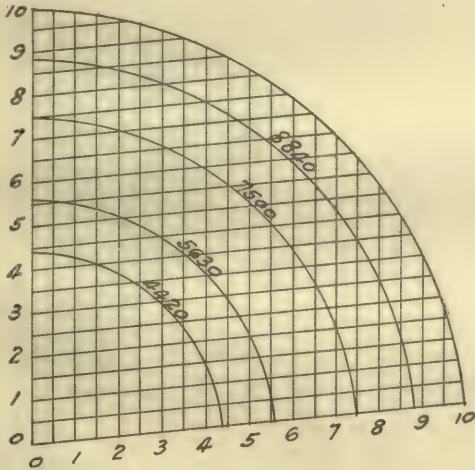
Two rows of rivets. - $5\frac{1}{4}$ " ctr. to ctr. of rows. - Rivets spaced 3" ctr. to ctr. in the rows.
Rivets not staggered.



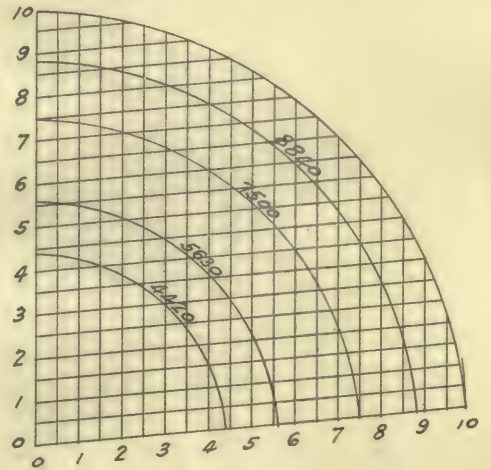
17 Rivets per row
C = 313.90



18 Rivets per row
C = 349.90

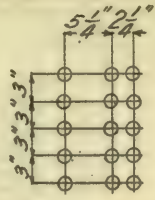


19 Rivets per row.
C = 387.90

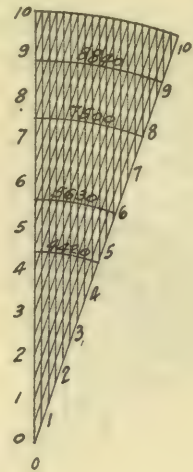


20 Rivets per row
C = 427.90

Three rows of rivets-distances between rows as shown
 Rivets spaced 3" ctr to ctr. in the rows.

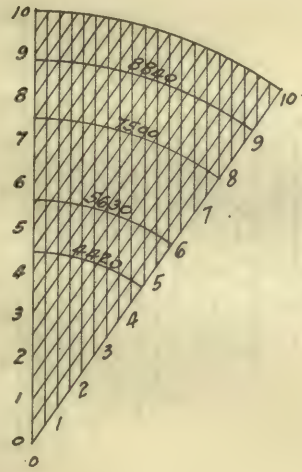


Where there is one rivet per row to obtain the stress due to bending on the extreme rivet subtract the stress per rivet due to direct load from the resisting value of the rivet, or from the bearing value of the plate as the case may be.

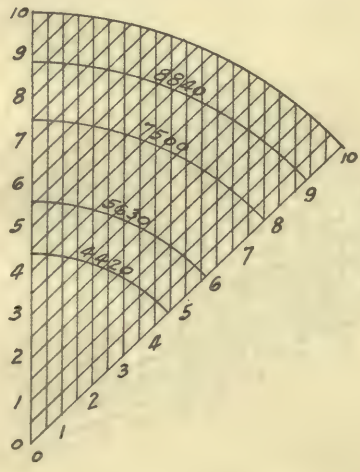


1 Rivet per row
 $C = 7$

2 Rivets per row
 $C = 16.10$

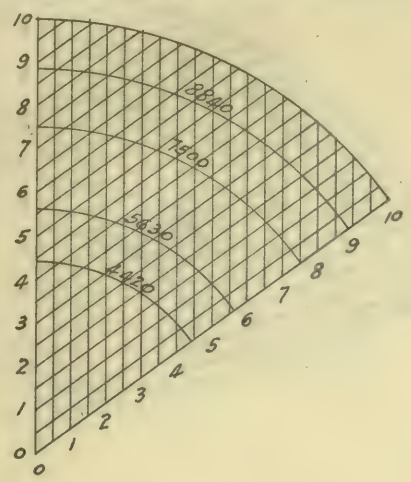
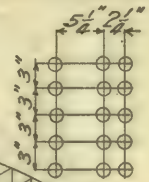


3 Rivets per row
 $C = 27.50$

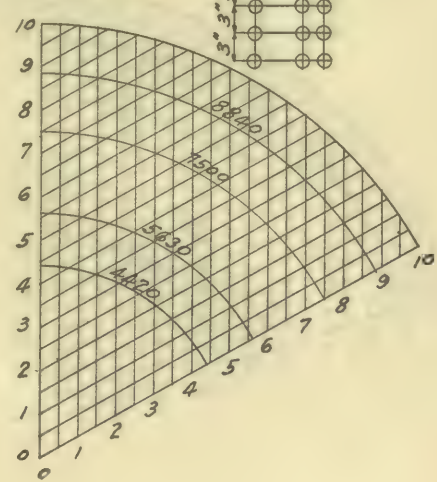


4 Rivets per row
 $C = 41$

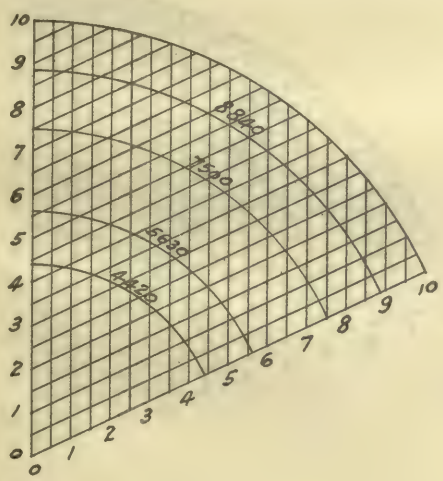
Three rows of rivets—distances between rows as shown
 Rivets spaced 3" ctr. to ctr. in the rows.



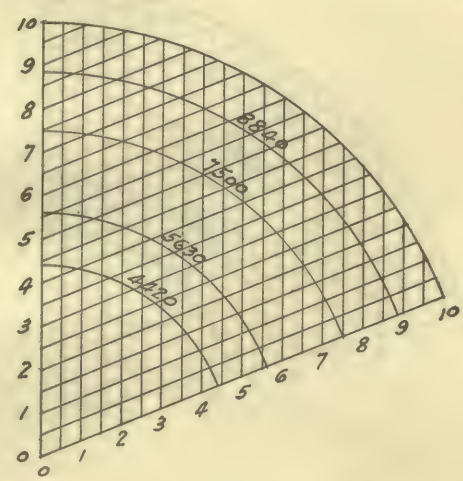
5 Rivets per row
 C = 56.90



6 Rivets per row
 C = 75.40

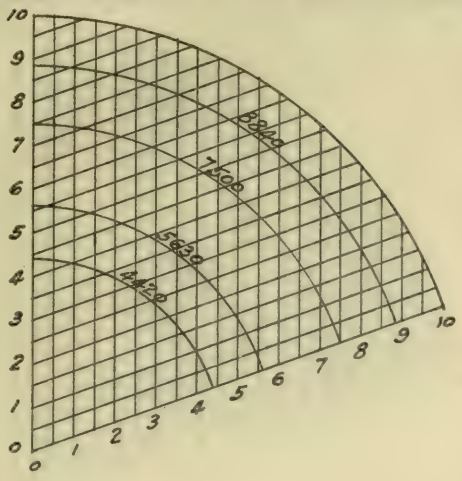
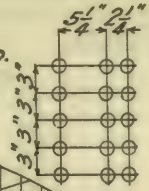


7 Rivets per row
 C = 96.80

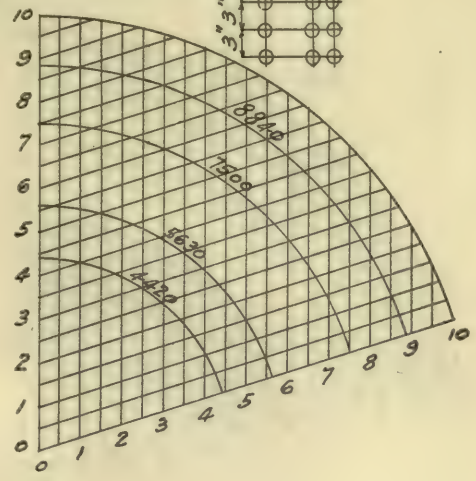


8 Rivets per row
 C = 121

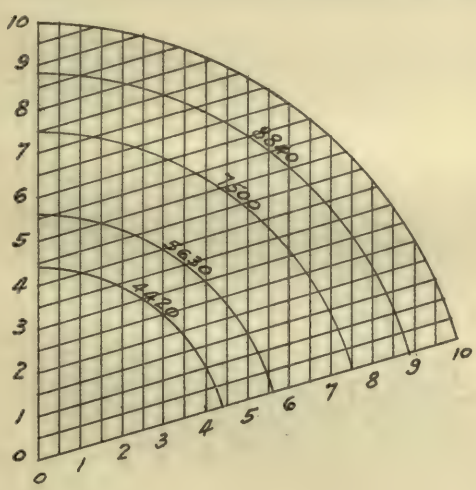
Three rows of rivets - distances between rows as shown.
 Rivets spaced 3" ctr. to ctr. in the rows.



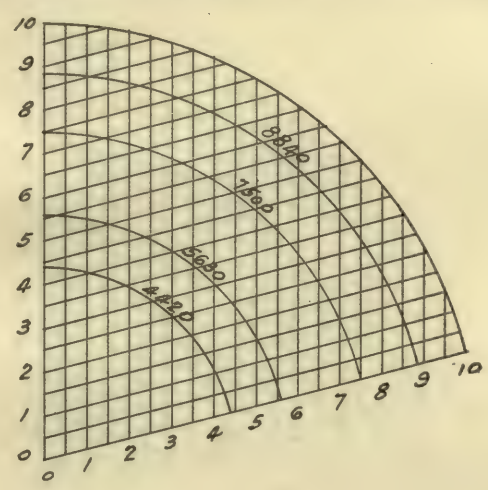
9 Rivets per row
 C = 148.20



10 Rivets per row
 C = 178.30



11 Rivets per row
 C = 211.40



12 Rivets per row
 C = 247.50

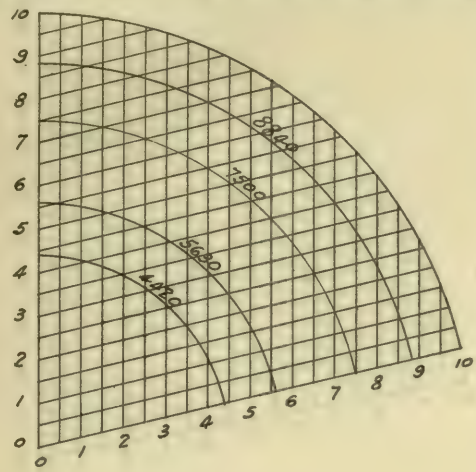
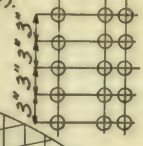


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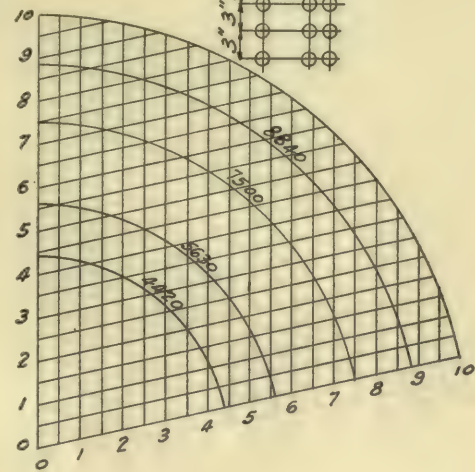
LIBRARY OF THE UNIVERSITY OF CALIFORNIA

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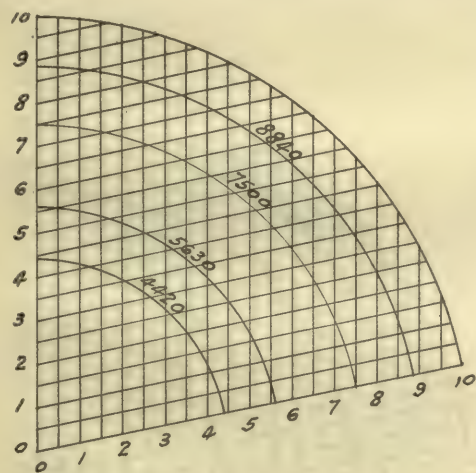
Three rows of rivets - distances between rows as shown.
 Rivets spaced 3" ctr. to ctr. in the rows.



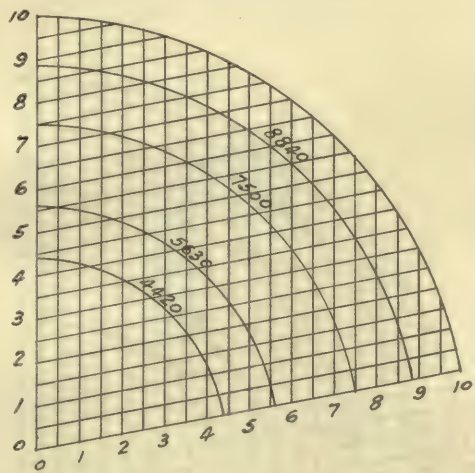
13 Rivets per row
 C = 286.50



14 Rivets per row
 C = 328.50

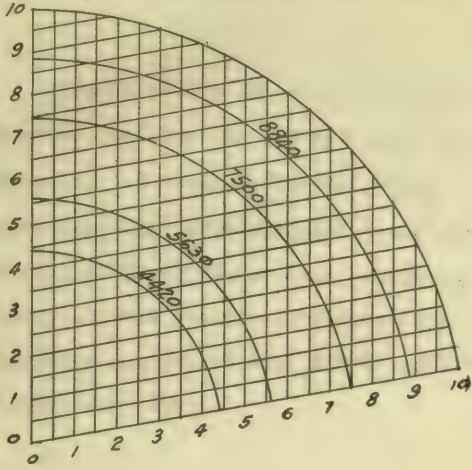


15 Rivets per row
 C = 373.60

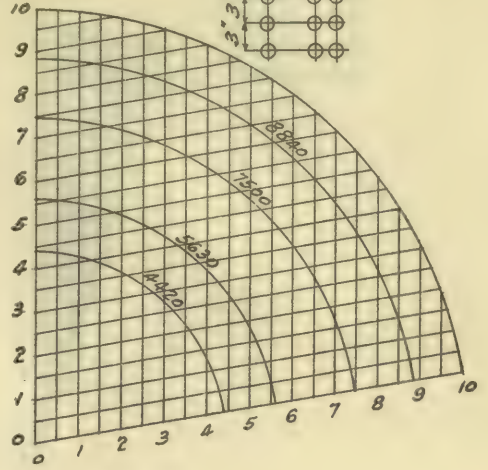


16 Rivets per row
 C = 421.60

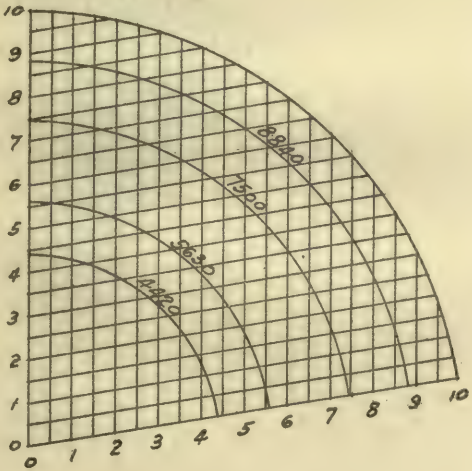
Three rows of rivets - distances between rows as shown.
 Rivets spaced 3" ctr. to ctr. in the rows.



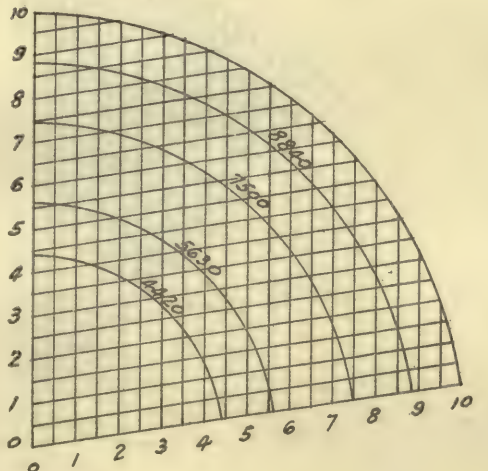
17 Rivets per row
 $C=472.60$



18 Rivets per row
 $C=526.60$

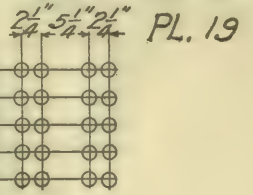


19 Rivets per row
 $C=583.70$

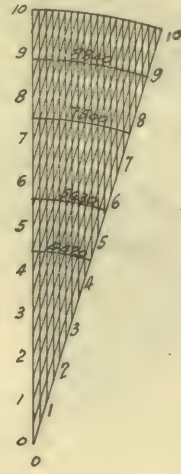


20 Rivets per row
 $C=643.70$

Four rows of rivets - distances between rows as shown.
 Rivets spaced 3" ctr. to ctr. in the rows.

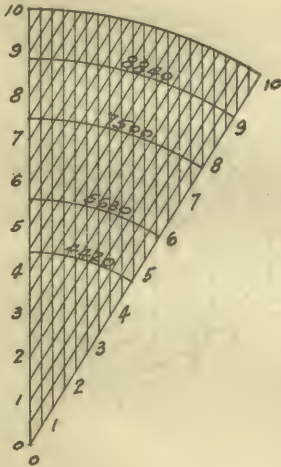


Where there is one rivet per row to obtain the stress due to bending on the extreme rivet subtract the stress per rivet due to direct load from the resisting value of the rivet, or from the bearing value of the plate as the case may be.

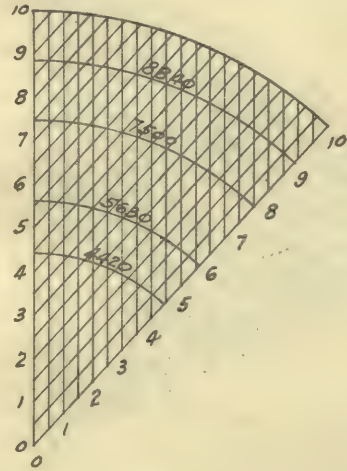


1 Rivet per row
 $C = 12.60$

2 Rivets per row
 $C = 27.60$

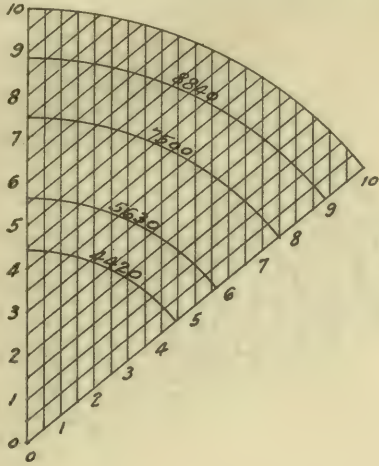
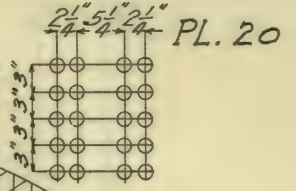


3 Rivets per row
 $C = 44.70$

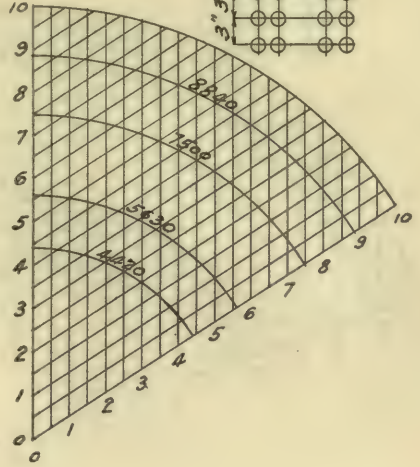


4 Rivets per row
 $C = 64.10$

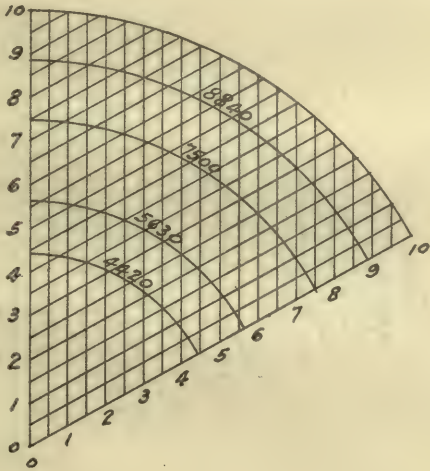
Four rows of rivets - distances between rows as shown
 Rivets spaced 3" ctr to ctr in the rows.



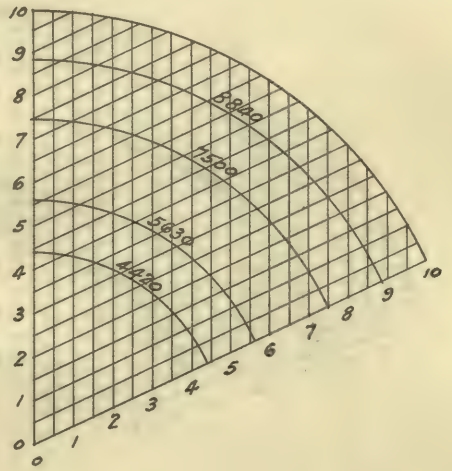
5 Rivets per row
 $C=86.20$



6 Rivets per row
 $C=111.50$

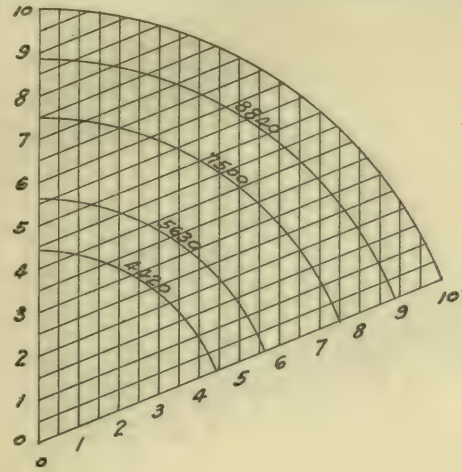
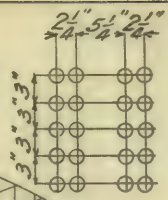


7 Rivets per row
 $C=140.40$

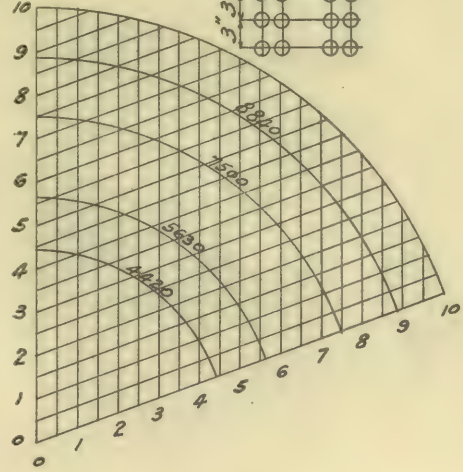


8 Rivets per row
 $C=173$

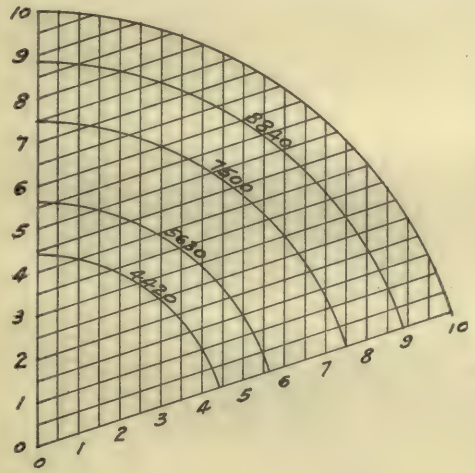
Four rows of rivets—distances between rows as shown
 Rivets spaced 3" ctr. to ctr. in the rows.



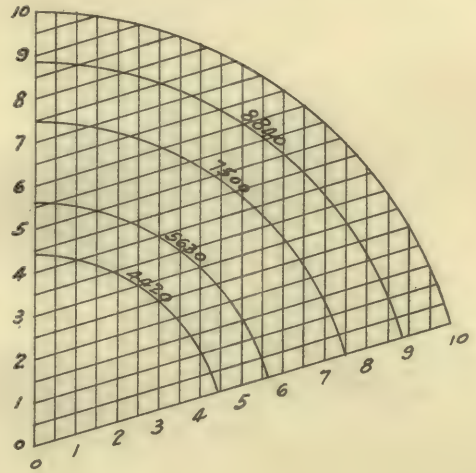
9 Rivets per row
 $C = 209.40$



10 Rivets per row
 $C = 249.60$

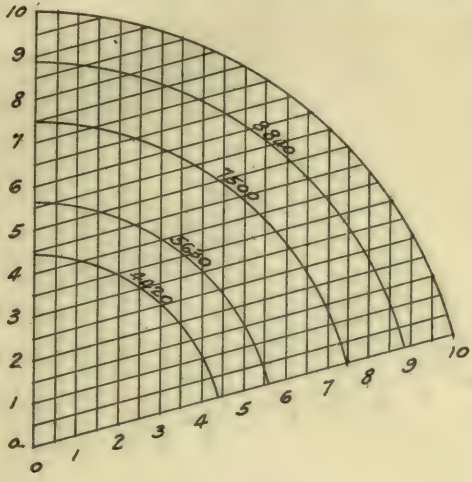
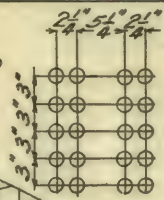


11 Rivets per row
 $C = 293.80$

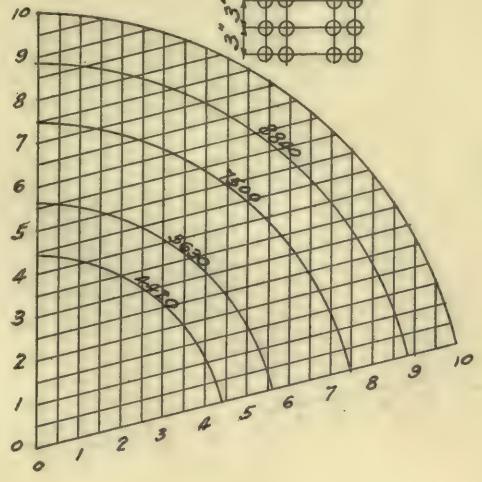


12 Rivets per row.
 $C = 342$

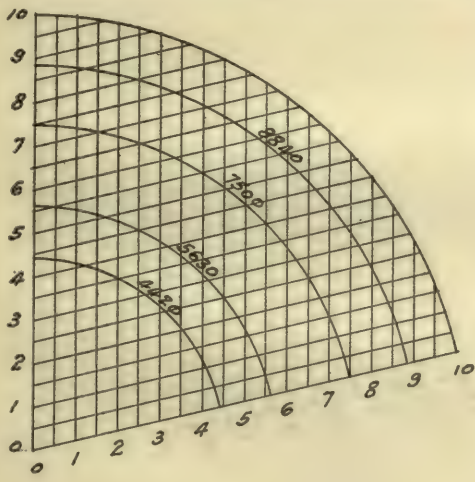
Four rows of rivets - distances between rows as shown
 Rivets spaced 3" ctr. to ctr. in the rows.



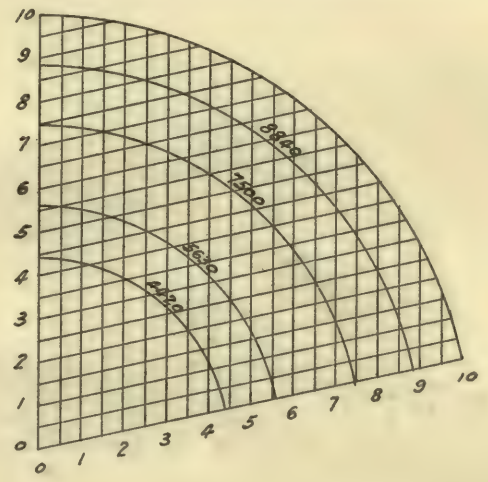
13 Rivets per row
 C=394.10



14 Rivets per row
 C=450.20

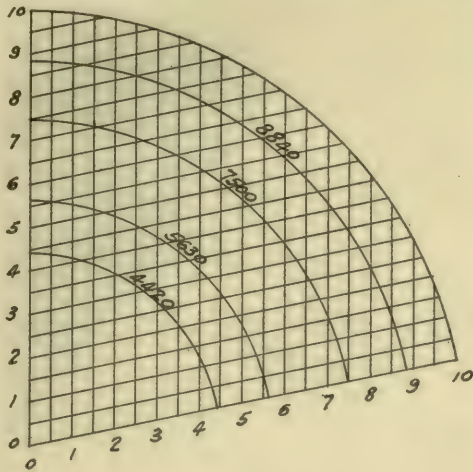
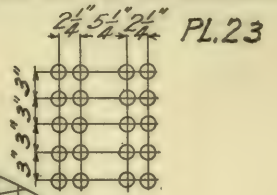


15 Rivets per row
 C=510.20

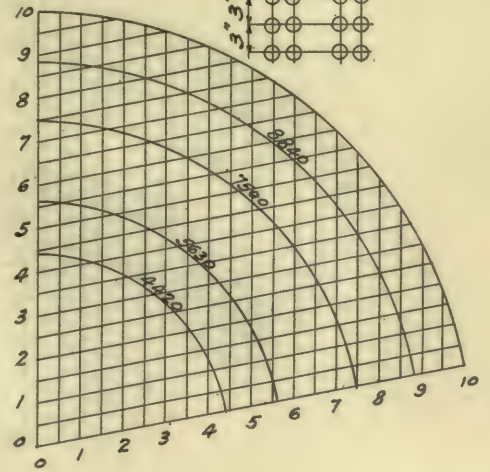


16 Rivets per row
 C=574.30

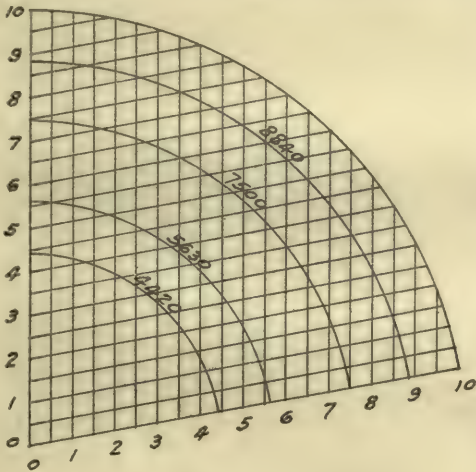
Four rows of rivets - distances between rows as shown
 Rivets spaced 3" ctr. to ctr. in the rows.



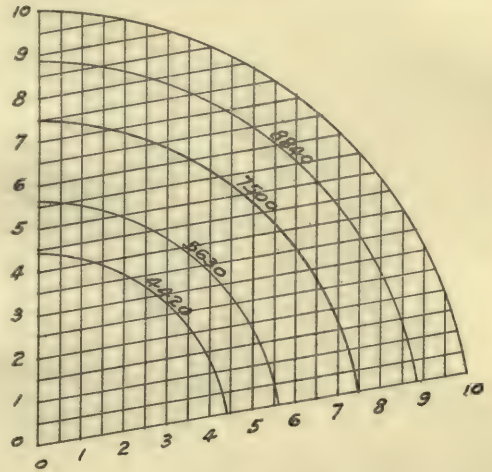
17 Rivets per row
 C = 642.30



18 Rivets per row.
 C = 714.30



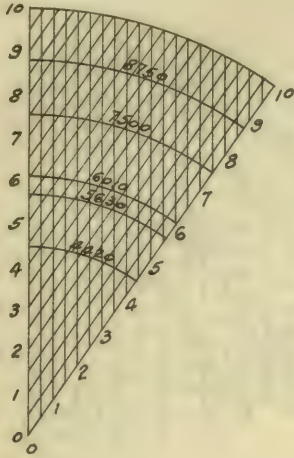
19 Rivets per row
 C = 790.40



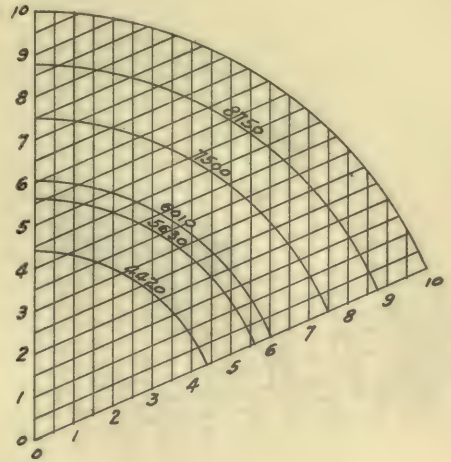
20 Rivets per row.
 C = 870.40



Two rows of rivets - $2\frac{1}{2}$ " ctr. to ctr. of rows.
 Rivets staggered - alternate spaces $1\frac{1}{2}$ " ctr. to ctr.

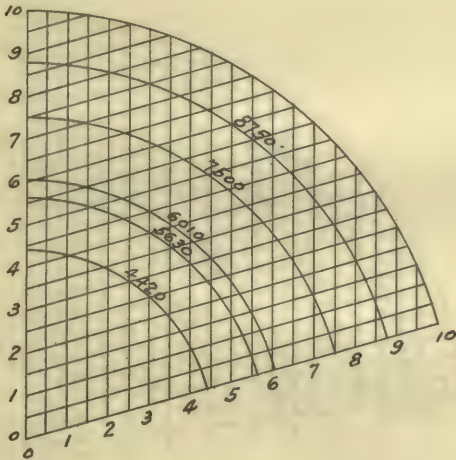


C for 2 rivets = 2.60



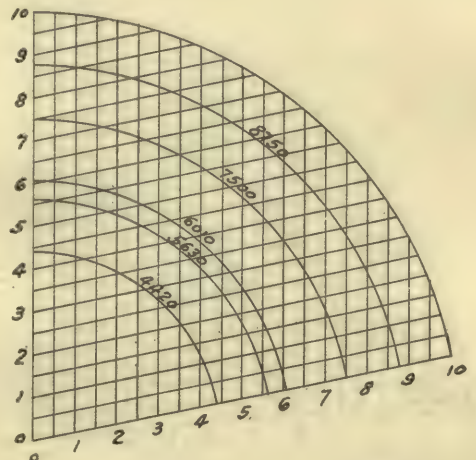
C for 3 rivets = 4.50

C " 4 " = 6.30



C for 5 rivets = 8.90

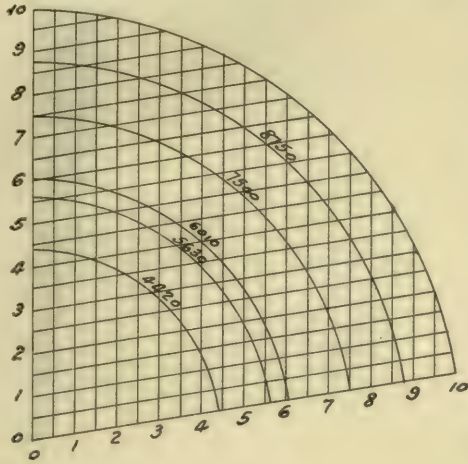
C " 6 " = 11.80



C for 7 rivets = 15.40

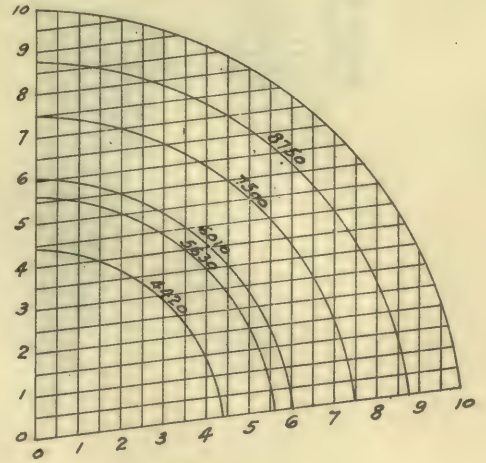
C " 8 " = 19.30

Two rows of rivets - $2\frac{1}{8}$ " ctr. to ctr. of rows.
 Rivets staggered - alternate spaces $1\frac{1}{2}$ " ctr. to ctr.



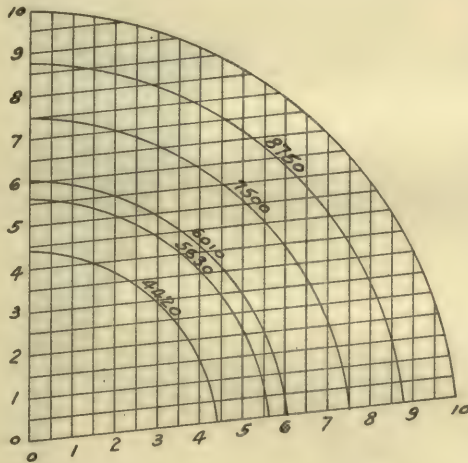
C for 9 rivets = 23.90

C " 10 " = 28.80



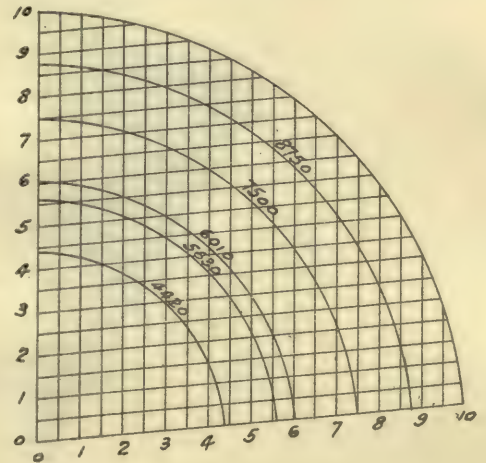
C for 11 rivets = 34.40

C " 12 " = 40.30



C for 13 rivets = 46.90

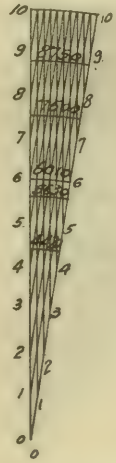
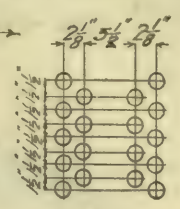
C " 14 " = 53.80



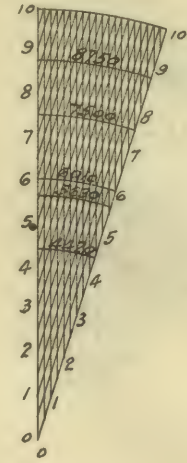
C for 15 rivets = 61.30

C " 16 " = 69.30

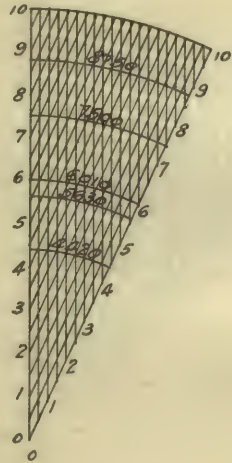
Four rows of rivets-distances between rows $2\frac{1}{8}$ "- $5\frac{1}{2}$ "- $2\frac{1}{8}$ " →
 Rivets staggered-alternate spaces $1\frac{1}{2}$ " ctr. to ctr.



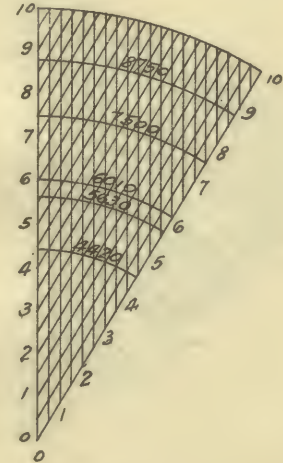
1 Space
 1 rivet per row
 4 = total no. of rivets.
 C = 13.10



2 Spaces
 6 = total no. of rivets
 2 rivets in each outside row.
 1 rivet " " inside "
 C = 23.30

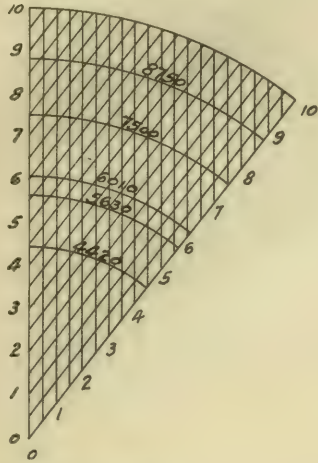


3 Spaces
 8 = total no. of rivets
 2 rivets per row
 C = 27.60

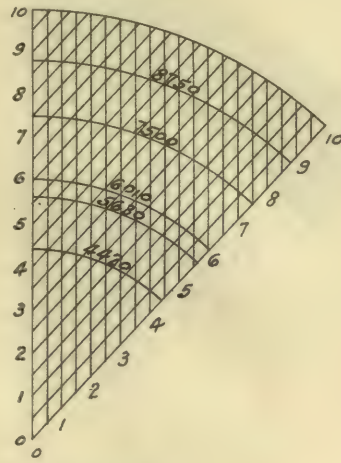


4 Spaces
 10 = total no. of rivets
 3 rivets in each outside row
 2 " " " inside "
 C = 37.80

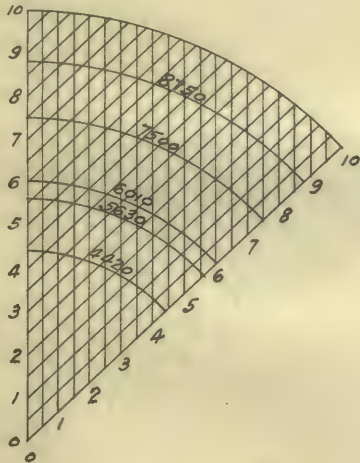
Four rows of rivets - distances between rows $2\frac{1}{8}''$ - $5\frac{1}{2}''$ - $2\frac{1}{8}''$ - see page 26
 Rivets staggered - alternate spaces $1\frac{1}{2}''$ ctr to ctr.



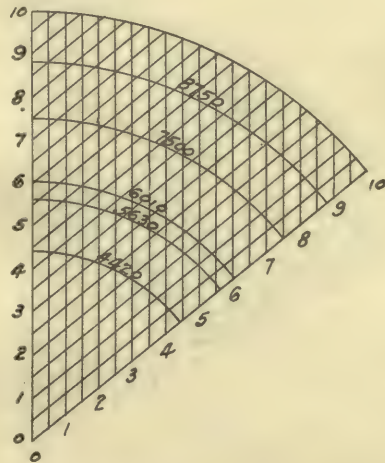
5 spaces
 12 = total no. of rivets
 3 rivets per row
 C = 43.40



6 spaces.
 14 = total no. of rivets.
 4 rivets in each outside row
 3 " " " inside "
 C = 54.60

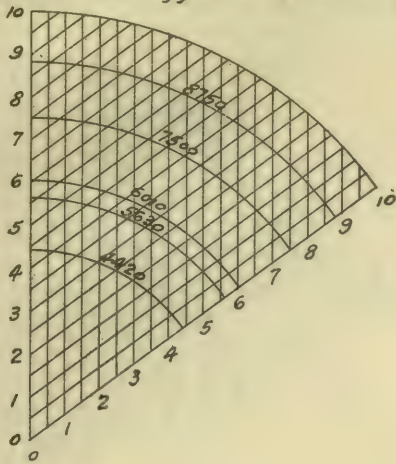


7 spaces.
 16 = total no. of rivets.
 4 rivets per row.
 C = 61.40

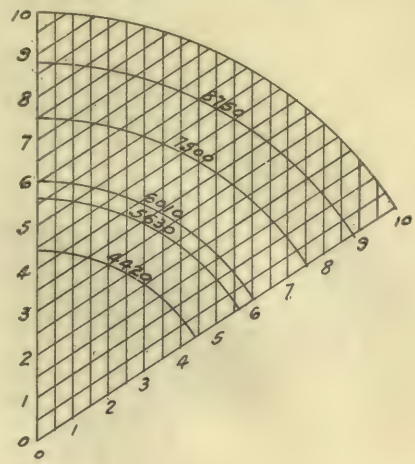


8 spaces.
 18 = total no. of rivets.
 5 rivets in each outside row
 4 " " " inside "
 C = 73.80

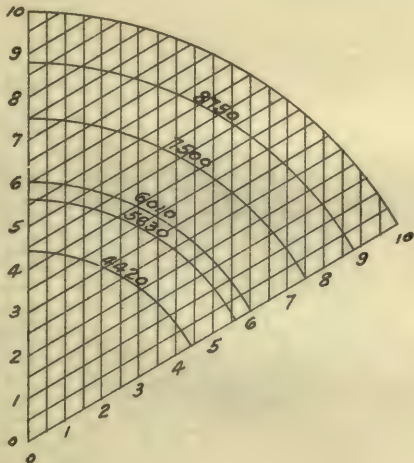
Four rows of rivets - distances between rows $2\frac{1}{8}'' - 5\frac{1}{2}'' - 2\frac{1}{8}''$ - see page 26 PL. 28
 Rivets staggered - alternate spaces $\frac{1}{2}''$ ctc. to ctc.



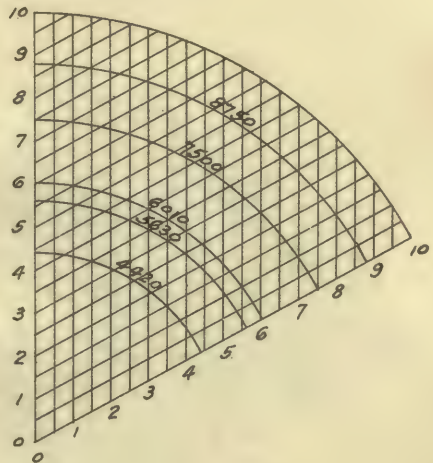
9 spaces
 20 = total no. of rivets
 5 rivets per row.
 C = 82.30.



10 spaces
 22 = total no. of rivets
 6 rivets in each outside row
 5 " " " inside "
 C = 95.70

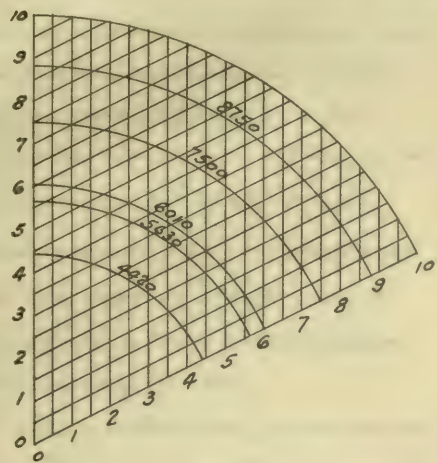


11 spaces
 24 = total no. of rivets
 6 rivets per row.
 C = 106.20

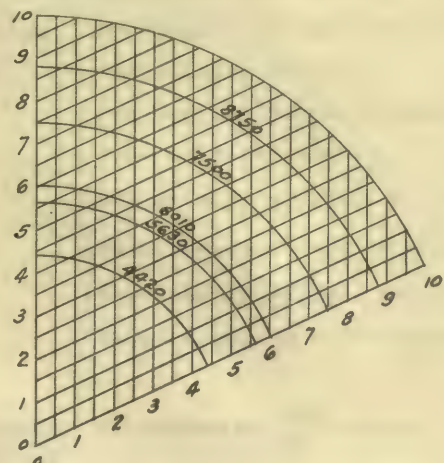


12 spaces
 26 = total no. of rivets.
 7 rivets in each outside row.
 6 " " " inside "
 C = 121.30.

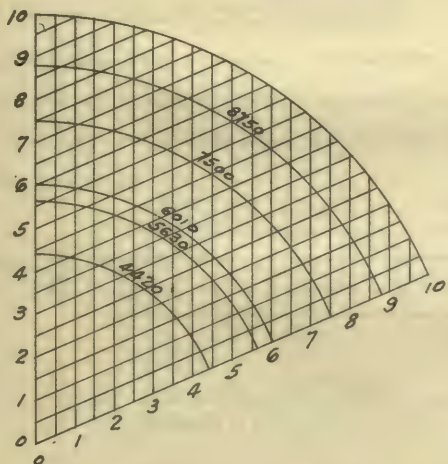
Four rows of rivets-distances between rows $2\frac{1}{8}$ "- $5\frac{1}{2}$ "- $2\frac{1}{8}$ "-see page 26
 Rivets staggered-alternate spaces $1\frac{1}{2}$ " ctr. to ctr.



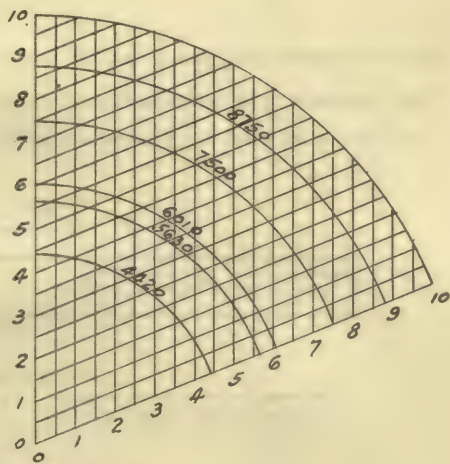
13 spaces
 28 = total no. of rivets.
 7 rivets per row.
 C = 134.40



14 spaces
 30 = total no. of rivets.
 8 rivets in each outside row.
 7 " " " inside "
 C = 150.90



15 spaces
 32 = total no. of rivets.
 8 rivets per row
 C = 165.70



16 spaces
 34 = total no. of rivets.
 9 rivets in each outside row.
 8 " " " inside "
 C = 183

The following substitutions can be made without any appreciable error:

For two rows of rivets $2\frac{1}{4}"$ c.to c. of rows, rivets spaced alternately $1\frac{1}{2}"$ c.to c.	} use values	} for	two rows of rivets $2\frac{1}{8}"$ c.to c. of rows- pages 24-25.	
For two rows $>5\frac{1}{4}"$ and $<6"$ c.to c.- rivets spaced $3"$ c.to c.- not staggered			"	two rows $5\frac{1}{4}"$ c.to c. of rows- pages 9 to 13 inclusive.
For four rows $2\frac{1}{4}"-5\frac{3}{8}"-2\frac{1}{4}"$ c.to c.- rivets spaced $3"$ c.to c.- not staggered			"	four rows $2\frac{1}{4}"-5\frac{1}{4}"-2\frac{1}{4}"$ c.to c. of rows- pages 19 to 23 inclusive.
For four rows $2\frac{1}{4}"-5\frac{1}{4}"-2\frac{1}{4}"$ c.to c. or $2\frac{1}{4}"-5\frac{3}{8}"-2\frac{1}{4}"$ c.to c.- rivets spaced alternately $1\frac{1}{2}"$ c.to c.			"	four rows $2\frac{1}{8}"-5\frac{1}{2}"-2\frac{1}{8}"$ c.to c. of rows- pages 26 to 29 inclusive

The coefficients, or values of C , represent the values of $\frac{\sum d^2}{y_1}$ where $d_1^2 + d_2^2 + d_3^2 + \dots + d_{n-1}^2 + d_n^2$ is the sum of the squares of the distances of the rivets from the center of gravity of all the rivets = $\sum d^2$, and where y_1 = the distance of the extreme rivet from the center of gravity of all the rivets.

The value of C for a single row of rivets with a given uniform pitch, x , is to the value of C for another row of the same number of rivets, but with a pitch = $x+a$, as $x : \overline{x+a}$ as may be shown thus:

Let C = the value of $\frac{\sum d^2}{y_1}$ for the row with the pitch x .

" C' = " " " " " " " " " " " " $x+a$.

To show that $C : C' :: x : \overline{x+a}$

Suppose the number of rivets in each row to be odd, and then there will be n rivets and n equal spaces above and below the center of gravity of each row of rivets where the number of rivets in each row = $2n+1$.

$$\begin{aligned} \text{Then } \frac{C}{C'} &= \frac{2\{x^2 + \overline{2x^2} + \overline{3x^2} + \dots + \overline{(n-1)x^2} + \overline{nx^2}\}}{2\{\overline{(x+a)^2} + 2\overline{(x+a)^2} + 3\overline{(x+a)^2} + \dots + \overline{(n-1)(x+a)^2} + \overline{n(x+a)^2}\}} \\ &= \frac{x + 2x + 3x + \dots + (n-1)x + nx}{(x+a) + 2(x+a) + 3(x+a) + \dots + (n-1)(x+a) + n(x+a)} \\ &= \frac{\frac{n}{2}\{2x + (n-1)x\}}{\frac{n}{2}\{2(x+a) + (n-1)(x+a)\}} = \frac{(n+1)x}{(n+1)(x+a)} = \frac{x}{x+a} \quad \text{Q.E.D.} \end{aligned}$$

Similarly the same result may be obtained for an even number of rivets.

In the diagrams the ordinates represent the vertical shear and are therefore drawn vertically. The abscissae represent the shear on the extreme rivet due to bending, and since this shear acts perpendicularly to the straight line joining the extreme rivet with the center of gravity of all the rivets they are drawn perpendicularly to that line. The distance from the origin of coordinates to the intersection of any ordinate and abscissa represents the resultant shear.



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