Referring to Diagram A, the negative bending moment will now be found for strip B.

$$Ms = -\frac{W_LL}{120} = \frac{36,352 \times 16 \times 12}{120} = 58,163 \text{ in.-lbs.}$$

Referring to section 1-1, it will be noticed that there are twelve ⅜-in. ϕ rods = 1.32 sq. ins. and that the rods

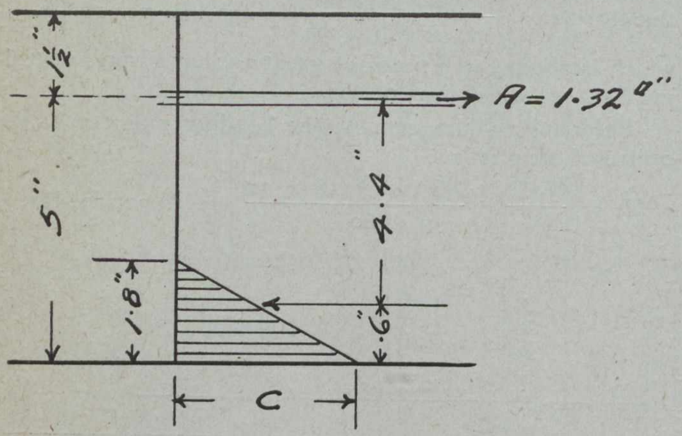

Fig. 3.

are 1½ ins. below the top of the concrete, and from this section Fig. 3 has been made.

$$s = \frac{58,163}{1.32 \times 4.4} = 10,030 \text{ lbs. per sq. in. tension in steel.}$$

By referring to reading No. 132 it will be found to be 525 lbs., hence the Chicago Code gives a computed stress twenty times as great as that given by the reading.

$$\frac{c}{2} \times 1.8 \times 96 \times 4.4 = 58,163$$

$$\therefore c = \frac{58,163 \times 2}{1.8 \times 96 \times 4.4} = 153 \text{ lbs. per square inch com-}$$

pression in the concrete.

Referring to reading No. 16 it will be noticed that the stress given is 203 lbs. per square inch, which is greater than that found by the Chicago Code.

Referring to Diagram A, the bending moment for the centre of strip B is

$$Mc = \frac{W_LL}{120} = 58,163 \text{ in.-lbs., the same as } Ms.$$

Referring to section 2-2 it will be found that there are twelve ⅜-in. ϕ rods = 1.32 sq. ins. and that the rods are

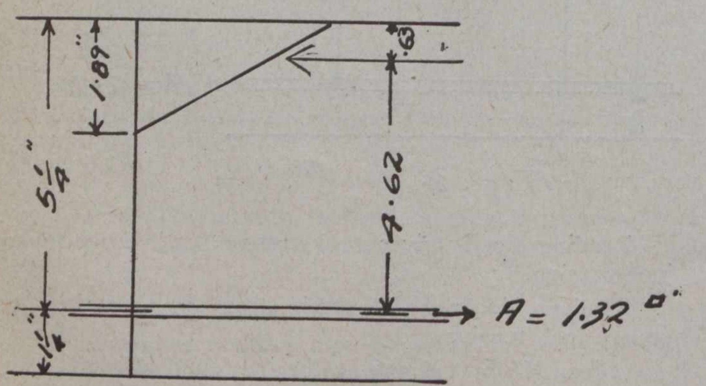

Fig. 4

1¼ ins. from the bottom of the concrete and from this section Fig. 4 has been made.

$$s = \frac{58,163}{1.32 \times 4.62} = 9,535 \text{ lbs. per sq. in. tension in steel.}$$

Referring to readings Nos. 1 and 2 it will be found that No. 1 gives a stress of 3,075 lbs. per square inch and No. 2 a stress of 1,050 lbs. per square inch, hence the Chicago Code gives a stress three times as great in the former and nine times as great in the latter, as found by test.

Philadelphia Code

The second by-law considered will be the Philadelphia Code. Extracts from the Philadelphia Code, using the same notation as before:

"The column capital shall have a diameter at the top in no case less than 0.2 L where L is the length of the longest side, centre to centre of columns for square capitals.

"The depressed head or drop may be cast above the column capital and the width of this drop shall be $\frac{38}{100}$ L and the depth of the drop shall not be less than ⅔ the thickness of slab.

"The width of bands shall be such as to properly cover the panel area but shall not be wider than 0.45 L.

"Load carried by straight band

$$= \frac{\text{total bay} - \text{capital head}}{2} \times w$$

$$-M = \frac{\text{total bay} - \text{capital head}}{2} \times \frac{wL_1}{12} \quad - \; - \; - \quad (1)$$

$$+M = \frac{\text{total bay} - \text{capital head}}{2} \times \frac{wL_1}{24} \quad - \; - \; - \quad (2)$$

"Width of concrete to resist compression at edge of capital head = width of drop.

"Width of concrete to resist compression in centre of the span = width of band = $\frac{45}{100}$ L."

Taking 0.2 L as the diameter of capital head and substituting this value in equations (1) and (2) we obtain:

$$-M = \frac{WL}{31} \text{ ft.-lbs.} \quad - \; - \; - \quad (3)$$

$$+M = \frac{WL}{62} \text{ ft.-lbs.} \quad - \; - \; - \; - \quad (4)$$

Areas of steel required to resist these moments are:

$$A = \frac{-M}{16,000\, d}$$

$$\text{and } A_1 = \frac{+M}{16,000\, d_1}$$

The areas of steel thus determined are, according to the Philadelphia Code, to be distributed in the slab as follows:

"Place 100% of A over capital head to resist $-M$.
Place 80% of A_1 in centre of straight bands to resist $+M$.
Place 50 % of A_1 in centre between straight bands to resist $+M_1$.
Place 50% of A_1 in centre of straight bands to resist $-M_1$."

The moments to be provided for in strips A and B in accordance with the above distribution of steel are shown in Diagram A, Table I.

Thus, over capital head, moment = 100% of $-M$ $= -\frac{WL}{31}$ ft.-lbs.

At middle of strip A moment = 80% of $+M$ = $\frac{80}{100} \cdot \frac{WL}{62}$ ft.-lbs. $= \frac{WL}{77.5}$ ft.-lbs.