trapezoid, and the other a triangle similar to that on first panel.

Let these loads be P_2 and P_2'. The moment will then be the sum of the two moments produced by these loads. Theoretically this is not correct because the maximum moment produced by each load does not occur at the same point. The maximum moment due to load P_2 occurs at the middle, while that due to load P_2' occurs $0.5774l_2$ from the upper support, or $0.0774l_2$ from the middle. Therefore the moment at the middle for load P_2' will be somewhat less, and the sum of the moments at the middle will be somewhat less, than that given in equation (9). For simplicity, however, we will assume the bending moment to be the sum of the two moments, as the difference is but small and the error gives us a safer result.

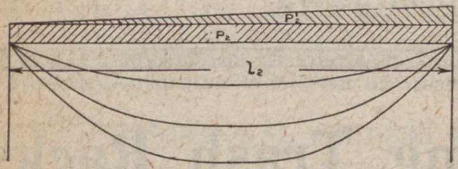

FIG. NO. 2—LOADING ON NO. 2 PANEL

$$M_2 = \tfrac{1}{8}P_2l_2 + 0.128P_2'l_2 \quad \ldots\ldots (9)$$

in which

$$P_2 = 0.434h_1l_2p/12,$$

and

$$P_2' = \tfrac{1}{2}[(0.434h_1/12) + (0.434h_2/12)]l_2p$$

in which $h_2 = h_1 + l_2\cos\alpha = 117.4 + l_2\cos\alpha$.

Substituting the values of h_1 and h_2, we get

$$P_2 = \tfrac{1}{12} \times 0.434 \times 117.4l_2p = 4.25l_2p \quad \ldots\ldots (10)$$

$$P_2' = [(\tfrac{1}{12} \times 0.434 \times 117.4) + (\tfrac{1}{12} \times 0.434)(117.4 + l_2\cos\alpha)]\tfrac{1}{2}l_2p$$
$$= [4.25 + 0.0362(117.4 + l_2\cos\alpha)]\tfrac{1}{2}l_2p \quad \ldots\ldots (11)$$

The resisting moment as before is

$$M_{r2} = 4{,}170bd^2 \quad \ldots\ldots (12)$$

Substituting the values of (10) and (11) in equation (9), we get

$$M_2 = (\tfrac{1}{8} \times 4.25l_2^2p) + (\tfrac{1}{2} \times 0.128l_2^2p)[4.25 + 0.0362(117.4 + l_2\cos\alpha)]$$

Reducing and substituting for p and $\cos\alpha$, we get

$$M_2 = 0.664l_2^2 + 0.08l_2^2(4.25 + 4.25 + 0.0314l_2)$$
$$= 0.664l_2^2 + 0.68l_2^2 + 0.002515l_2^3$$
$$= 1.344l_2^2 + 0.002515l_2^3 \quad \ldots\ldots (13)$$

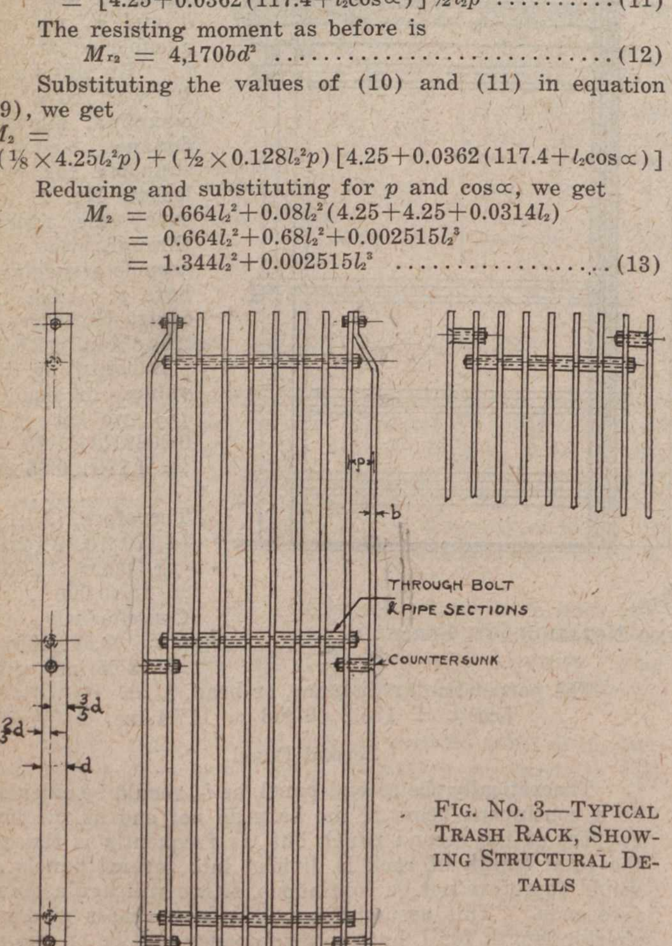

FIG. NO. 3—TYPICAL TRASH RACK, SHOWING STRUCTURAL DETAILS

Equating (12) and (13), we get

$$1.344l_2^2 + 0.002515l_2^3 = 4{,}170bd^2 = 6{,}660 \quad \ldots (13a)$$

Solving for l_2 by trial, we get

$$l_2 = 67 \text{ ins.}$$

and

$$h_2 = h_1 + l_2\cos\alpha$$
$$= 117.4 + (67 \times 0.866)$$
$$\doteq 174 \text{ ins.}$$

Third Panel

The load on the third panel, or l_3, will be represented by a trapezoid, as in the second panel, with the short leg equal to the long leg of the trapezoid on second panel, and the long leg increased by the increment due to the additional head. This loading can likewise be divided into two loads, as in the case of the second panel.

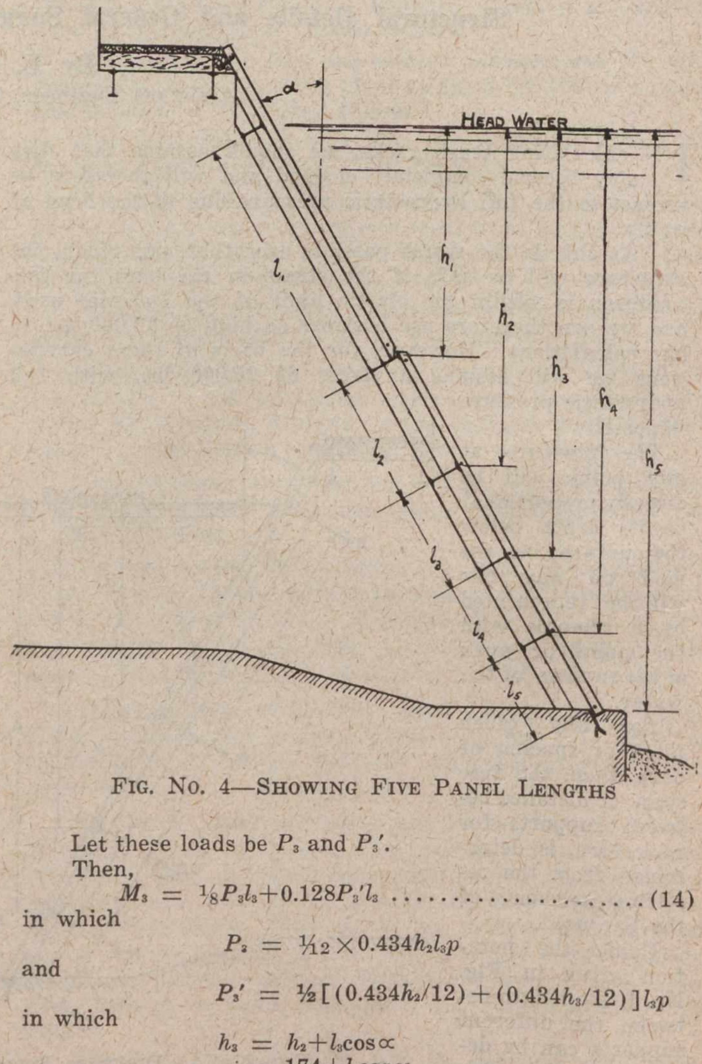

FIG. NO. 4—SHOWING FIVE PANEL LENGTHS

Let these loads be P_3 and P_3'.

Then,

$$M_3 = \tfrac{1}{8}P_3l_3 + 0.128P_3'l_3 \quad \ldots\ldots (14)$$

in which

$$P_2 = \tfrac{1}{12} \times 0.434h_2l_3p$$

and

$$P_3' = \tfrac{1}{2}[(0.434h_2/12) + (0.434h_3/12)]l_3p$$

in which

$$h_3 = h_2 + l_3\cos\alpha$$
$$= 174 + l_3\cos\alpha$$

Substituting values for h_2 and h_3, we get

$$P_3 = \tfrac{1}{12} \times 0.434 \times 174l_3p = 6.3l_3p \quad \ldots\ldots (15)$$

$$P_3' = [(\tfrac{1}{12} \times 0.434 \times 174) + (\tfrac{1}{12} \times 0.434)(174 + l_3\cos\alpha)]\tfrac{1}{2}l_3p$$
$$= [6.3 + 0.0362(174 + l_3\cos\alpha)]\tfrac{1}{2}l_3p \quad \ldots\ldots (16)$$

The resisting moment, as before, is

$$M_{r3} = 4{,}170bd^2 \quad \ldots\ldots (17)$$

Substituting values of (15) and (16) in equation (14), we get

$$M_3 = (\tfrac{1}{8} \times 6.3l_3^2p) + (\tfrac{1}{2} \times 0.128l_3^2p)(6.3 + 6.3 + 0.0314l_3)$$

Reducing and substituting for p, we get

$$M_3 = 0.985l_3^2 + 1.01l_3^2 + 0.002515l_3^3$$
$$= 1.995l_3^2 + 0.002515l_3^3 \quad \ldots\ldots (18)$$

Equating (17) and (18), we get

$$1.995l_3^2 + 0.00252l_3^3 = 4{,}170bd^2 \doteq 6{,}660.$$

Solving for l_3 by trial, we get

$$l_3 = 56 \text{ ins.}$$

and

$$h_3 = h_2 + l_3\cos\alpha$$
$$= 174 + (56 \times 0.866) = 288 \text{ ins.}$$