rect position, due to the fact that the constants of integration are determined by conditions imposed on the deflection curve, and, therefore, are not determined until this curve is drawn. These conditions are that the deflection curve shall pass through zero at each of the reactions. The slope curve could easily be shifted to its

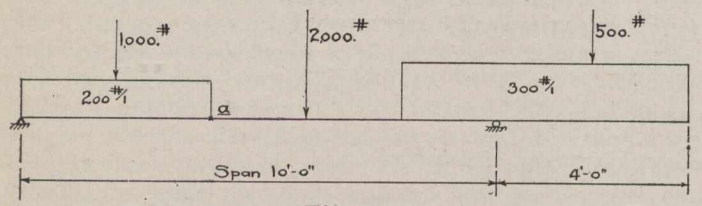

Fig. 2.

proper place, but that is hardly necessary, since the deflection curve is all that is desired in this instance. The deflection curve was made to pass through the required points by one of the several well-known methods for passing a polygon through two points. The choice of the last pole for this curve, therefore, was not wholly arbitrary and had to be scaled.

The scales work out as follows:—

First Scale: Horizontal, 1 in. = 2 ft.; vertical, 1 in. = 500 lbs.; pole distance, 4 ft.

Second Scale: Vertical, 1 in. = 2,000 foot-pounds. Pole distance, 4 feet.

Third Scale: Vertical, 1 in. = 8,000 pound-feet^2. Pole distance, 2.88 feet.

Fourth Scale: Vertical, 1 in. = 23,040 pound-feet^3.

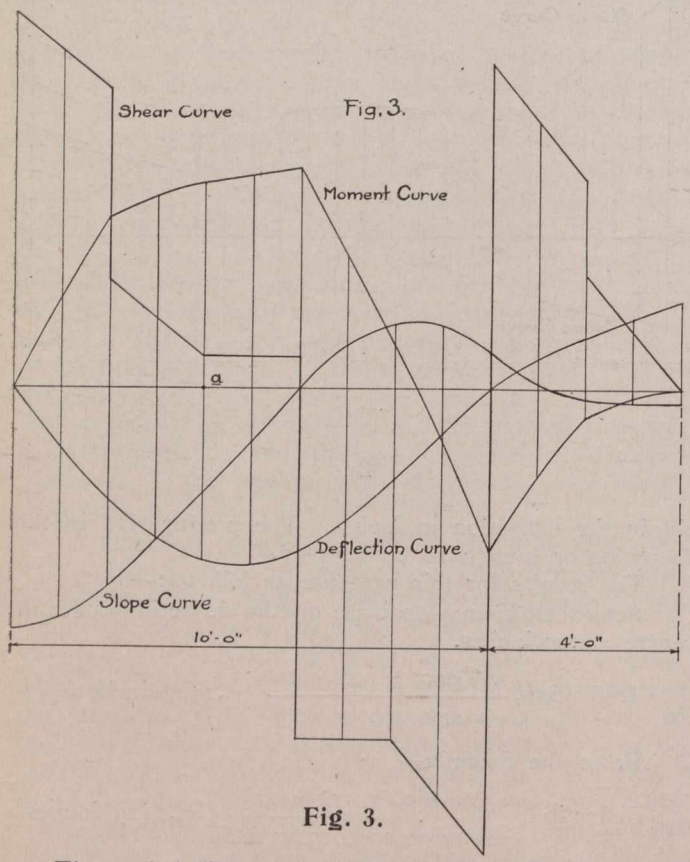

Fig. 3.

The scaled distance in inches to the deflection curve at "a" = 1.80 inches.

$$\text{Deflection}, \frac{23{,}040. \times 1.80 \times 12^3}{30{,}000{,}000. \times 21.8} = .1095 \text{ inches.}$$

Suppose that the beam shown in Fig. 2 is continuous over three supports and that the third support is at "a." To determine the reaction there it is required to find the single force which will cause a deflection at "a" of .1095 inches in the same beam. Substituting the numerical values in the formula for the deflection of a point on a beam with a single load and solving for the unknown load, it becomes in this case equal to 2,160 pounds. If this force of 2,160 pounds were to act upwards at point "a" in Fig. 2 it would deflect that point back to zero and the deflection curve for the beam over three supports would pass through zero.

In order to plot the deflection curve, plot first the deflection curve for the upward reaction in the same manner as demonstrated above. Observe that the same pole distances and the same scales should be used, so that the scale of this deflection curve will be the same as the previous one above. The final curve may be plotted by taking the algebraic sum of the ordinates of each curve at each point.

A fourth reaction might now be considered and treated in the same manner, but the solution would be much more complicated and laborious. It would require the drawing of a deflection curve for the beam over three supports and loaded with this fourth reaction. No new methods would be involved, however, and the work has, therefore, not been extended.

Besides being valuable as a practical application, those who are teaching the subject of the deflection of beams will find the above method very instructive. It shows graphically to the student the relations of the shearing force, bending moment, slope and deflection curves to one another.

TORONTO ELECTRIC DISTRIBUTION SYSTEM.

A quantity of underground work in connection with the Hydro-Electric distribution system has recently been under construction in Toronto. This consists of building a 15-duct run on the south side of King Street from John Street to Jarvis Street. Single 3-in clay ducts are laid three wide and five high, the top layer being square bore distributer duct. Several difficult channels have had to be made under car tracks—namely at York Street, Bay Street, Yonge Street, and Church Street. A single fibre duct of 3-in. diameter is used to connect run to all service boxes in the old run in the sidewalk. The ducts are encased in three inches of concrete and are laid with a minimum cover of 30 ins. from top of pavement.

In addition to the above work six large concrete transformer pits are being built. The dimensions of these pits are 9 ft. x 20 ft. deep, inside measurement. The pits will have 13-in. concrete walls and will be provided with special ventilation chambers. These pits are of sufficient size to take care of additional load in future years.

RAILWAY EXTENSION IN CHILE.

The Northern Longitudinal Railway of Chile is now in full operation, the work being entirely completed connecting Pisagua in the north of Chile with Valparaiso, Santiago, and Puerto Montt, well to the south of the country, a distance of about 1,960 miles. The new portion from Iquique to Calera, a distance of about 750 miles, has been constructed within the past three years; has cost about $40,000,000; and is to be operated for 50 years by the Chilean Northern Railway Company, Calera, Chile, an operating company organized by the Howard syndicate, which supplied the money under a guaranty from the Chilean Government. The gauge of this line is 3.28 feet, while the gauge of the old portion of the Longitudinal Railway is 5 feet 6 inches. A full description of this railway appeared in *The Canadian Engineer* for March 19th, 1914.

C. S. Cameron, secretary and treasurer of the Sydney Steel plant, has gone to England to investigate the opportunities for trade in the British market.