PROBLEMS IN APPLIED STATICS.

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This series of problems began in the issue for the week, October 22nd, 1909. It is assumed that the reader either has an elementary knowledge of the subject of Statics, or is in a position to read some text on such theory.

Consider the forces acting at the point EFDC. The condition of affairs is represented in the Statical Diagram (Fig. 85).

$$\Sigma Y = Y_{EF} + Y_{FD} + Y_{DC} + Y_{CE} = 0.$$
$$-1{,}000 + 0 + DC + 0 = 0.$$
$$DC = 1{,}000.$$

From the positive result it is seen that the Y_{DC} is positive. DC, therefore, acts away from the point; i.e., the member DC is in tension 1,000 pounds.

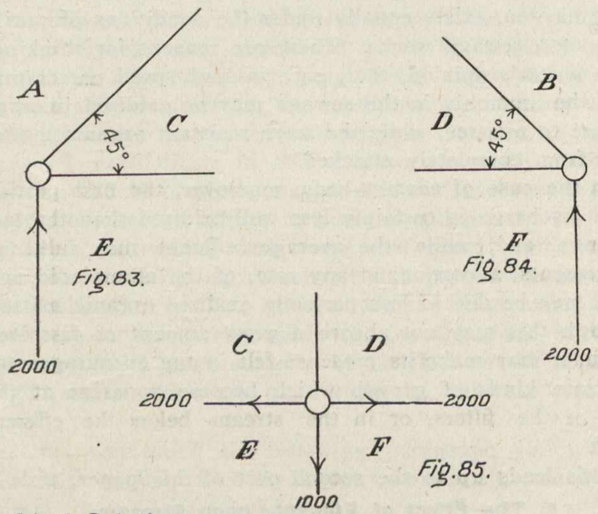

Fig. 83. Fig. 84. Fig. 85.

Graphical Solution.

Consider the forces acting at the point EFDC, represented in the Statical Diagram (Fig. 86). Since there are three unknown forces in this case, it is seemingly impossible to construct the Vector Polygon for the set of forces. However, **because FD and CE have the same lines of action, their resultant must act in that line.** Replace FD and CE by their resultant as indicated by R, Statical Diagram (Fig. 87). How this resultant acts is as yet unknown, but, as will be seen, this is of no importance.

Construct the Vector Polygon for the forces shown in the Statical Diagram (Fig. 87). Draw EF (Fig. 88) to represent the known force EF (Fig. 87). Then, from F (Fig. 88) a line is drawn to represent the known direction of R (Fig. 87). Now, since the set of forces

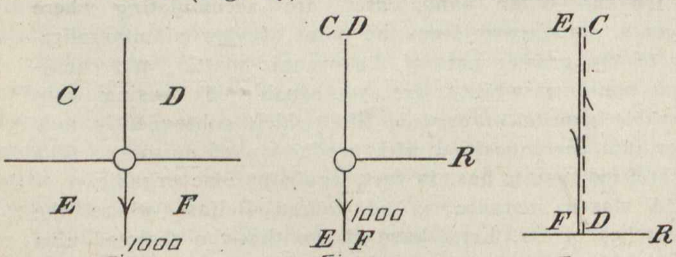

Fig. 86 Fig. 87 Fig. 88.

being considered is in equilibrium, we know that from some point in the line drawn to represent the direction of R, another line must be drawn to represent the direction of CD (Fig. 87), and also pass through E (Fig. 88), thereby closing the Vector Polygon. It is evident that such a line will coincide with EF (Fig. 88). To avoid confusion, the line representing DC, which would coincide with EF, is shown dotted to one side of EF. The force DC is seen to be an equal and opposite force to EF; i.e., it acts away from the point. The member DC is, therefore, in tension 1,000 pounds.

Consider the forces acting at the point ABDC, Fig. 89 being the Statical Diagram representing the condition of affairs at this point.

AB (Fig. 90) represents the known force AB (Fig. 89), due to the load of 3,000 pounds. Referring to Fig. 89, it is seen that an unknown force intervenes between the force AB and the next known force DC. It will, therefore, be impossible to use Bow's Notation throughout in constructing the Vector Polygon. **Whenever this notation cannot be applied to a line representing any particular force, the line will be shown dotted and the letters designating the force placed beside the line.**

From B (Fig. 90) a dotted line is drawn to represent the known force DC. Now, since the forces under con-

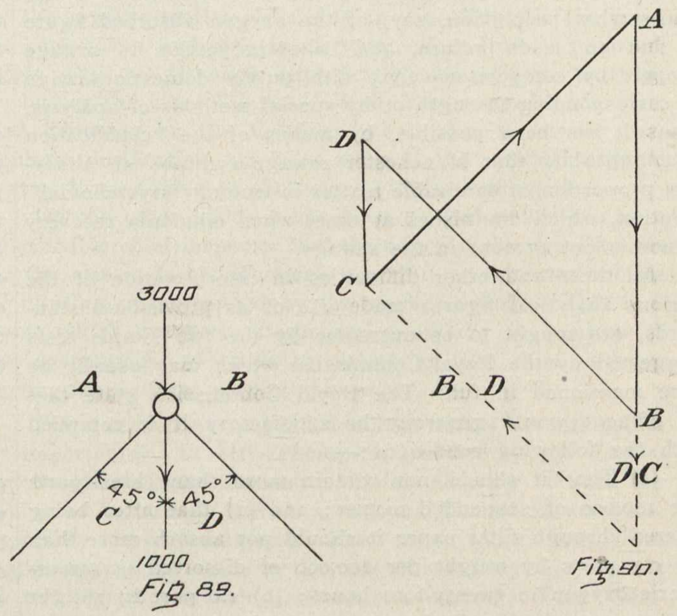

Fig. 89. Fig. 90.

sideration are in equilibrium, their Vector Polygon must close, and it must be closed by lines drawn to represent the directions of the unknown forces BD and CA. Therefore, from the termination of the dotted line drawn to represent DC, a dotted line is drawn to represent the direction of the force BD, and from A is drawn another line to represent the direction of the force CA. These last two lines intersect at C, and it is seen that Bow's Notation applies to the line representing the force CA. This line is, therefore, drawn in full. The Polygon should then read: AB, DC (dotted line), BD (dotted line), and CA.

Having fully determined the unknown forces, it is now possible to go back and construct a Vector Polygon lettered throughout with Bow's Notation.

From B (Fig. 90) draw the full line BD equal in length and parallel to the dotted line representing the force BD. If D be joined to C, the line DC should then be equal and parallel to the dotted line representing the force DC. This new polygon, which will represent fully the forces acting at the point being considered, reads: AB, BD, DC, and CA.

(Continued on Page 645.)