It is now proposed to give the general method of arriving at the total stress on the main members, and we will assume the following figures to form the basis of our calculations:—

	Pounds.
Weight of one cage, empty	4,000
Weight of two tubs, empty	1,000
Weight of rope	7,000
Total descending cage	12,000
Weight of coal per trip	3,000
Total ascending cage	15,000

Acceleration = 16 feet per second in a second.

Therefore, stress or pull on descending rope = 6,000 pounds.

And stress on ascending rope = 22,500 pounds.

Weight of eight guide or conductor ropes and weights = 96 tons.

Height of headgear = 60 feet to centre of pulley.

centre line of shaft, thus making an oblong of eighteen by sixteen feet.

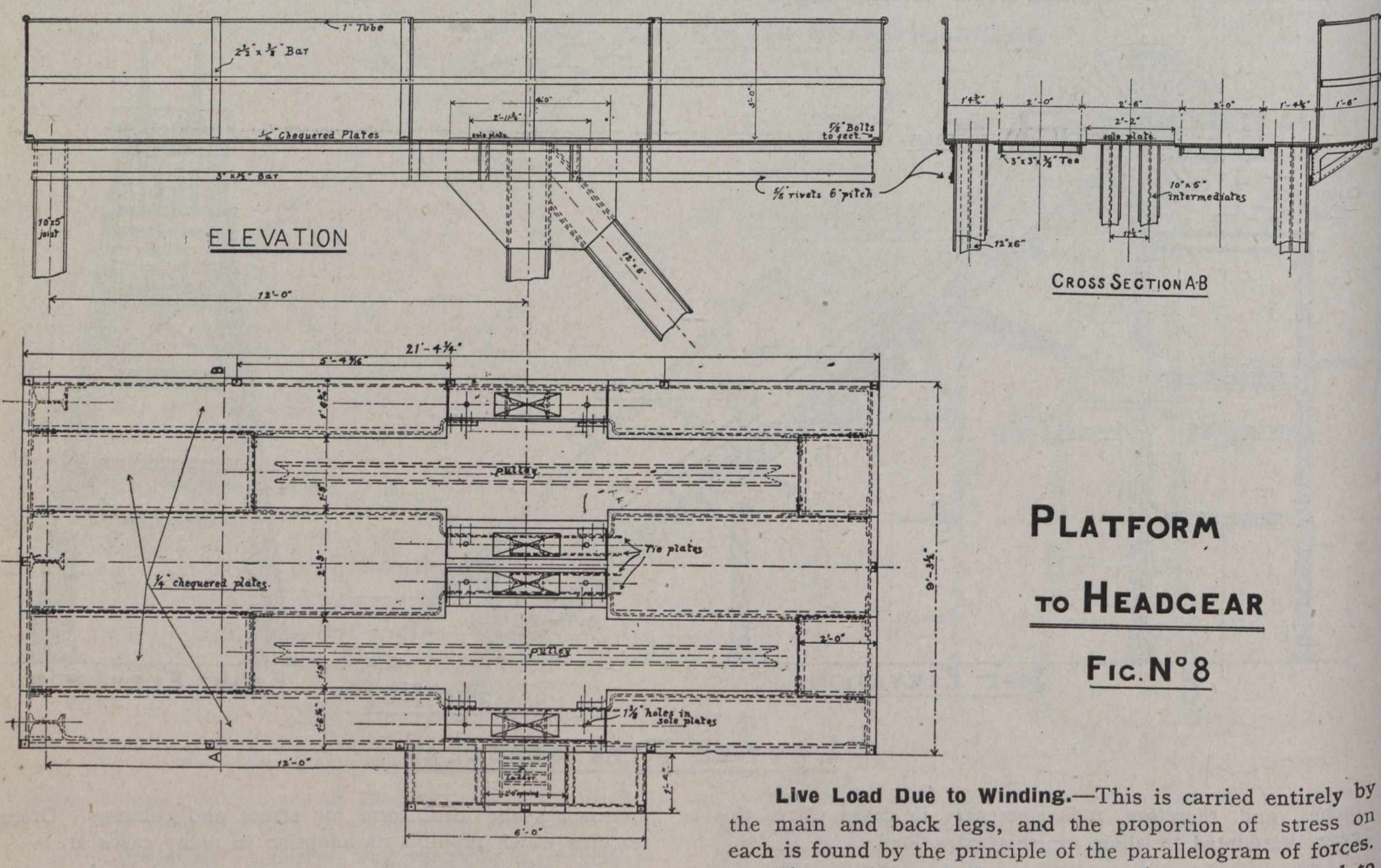
The position of the back legs is generally determined by the wall of the engine-house, which takes up any horizontal thrust there is. Should this support not be available for any reason, separate foundations must be made to carry the loads safely.

Referring now to Figs. 4, 5 and 6, these give the outline of the structure in side and front elevations and a true view of the back legs, respectively.

The short diagonal struts (or spurs, as they are sometimes called), shown in Fig. 4 below the girder for the overwind gear on the guide-rope platform, are for the purpose of transferring the load from the over-wind girder directly to the main and front legs, leaving only the quiescent load on the conductors to be carried in bending.

The similar struts in the other two views also transfer the loads from the inside bearings of the two pulley shafts direct to the main and back legs without introducing transverse stress.

Having settled the general layout, we will now proceed to find the stresses on the main members.



Platform to Headgear

Fig. No. 8

Diameter of shaft = 18 feet.

In starting to set out our frame the first consideration should be to plant the legs of our structure where they will get a good, solid foundation, and also to give a diameter of pulley for the rope suitable for its size. We will, therefore, assume that it is necessary to have pulleys 16 feet diameter in order that the bending stresses do not run too high. (This information is usually supplied by purchaser.)

If this dimension is plotted down in plan, as shown in Fig. 3, it will be easy to arrive at a suitable figure for the other dimension tying up the position of the four legs round the shaft, so that the bases do not come too close to the edge of same, and it will be noted on referring to the figure that they are placed at nine feet each side of the

Live Load Due to Winding.—This is carried entirely by the main and back legs, and the proportion of stress on each is found by the principle of the parallelogram of forces.

The maximum pull on the ascending rope we found to be 22,500 pounds, and for the descending one 6,000 pounds.

Referring to Fig. 4, and treating the ascending load first, if the lines indicating the rope on both sides of the pulley are produced until they meet, which will be at the point "a," and from this intersection lengths are scaled along both lines to represent the maximum tension in the ropes, as shown by "a b" and "a c," then by completing the parallelogram "a b d c" the resultant of these two forces can be found, namely, "a d," and on being measured by the same scale the magnitude of this resultant is approximately 39,500 pounds. This line, it will be noted, passes through the centre of the shaft, and indicates the desirability of using angular bearings rather than the ordinary vertical type. This resultant can now be resolved into two other components acting in the direction of the main and back legs, respectively.