Again, to the insulating piece (C) there is attached an arm (D) which supports one of the fibers of the bifilarly suspended mirror (E), the other fiber being attached to a fixed pillar (F), which has an adjustment to change the distance between the ends of the fibers. To explain the action of this mechanism, suppose the field magnet (M) to be excited, and thereby producing a very intense magnetic field in the field gap, and that a small current be flowing in the deflection coil freely suspended in this field gap. The result will be an upward or downward motion of the deflection coil, according to the relative directions of the currents in the two coils.

This motion will be communicated by means of the terminals to the pulleys (P, P), which will be rotated about their axis, the piano wire, carrying the arm (D) with them.

It will be seen that if the ratio of the radius of the pulleys to the arm (D) be 1-r, then will the upper extremity of (D) describe an arc whose length is r d, where d is the distance that the coil moves up or down.

Again, suppose the horizontal distance between the upper ends of the bifilar suspension to be s, then will the mirror (E), which, of course, hangs in the plane of the two fibers, make the angle $\mathrm{Tan}^{-1}\, rd \div s$ with its initial position. And therefore for a given value of rd. the deflection of the mirror will approach a maximum as s decreases.

We are thus able to increase the sensibility of the instrument in a very convenient manner, and what is more, we can change it a given amount at will by simply changing the distance s by means of the gradnated screw (T).

The instrument has been completed but a short time, and therefore we have not been able to give it a fair test, but the experiments that have been made are sufficient to indicate that, with a few changes in the mechanical details, our object has been attained.

Note on Some Experiments to Determine the Ratio Between the Elastic Limit in Tension and in Flexure for Soft Steel. By W. K. Hatt.

The fact that the material at the top and bottom of a beam of ductile material will show an elastic limit in flexure higher than its elastic limit in tension has been noted by experimenters, by Baoshinger and M. Considere, for instance. For steel bars the elastic limit in flexure was $\frac{1}{3}$ to $\frac{3}{4}$ larger than in tension, and the increase is a function of the shape of cross-section and ductility of material. The increase may be explained by considering that when a beam is bent to the elastic limit of the outside fibres, connection between these fibres and those just below will prevent the free contraction or expansion of the outside fibres, and thus the beam has its elastic strength increased. In case of harder steels and materials such as cast iron or wood, no such increase may be expected. Experiments are being carried on by the writer to determine as completely as possible the increase of the elastic limit as a function of the shape of the cross section. Up to the present a series of I beams have been tested, and a series of flat plates. The tests in flexure are compared with tests in tension on material cut from the flexure specimens. The plates were partly $6\frac{1}{2}'' \times 1''$ with span of $28''$ and partly $7\frac{1}{2}'' \times 1\frac{1}{2}''$ in section with a span of $40''$. The increase in the elastic limit for the plates was 55 per cent. in the first case and 27 per cent. in the second case

A specimen $3'' \times 4''$ in section tested with a span of $57''$ showed an elasti limit of 42,000 lbs. □″. A tension test was not made of this material, but the yield point reported by the mill is 37,950 lbs. □″. Mr. Gus Henning has shown that the elastic limit of rolled material is some 4,000 lbs. □″ less than the yield point from the billet, and if the 37,950 lbs. □″ is thus reduced, the 42,000-lbs. □″ elastic limit in flexure will represent an increase of 27 per cent.

When the height increases in comparison with the breadth, the excess strength in flexure disappears, and for the I beams tested the elastic limit in flexure was slightly less than that of a tension specimen cut from the web.

It is to be noticed also that, in the case of flat plates, there is not free elastic expansion in the side direction during flexure; consequently the modulus of elasticity should be increased. The tests on seven plates show an average increase of 3.6 per cent. in Young's Modulus.

Note on Compressive Strength of Wrought Iron. By W. K. Hatt.

While the tensile strength of wrought iron or steel is a definite quantity, the compressive strength is not so well defined. In the case of wrought iron the compressive strength is quoted by different authors in values from 40,000 to 90,000 pounds per square inch for a state of stress consisting of compression in one direction only. The strength of any specimen is a function not only of its physical properties but of its shape, and the maximum resistance to compression may be anywhere from the elastic limit to the plastic limit, depending on the shape of the specimen tested. It is not customary to test iron and steel in compression, since the results of a tension test give an index of the capacity of the material to