bundles on the inner or superior side of the leaf are very different in appearance. The cavity of the cell is very small, and the thickness of the cell wall great. These cells are, however, few in number when compared with the others. The best kind of fibre is therefore very deficient in the lower portion of the butt, while the inferior fibres are abundant.

The parenchymatous cells at the base of the leaf contain more or less protoplasm and nuclei; but no chlorophyll was observed in the cells.

The epidermis of the upper or inner surface of the leaf has only a very slightly developed cuticle, while the epidermis of the lower or outer surface is made up of cells of small size, much thickened on the free surface, and covered with a very thick cuticular layer.

In the lower part of the butt of the leaf the cellular tissue largely predominates, forming about 3-5ths or 4-5ths of the whole. The fibro-vascular bundles vary much in character, some consisting entirely of the prosenchymatous cells, others containing only a few: The large size of the cavity of the prosenchymatous cells shows that they will possess but very little strength; and also, that there will be very great difficulty in separating these ultimate cells on account of the thinness of the wall.

The fibres from the lower part of the butt cannot be considered to be of good quality and probably it will be found best in preparing the fibre for manufacturing purposes to reject entirely that contained in the lower part of the butt of the leaf.

B.—The upper portion of the Butt.

Here the arrangement of the tissues correspond for the most part with that at the lower portion of the butt.

The superior or inner epidermis is composed of small cells, with only a very slightly developed cuticular layer. In many specimens no cuticle is visible, the cuticularized outer wall of the epidermal cells being also thin. Higher up in the leaf the cuticle is thick and well developed. It is at this portion of the leaf that the flax gum is mostly developed. At first the gum is a viscid semi-fluid substance, which speedily dries into thin laminæ. This gum is apparently not produced by glands or secreting organs in the tissues of the leaf, but is a superficial formation, produced by degenerative changes occurring in the thick cell-wall and cuticular layer of the epidermis of the upper or inner side of the sheathing portion of the leaf. This accounts for the absence of a thickened cuticle on that part of the leaf, and also for tho absence of all glands or openings on the surface of the leaf by which the gum can be secreted. Gum *tragacanth* is formed in a somewhat similar manner by degeneration of cell-walls; and in sea-weeds, the so-called "intercellular substance" is produced in a similar way. In the spores of *pilularia* and *marsilia*, a gummy secretion is formed at the expense of the cuticular layer. Very little chlorophyll exists in the cells below the upper epidermis at this part of the leaf.

The cellular tissue of the leaf resembles greatly that of the lower butt, but now the fibro-vascular bundles are seen to be more regularly arranged, and the air-cavities or intercellular spaces are much more marked.

The fibro-vascular bundles, near the inner or superior surface, are complete with prosenchymatous wood-cells, spiral vessels, and cambiform cells, the prosenchymatous cells being well developed on both sides of the bundle. Close to the inferior, or outer epidermis, the bundles are not constituted in the same way, in them the prosenchymatous wood-cells largely predominate, and in a few, spiral vessels exist, while in others only wood-cells are visible. These bundles are very regularly arranged, close to the lower epidermis, and only separated from it by two or three small cells. Between these bundles the cells containing chlorophyll are placed, and give a very characteristic appearance to the section.

The large intercellular spaces form a very marked feature in the transverse section of the leaf. They are regularly arranged in a single row in the middle of the leaf, and separate more or less accurately the bundles of the upper side of the leaf from the bundles of the lower. The lower epidermis consists of a layer of small cells, with a well marked cuticular layer. This arrangement holds both for the thick portion of the sheath and the thin lateral parts.

The quantity of fibre in this part of the leaf is greater than that in the lower portion of the butt. Near the lower epidermis the bundles are placed very close together, and form about half of the tissues, while in the rest of the leaf the bundles are few and scattered, and not occupying more than 1-10th of the tissue.

At this portion of the leaf small intercellular cavities, containing a dark reddish-brown fluid, were observed; one situated on each side of the middle line of the sheath, on the superior surface. Similarly coloured marks were also on the leaf, but as their development could not be traced by means of the specimens examined, no opinion can be give respecting them. The irregular arrangement of the cells surrounding them, and their varying depth from the surface is to be noticed. In some places the gum on the surface was deeply coloured of the same tint as the colouring matter contained in these cavities. Careful examination of the development of the leaf would be the only way to make out the true nature of these structures, and to do that would not come within the sphere of a preliminary report like the present.

§ 3.—Structure of the Blade and Tip of the Fresh Leaf.

A.—Lower portion.

As the lower portion of the leaf, or butt, could be more correctly described as the sheath, so the whole upper portion may be described as the blade, or lamina. As we described the lower and upper portion of the butt, or sheath, so we may describe the upper and lower portion of the lamina, the tip or apex, and the blade.

Above the butt, or sheath, the blade appears as a well marked flattened expansion, with a strongly marked keel on the lower side, this keel extending down the butt. No gum is now formed by the upper epidermis, which is glossy and dark green. The margin of the keel and the edge of the leaf is reddish-brown in colour, and differs from the other part of the leaf in appearance.

The arrangement of the different tissues in the leaf differs considerably from that in the sheathing portion. We do not find the fibro-vascular bundles arranged in the same way. The complete bundles,