A.

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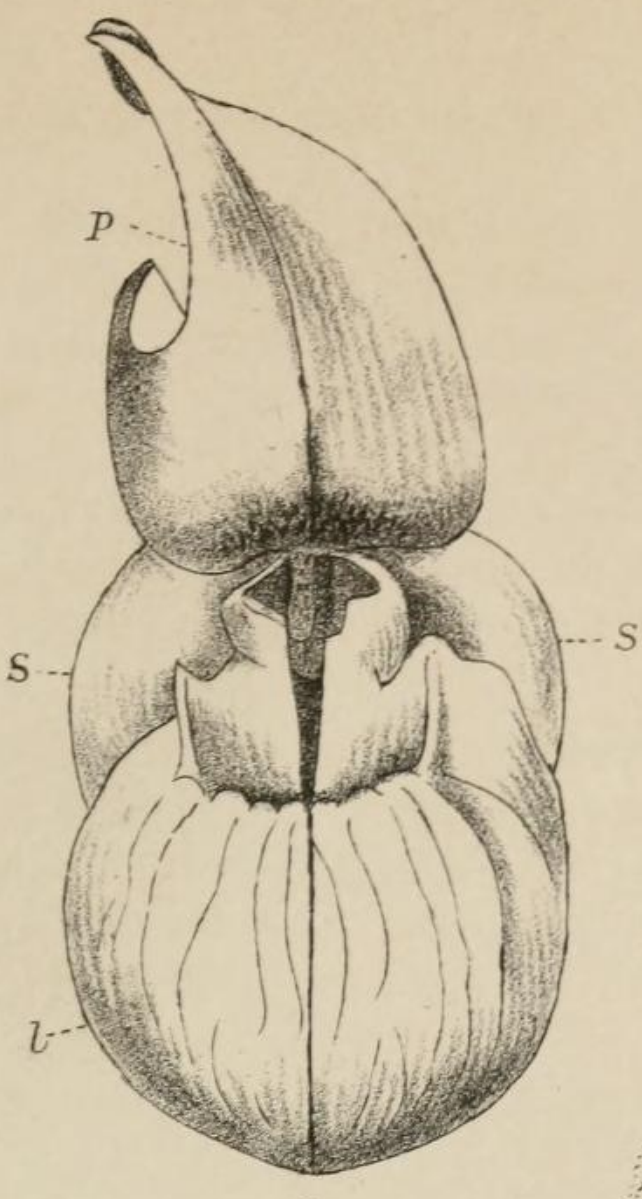

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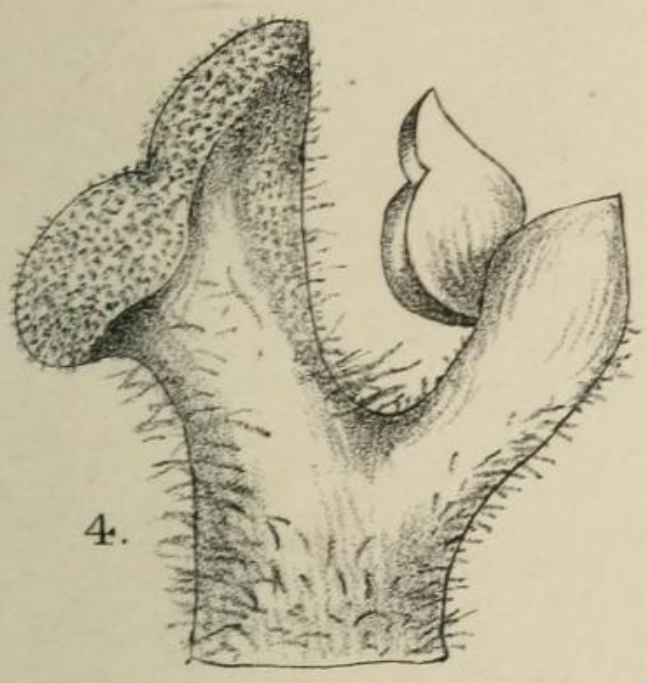

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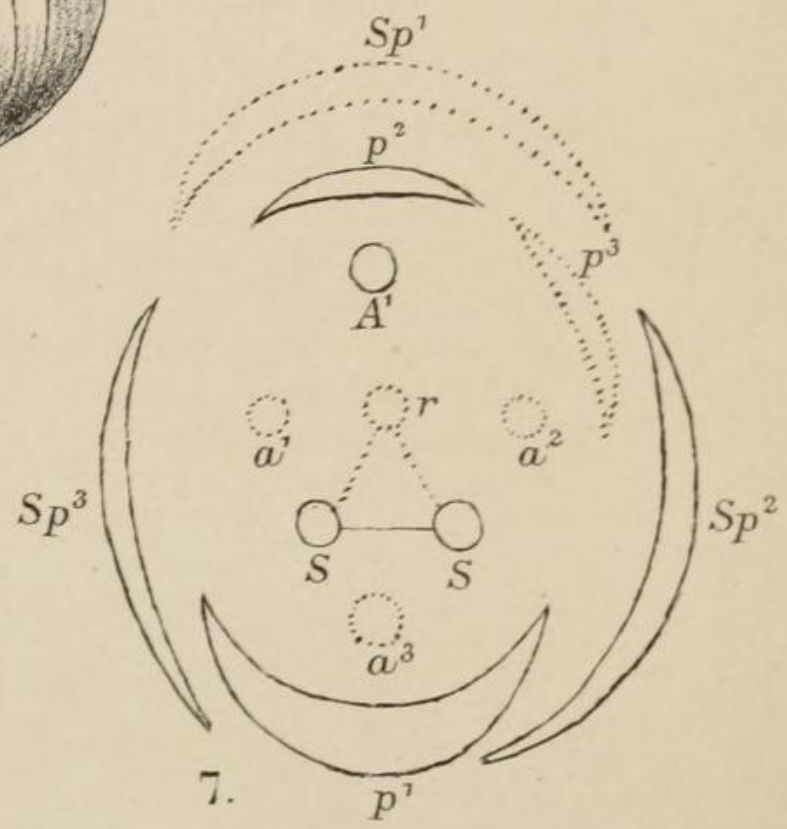

7.

Monandrous Cypripedium.

B.

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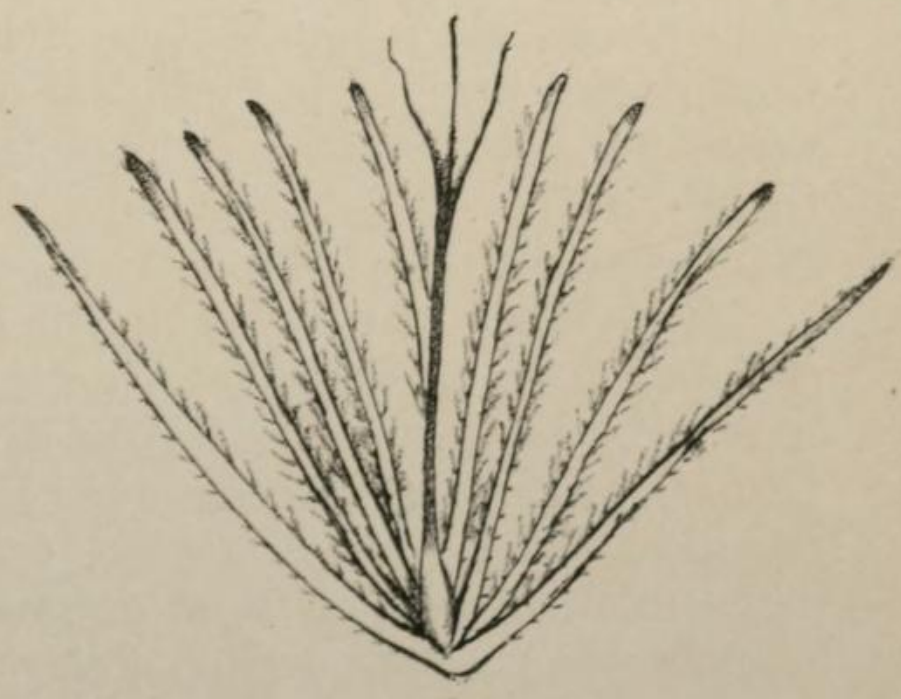

2.

M. Suft del.

Mintern Bros. imp.

Monstrous Apargia.

THE

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BRITISH AND FOREIGN.

Original Articles.

ON A MONANDROUS *CYPRIPEDIUM*.

By S. Le M. Moore.

(Tab. 200, a.)

During the past two seasons some of the flowers, as well lateral as terminal, on Kew-grown specimens of *Cypripedium Sedeni*, Rchb. f. (a hybrid between *C. longifolium*, Warsc., and *C. Schlimii*, Rchb. f.*) have lapsed into the curious and highly instructive andrœcial modification which I purpose to describe and make a few comments upon. I may state that flowers showing this malformation are deposited in spirit in the Kew Herbarium, so that even if it should not occur elsewhere there will be material for future investigation.

Reference to Fig. 1 will show that the monstrous flowers have only four instead of six perianthial organs; of these the conjoined lateral sepals (*s s*) are almost normal, and the labellum (*l*) quite so. Opposite the latter, and on the other side of the column, is an organ in the position of the upper sepal, but that it is a petal and not a sepal is shown by its standing on the inner side of the sepals, and by its having the same hue and basal-coloured hairs of a petal. Outside this transposed petal there is no sign of the missing sepal, neither is there a trace of the second petal.† But the most remarkable deviation is to be found in the column. On looking to the centre of the flower the reader will be struck by the absence of the 'shield,' the transformed posticous, in monandrous Orchids antheriferous, stamen. This strange column is shown at Fig. 3

* 'See Gard. Chron.' 1873, p. 1431.

† The following notes are selected from a number made with the monstrous flower before me:—Labellum normal. Breadth of conjoined lateral sepals, an inch and one-fourth (of unmodified flowers an inch and one-twelfth), and their free edges are not reflexed, so that they more closely invest the labellum than is usually the case. Petal an inch and five-sixths long by two-thirds of an inch broad at its widest part; in the ordinary state it has the same length, but is a trifle narrower; the upper sepal is an inch and one-third broad at widest part, and it has no coloured hairs at its base. The figure in the 'Floral Magazine' (1876 t. 206) shows larger and brighter flowers than any I have seen at Kew.

somewhat larger than nature; beside it I have figured for comparison on the same scale the ordinary shield-bearing column, and at Fig. 4 the monstrous arrangement is shown in a larger and more convenient way. The posterior division of the column is here comparatively narrow, short, and truncated at the top, and it bears at the upper part of its inner (anterior) face a single anther; at the point of divergence of the two divisions on neither side is there the least trace of the usual *Cypripedium* anther. The flower is, therefore, monandrous in the strictest sense of the word. The anterior or stigmatic branch of the ordinary column makes a considerable angle with the common base, and the two lobes of of the stigma, as well as the crowning third lobe—the rostellum of the Monandreæ—are placed transversely and are directed forwards. In the monster, on the contrary, the third lobe is suppressed, and the two longitudinally-placed stigmatic lobes are borne on a branch which is almost continuous with the common base, so that they look upwards as well as outwards (Figs. 5 and 6). Finally, as might with much safety be assumed, from the state of the stigma, the ovary is two-celled.* The modified flowers have, therefore, a two-whorled four-membered perianth, a monandrous andrœcium and a dimerous gynæcium. It is manifest that interest centres on the second of these peculiarities, and that two questions will be uppermost in the mind of every morphologist: first, what is the position of the single stamen? and secondly, what phylogenetic deductions, if any, are to be drawn from the anomaly? These questions I shall endeavour to answer as satisfactorily as possible.

A glance at the diagram (Fig. 7), the explanation of which is obvious, will suffice to show that the fibro-vascular bundles of the column are three in number, of which one, namely, that supplying the anther-bearing arm, is median, and evidently belongs to the outer whorl, while the other two proceed each towards a stigmatic lobe; but there is no trace of bundles corresponding in position to the letters a^1, a^2, a^3,† and r of the diagram. There is, therefore, no room for doubting that the andrœcium of our monster is similar, allowance made for suppression, to that of ordinary Monandreæ. The expectation of finding, in accordance with this interesting fact, cellular modifications associated with the morphological ones, was, however, nullified in every way, the anther having the many-layered endothecium and fully-evolved pollen-grains entangled in glutinous matter which mark the genus.

It will here be convenient to mention the published deviations from the usual structure of *Cypripedium*. Asa Gray‡ has seen a

* A tendency to suppression of one of the placentas is figured by Cramer (Bildungsabweichungen, t. xiv. Fig. 2) in an abnormal flower of *Ophrys arachnites*, and in Asa Gray's specimen of *Cypripedium candidum* ('Silliman's Journal,' 1866, p. 195), there were only two placentas.

† I may here state that, in common with everybody who has worked at Orchid Morphology, I have never seen in this genus a trace of the bundle corresponding in position to the a^3 of the diagrams.

‡ *L. c.* p. 195. Dr. Reichenbach showed me a similar monster some months ago.

terminal flower of *C. candidum*, L,, which had no labellum, but two sterile 'shield' stamens, and two fertile stamens opposite the petals, and therefore normal in position. Unfortunately the two lateral sepals are, in this note, considered as one; and as it is said that the sterile stamens were opposite the sepals, it seems scarcely possible to conclude otherwise than that they represent the organs marked A^1 and a^3 in the diagram. The surprise which is naturally felt at the appearance of the usually-absent a^3 is lessened by the fact of the absence of the labellum,* and by the existence of the former organ in the closely allied genus, if not monstrous form known as *Uropedium*. Then Masters† figures a monster which seems to have been modified in a somewhat similar way to ours. In this the lateral sepals are wanting, and the central one is divided into two; the labellum is quite normal, except for a slight lateral disarrangement; the petals are placed in a median or nearly median position, and the androecium is regular, except that the shield is suppressed. The same author says:—"A tetrandrous flower of *Cypripedium* has also been recorded." This I presume to refer to Asa Gray's case above-mentioned, though possibly I may be mistaken. To these must be added *Uropedium*,‡ which has a flat petal-like labellum, three complete stamens opposite the petals, and therefore in the position of a^1, a^2 and a^3, as well as a median sterile one (A^1), something like the *Cypripedium* 'shield,' but free from the style, and united to the lateral stamens. We see then that in *Cypripedieæ* every stamen may be antheriferous with the exception of A^2 and A^3, which by adherents to the Brown-Lindley-Darwin morphology are supposed to be united with the labellum. On the other hand, if we turn to Monandreæ, we find that in *Pogonia ophioglossoides* all the stamens have been seen, and in the well-known case of *Arundina pentandra*, figured by Reichenbach in 'Xenia Orchidacea,' t. 105, all with the exception of a^3. Many instances have also been recorded of diandrous and triandrous monsters in several other genera. §

Whether we incline to the conclusion of Brown, Lindley,‖ Darwin, and their followers, according to which the position of the

* May not the labellum have been present in the form of the sterile stamen? Cases of pollen being borne by petals in Orchideæ are on record. Perhaps an intermediate condition may be that of a flat labellum, mentioned by Reichenbach as occurring in the case of *Selenipedium Warszewiczii*.

† 'Vegetable Teratology,' p. 93, fig. 44.

‡ Brongniart, 'Ann. Sc. Nat.' III. Ser., Botanique, vol. xiii., p.113, tab. 2. The question as to the monstrous condition or generic validity of this form has been answered by Reichenbach ('Bot. Zeitung,' 1876, p. 41) in the latter sense. This conclusion is founded on two facts: first, that it bears seed capable of reproduction; and secondly, that for the most part *Uropedium* and *Selenipedium* inhabit different countries, and that where they are compatriots they are not neighbours. It matters little to my present purpose which view be adopted; it ought, however, to be said that Reichenbach speaks of having seen a tripetalous flower of *S. Warszewiczii*.

§ See Masters, *l.c.* p. 380, for a number of these,

‖ Every appeal to theoretical structure indicates, in my opinion, a belief in Evolution so far as relates to the differentiations from that structure, so that we may fairly claim the two greatest nineteenth-century English botanists as

vascular bundles is absolutely determinative of that of the organs, or whether with Reichenbach, Crüger and others, we deny the existence of any adnation of andrœcium to labellum,* we cannot have a doubt but that in the andrœcium of *Orchideæ* there has been a tendency to suppression in an organic posticous (usually positional anticous) sense, just the reverse of what we find in *Apostasia*. This applies to the gynæcium as well as to the andrœcium, but conversely. I unhesitatingly include *Cypripedieæ* here, and perhaps the proof of the legitimacy of my doing so is the most valuable outcome of this note, since, while a monandrous condition was unknown in Diandreæ, it might have been considered quite possible that, proximately speaking, these latter and the Monandreæ did not have a common ancestor, though it must be admitted that Hildebrandt's † discovery of the reciprocal effect of the pollen made this position a very unsafe one. Fortunately there is no need to make a great call on the imagination to gain clear insight into the process of evolution of the various forms, for the normal and abnormal 3-6-androus states among Monandreæ, together with *Uropedium*, afford us the plainly defined outlines for such insight. What we have to decide is, whether our monstrous condition is a mere 'freak of nature,' or a reversion to some ancestral condition. The method in the madness at once puts a veto on the first presumption. As for the second, were Link's ‡ view of the monandry of *Cypripedium* the correct one, we should feel almost sure that, in spite of some difficulties, this is an instance of simple reversion, the Diandræ being the descendants of

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believers, to some extent, in Darwinian principles. This has recently been insisted on by Kuntze, who says, "Diese Mutationslehre der Blüthen ist vor Darwin's Epoche in Geltung gewesen; sie wird auch heutzutage von allen Gegnern Darwin's inconsequenterweise nicht beanstandet, trotzdem eine Lehre ohne die andere nicht denkbar ist," 'Schutzmittel,' p. 63.

* I venture to think that Crüger's citation of *Isochilus*—a genus in which the labellum is scarcely different from the petals—is as much unfortunate as otherwise, since it may be that the tendency to pentandry is a consequence of the singleness of the labellum, so that this may be an exception upon which no conclusion can be founded. It is here noteworthy that the labellum of *Arundina pentandra* is comparatively small, and but slightly differentiated. On the other hand, teratological cases in which the labellum is simplified without numerical increase of the stamens support the Reichenbachian view. In the curious *Dichæa* referred to by Reichenbach ('Bot. Zeitung,' 1877, p. 38), I can only see an example, either of fission or of multiplication and displacement. Crüger found that in *Catasetum* the labellum appears after the petals, and nearly at the same time as the stamen, a fact which militates to a certain extent against his theory. The same order of appearance of the members of the petaline whorl was observed by Payer in *Calanthe veratrifolia* ('Organ. Comp.' p. 665, t. 142).

† 'Bot. Zeit.,' 1865, p. 246. He found that pollen of *Cypripedium parviflorum* applied to *Orchis mascula* caused the ovary to swell and the ovules to come to almost a perfect development, though there was no embryo-formation; in fact this pollen, curiously enough, was more effectual on the above-named *Orchis* than was pollen of *O. Morio*. Conversely, pollen of *O. mascula* was similarly effectual on *Cypripedium Calceolus*.

‡ 'Bot. Zeitung,' 1849, p. 745. He thinks that each division of the column bears half an anther! He examined *C. spectabile*, L., a species about which I can affirm that there is nothing peculiar.

the Monandreæ. But nowhere has Link's curious theory, so far as I am aware, met with favourable reception, and whatever refutation it does not carry with itself is furnished by the appearance in *C. Sedeni* of a single median anther *essentially similar to either of the normal ones*.

In all probability the Cypripedeous type is an earlier one than the Monandreous, since there are in it more similar parts and a lesser differentiation of those parts; and this may be held in spite of the undoubted fact of retrogression in both the animal and the vegetable kingdom;* in fact, if the subject be thought out, there seems to be no other possible view than this; for, supposing otherwise for a moment, we can conceive no conditions which could educe the Diandreous from the Monandreous type, since all the causes of floral retrogression, viz., variations in entomophily or in reciprocal fertility, unfavourable weather, and change of entomophily to anemophily are out of the question here. I do not mean to say that *Cypripedium* is the progenitor of all other Orchids, but that some type, probably extinct at the present time, containing stamens of the two whorls and Cypripedeous pollen, was the starting point of the Order. On this supposition the persistence of *Uropedium*, provided it be not a monster, and the possession by *Yucca Whipplei*, Torr.,† of pollen like that of the *Cypripedieæ* are facts of the highest importance. After a time all the stamens except A^1, a^2 and a^3 would appear to have been either entirely eliminated or partially so, and finally, either A^1 or both a^2 and a^3 failed to produce pollen. Now if in our monster a^2 and a^3 had not entirely aborted, we should have precisely the structure of some ordinary Monandreæ. I believe, then, that we see here a peculiar kind of reversion, entirely distinct from any form of what Darwin has called "analogous variation," and perfectly consonant with the theories of 'Pangenesis' and 'Physiological Units,' as well as with the 'Plastidule' theory of Haeckel adopted by Strasburger.‡ It differs from ordinary reversion in this, that whereas in the latter the teratological structure is the ancestral one, in *C. Sedeni* the monstrous is the derived state. I was at first so struck with this that I thought of proposing some term to express it, such as 'Revision of Structure,' or 'Re-presentation of a Process of Evolution,' but I now think all requirements will be satisfied by accentuating this as a peculiar method of reversion.

We see, then, that those of the lapses from normal expression of organised existence which are sufficiently constant to be apprehended by the science of to-day as orderly phenomena, may be separated into two groups. One of these shows us Reversion

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* For the animal kingdom see Darwin's 'Descent of Man,' i., p. 205, and text-books; also E. R. Lankester on Dohrn's Theory in 'Nature,' Vol. xii. p. 479. In the vegetable kingdom, take Glumales for instance, and most *Monochlamydeæ*, as well as many aquatic Phanerogamia. Sixteen years ago Mr. Darwin came to the conclusion that *Cypripedium* is an ancient type. 'Fert. of Orchids,' ed. i., p. 331.

† See J. G. Baker in 'Gard. Chron.' 1876, pt. I., p. 196, Fig. 42.

‡ 'Studien uber Protoplasma,' p. 48.

to an ancestral condition, and for it the term "Proximate Reversion" may perhaps be allowed. The other is a re-delineation, as it were, of developmental lines which are usually invisible. Moreover, it may confidently be expected that when our knowledge of that difficult subject the pedigree of organisms becomes more definite, and when some safe conclusions have been reached concerning the phylogenetic value of the facts of Teratology, many more instances of this second form of Reversion will be brought to light.

[Appendix.—Since writing the above I have had the advantage of oral communication with Dr. Reichenbach, who informs me that he has in his collection two monstrous states of *Cypripedium Sedeni*, the one above-noticed, and another in which the sides of the 'shield' are polleniferous. As he has many other interesting *Cypripedium* monsters, we may hope soon to have a memoir on the Teratology of the genus at his hands.—Oct. 1878.]

Explanation of Tab. 200, a.—1. Monandrous flower of *Cypripedium Sedeni*, Rchb. f. (natural size). 2. Column of normal flower about natural size. 3. Column of monster on scale of last. 4. Enlarged view of monstrous column. 5. Stigmatic lobes of normal flower slightly enlarged. 6. Stigmatic lobes of monster on scale of last. 7. Diagram of flower.

FURTHER NOTE ON THE STRUCTURE OF COMPOSITES.

By Maxwell T. Masters, M.D., F.R.S.

(Tab. 200, b.)

In the number of this Journal for February last I took occasion to allude to certain malformations of interest as bearing upon the structure of Composites. The flowers of *Helenium autumnale*, to which reference was there made, had neither ovary nor calyx, the corolla was virescent, the five stamens were free and sprang from a prolonged thalamus, which bore at its summit two open leaves representing carpels but without trace of ovules. It is not necessary to refer in greater detail to these flowers; suffice it to say that from a consideration of the structure, normal and abnormal, of Composite flowers, as well as of the course of development, I arrived at the conclusion that the balance of evidence lay with those who consider the pappus not as a true calyx, but as a series of outgrowths or trichomes rather than as definite phyllomes.

I have now to mention some malformations in *Leontodon* (*Apargia*) *autumnale* which appear to me to be of considerable interest, and for which I am indebted to the kindness of Mr. M. P. Edgeworth. Under ordinary circumstances the flower-heads of this plant are borne on long slender stalks, destitute, or nearly so, of scales. The involucre consists of numerous linear-lanceolate bracts in many rows, surrounding a flat receptacle from which the ligulate florets proceed. Each floret emerges, as it were, from a little socket in the receptacle, the edge of the socket bearing four or five small