

Daedalus

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137

PROCEEDINGS

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ARTS AND SCIENCES.

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VOL. XVII.

PAPERS READ BEFORE THE ACADEMY.

I.

CONTRIBUTIONS FROM THE CHEMICAL LABORATORY OF HARVARD COLLEGE.

BY JOSIAH PARSONS COOKE, *Director.*

Presented May 11, 1881.

INTRODUCTION.

MARINE BIOLOGICAL LABORATORY.

Received *June 18th 1890*
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INTRODUCTION.

In a paper presented to the Academy, and published in its proceedings, Vol. XIII., page 1, we gave the results of our investigation of the haloid compounds of antimony up to that time, including a revision of the atomic weight of this element. We did not directly answer the criticism which this paper called forth, except so far as to present to the Academy, March 10, 1880, and to publish in these Proceedings, Vol. XV., page 251, a preliminary notice of experiments then in progress which furnished the best possible answer to the unfounded assumptions of the critic. We also gave brief notices of our work from time to time in the American Journal of Science. But now that the work is ended for the present (or at least must be suspended for a considerable period), we propose to bring the results together in the present paper.

I. THE OXIDATION OF HYDROCHLORIC ACID SOLUTIONS OF
ANTIMONY IN THE ATMOSPHERE.

In our first paper (*loc. cit.*, page 21) we made the following incidental observation, in explanation of certain precautions which we

found to be necessary in order to secure the precipitation of pure antimonious sulphide :—

“The precautions here described may seem unnecessary to those who are not familiar with the fact that a solution of antimony in hydrochloric acid oxidizes with very great rapidity in the air,—fully as rapidly as the solution of a ferrous salt. A solution reduced as we have described, which has at first no action on the iodized starch paste, will strike the blue color after it has been exposed to the air for only a few minutes. This property of an acid solution of antimonious chloride is mentioned by Dexter, in the paper already referred to, but we were wholly surprised by the energy of the action. By means of it, antimony can be dissolved in hydrochloric acid without the aid of nitric acid, or of any other oxidizing agent save the air, if only a certain amount of antimonious chloride has once been formed. When, after exposure to the air, the solution is boiled over pulverized antimony, the solution is reduced, and a further portion of the metal enters into solution. After a second exposure, the same process can be repeated, and so on indefinitely. The process is very slow and tedious, but, in one experiment, we succeeded in bringing into solution in this way several grammes of antimony.”

On the sole basis of this language we have been represented as asserting that such antimony solutions oxidize in the air as rapidly as a solution of *ferrous chloride*, and experiments on comparatively dilute solutions of antimonious oxide in hydrochloric acid have been adduced as proofs that our observation was incorrect.

As is evident from the context, the statement just quoted, although the result of a very extended experience, was not based on quantitative measurements. What we noticed was that the solutions *were very quickly acted on* by the oxygen of the atmosphere, and we freely admit that the expression here italicized is a more accurate description of our observation than the words originally used as quoted above. But our meaning was not left in doubt, for we expressly say, immediately after, that the process is very slow and tedious. In regard to the phenomenon in question, the effects are so obvious, when once attention is called to them, that it is entirely unnecessary to confirm our previous observations except so far as to add the following quantitative determinations, which will serve to give an accurate idea of the extent of the action under the only conditions we have investigated, or in regard to which we have written.

In order to determine the amount of oxidation caused by the action of the atmosphere on a solution of antimony in hydrochloric acid, we

reduced the oxidized solution by boiling the liquid over antimony bullets, and determined the loss in their weight. This method is fully described in our original paper, and is based not only on the reducing power of the metal, but also on the fact repeatedly observed, that, after the reduction was complete, the smallest excess of the finely pulverized metal would not dissolve, even after prolonged boiling, and in the presence of a large excess of acid, if only the solution was protected from oxidation.

We began our experiments by dissolving 1.0036 grammes of pure antimony (a portion of the same used in our experiments on the synthesis of antimonious sulphide) in about 30 cubic centimetres of pure hydrochloric acid (sp. gr. = 1.175) adding 3 cubic centimetres of very dilute nitric acid (containing only about 5.4 per cent of HNO_3). After the solution was completed we added bullets made of pure antimony (the same that had been used in our previous experiments), and boiled the solution in an atmosphere of carbonic dioxide, using the same apparatus which we described in our previous paper (*loc. cit.*). After the reduction was ended, the solution was transferred to a flat-bottomed flask through a platinum tunnel, on which the bullets were retained; and, after washing into the flask the last traces of the solution, with as small an amount of hydrochloric acid as possible, the tunnel was removed, the bullets washed with water, and again weighed as at first on the platinum tunnel. In reducing the original solution, 0.4100 of a gramme of antimony were dissolved from the bullets. The solution now containing 1.4136 grammes of antimony was next exposed to the air for different successive periods of time in a room having a varying temperature of from 15° to 30° , sometimes in the shade, and at other times on a window seat, where the sun's direct rays fell on the flask during several hours of each clear day.

We give in the following table the weight of antimony dissolved from the bullets after each successive exposure to the air, the amounts in each case being determined with all the precautions described above, and still more at length in our former paper:—

Weight of Sb originally dissolved	<u>1.4136</u>
1. Dissolved from balls after 3 days' exposure,	0.0150
2. " after 5 days	0.0295
3. " " 10 " May 17 to May 27 .	0.0600
4. " " 23 " May 27 to June 19 .	0.1340
5. " " 37 " June 19 to July 26 .	0.2960
6. " " 120 " July 26 to Dec. 24 .	0.4481 0.9826

During these experiments the volume of the solution was gradually increased by the hydrochloric acid used in washing as above described, so that at last the volume amounted to 100 cubic centimetres.

It will be noticed that the amount of oxidation increased with the time of exposure, and that, so long as the amount was small, it was as nearly proportional to the time as could be expected under the varying conditions. The increased activity shown by determination No. 5 appeared to be due to the intensely warm weather and bright sunshine during the period, and the last determination would seem to indicate that, after the oxidation reached a certain limit, the process went on more slowly, as we should naturally expect; but, with the greatly varying conditions during this long period, no certain conclusion can be drawn in regard to the effect of any single cause.

The action we are discussing is entirely in harmony with the chemical relations of antimony. The most striking characteristic of this elementary substance is its tendency to form compounds of the radical antimonyl, SbO . The oxichlorides, the oxibromides, and the oxiodides, whose relations we have discussed so fully in our previous papers, are examples in point, and we have been continually surprised by the appearance of such compounds in reactions in the most unexpected ways. In this respect antimony closely resembles vanadium, and with this element antimony is more closely allied than with its familiar associate, arsenic. What the precise reaction is in the present case we are not prepared to state. That it is not the simple conversion of a tetrachloride into a pentachloride we are convinced; but, in order to elucidate the subject, further investigations are necessary.

In this connection we may appropriately add that while the above determinations were in progress we repeated the experiment described on page 19 of our previous paper (*loc. cit.*). We treated in an open flask 5 grammes of finely powdered pure metallic antimony with 50 cubic centimetres of strong and pure hydrochloric acid, to which we added only one cubic centimetre of the very dilute nitric acid (5.4 per cent) described above. The flask was placed in a warm, protected place (30°C .), and shaken from time to time. Soon the acid became colored reddish-yellow, and the chemical action began. When it had apparently ceased, the contents of the flask were shaken together, and the solution became at once as colorless as water; but, on standing in the air, the color rapidly returned, spreading from the surface of the liquid downward. These phenomena were repeated again and again during four or five months, until the whole of the metal dissolved. According to the reaction usually assumed to take place under these

circumstances, 5 grammes of metal would have required 50 cubic centimetres of acid, so that the effect was obtained with only one-fiftieth of the amount required by this theory.*

II. ARGENTO-ANTIMONIOUS TARTRATE (SILVER EMETIC).

On one occasion when analyzing antimonious chloride we noticed the formation of "silver emetic," and the observation led us to fear that this compound might be occluded by the argentic chloride or bromide, precipitated from a solution containing tartaric acid and antimony. This suspicion, thus excited, led us to make an investigation of the substance in question with the following results:—

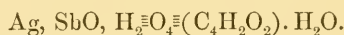
As stated by us in our former paper, this compound was originally obtained by Wallquist by precipitating nitrate of silver with tartar-etic, and was analyzed both by him and by Dumas and Piria. These chemists obtained respectively 27.31 and 28.05 per cent of oxide of silver. They appear, however, to have prepared the substance only in an amorphous form. As stated in the paper just cited, we first noticed the formation of crystals of the compound in a concentrated solution of antimonious chloride and tartaric acid, to which had been added an excess of argentic nitrate, and from the circumstances of their formation we were led to form a somewhat erroneous inference in regard to their relation to water. We find that the substance is far more soluble in this solvent than at first appeared. We have found from further investigation that one part of silver emetic dissolves completely in one hundred parts of boiling, and in somewhat less than five hundred parts of water at 15° C. In one determination made by evaporating, a saturated solution, which had stood a long time at a temperature of 15°, we found that one thousand parts of water had dissolved 2.76 parts and in another 2.68 parts of the salt. There

* Although in our synthesis of antimonious sulphide it was our constant study from the first to prevent the oxidation of the product, and although we most carefully guarded every phase of the process, yet the theory was advanced that the apparent weight of the product was *increased* by a partial oxidation of the antimonious sulphide at the temperature at which the red was converted to the gray modification. In answer to this wholly gratuitous assumption, it is only necessary to say: 1. That the oxidation of the dried precipitate at this stage of the process is a well-marked phenomenon, with every phase of which we are acquainted. 2. That the oxidation is always attended with a *loss* of weight. 3. That the products of our determinations were always examined, and have been in two cases preserved, and that these do not show the least signs of oxidation.

is obviously therefore no danger of the formation of this product in the precipitation of chlorine, bromine, or iodine from solutions of the antimony compounds of these elements in tartaric acid, unless the excess of silver nitrate is very large and the solutions very concentrated; and although we have most carefully looked for it in the precipitate we have never discovered it, except under the peculiar conditions described in our former paper, and our fear that it might be occluded by these precipitates was wholly unfounded.

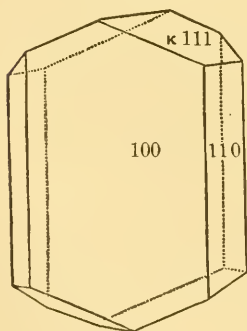
It is evident from the above experiments that the solubility of silver emetic in water like that of cream of tartar and other salts of tartaric acid is very greatly increased by heat, and we were easily able to obtain good crystals of the compound in large quantities by dissolving the precipitate, obtained as Wallquist describes, in boiling water, and allowing the solution to cool. The crystals are colorless and have a very brilliant, almost an adamantine, lustre.

From the reaction by which silver emetic is formed we should infer that the composition of the salt would be expressed by the symbol



This compound would theoretically contain 26.34 per cent of silver and, as a mean of three analyses, we obtained for the amount of silver in the crystals 26.30 per cent, as previously stated.

The crystals of silver emetic rapidly blacken in the light, and are very easily decomposed by heat. This decomposition takes place at about 200° C. with a slight explosion. A very fine carbon dust is blown out of the crucible, and a residue is left behind, which under the microscope is seen to consist of spangles of metallic silver mixed with an amorphous powder. Almost the whole of the powder dissolved easily in a solution of tartaric acid, and it evidently consisted of Sb_2O_3 . In one experiment we weighed the silver emetic and the product, and found that 0.8460 gramme of the salt left 0.5304 gramme of residue. If the residue consisted solely of silver and Sb_2O_3 ,



theory would require 0.5200 gramme, and it can be seen from this how perfect the decomposition was. It is obvious, therefore, that were this compound occluded as we at first feared, it would have made itself evident on drying the precipitates.

Mr. W. H. Melville, assistant in this laboratory, has made the fol-

lowing crystallographic measurements of the crystals whose formation and reactions we have described.

Angles between normals.

$$\begin{aligned} (111) \wedge (100) & 70^\circ 19\frac{1}{2}' \\ (111) \wedge (\overline{111}) & 70^\circ 17' \\ a : b : c & = 1 : 1.386 : 0.571 \end{aligned}$$

	I.	Measured.
100 \wedge 110	54° 12'	54° 19'
111 \wedge 110	54° 51'	54° 54'

The pinacoid planes were irregular and the angles can only be regarded as approximate.

System Trimetric with hemihedral habit.

Observed planes $\pm \kappa \{111\} \{100\} \{110\} \{011\} ?$

In the following table the crystallographic ratios are compared with those of the acid tartrates of rubidium, caesium and potassium, formerly measured by us, and which have the same general form and hemihedral habit.

	Vertical.	Macro.	Brachy.
Acid tartrate of caesium . . .	0.661	1	0.694
“ “ rubidium . . .	0.695	1	0.726
“ “ potassium . . .	0.737	1	0.711
Silver emetic	0.412	1	0.721

III. ON THE SOLUBILITY OF ARGENTIC CHLORIDE IN WATER.

In our analyses of antimonious chloride we constantly noticed, while washing the precipitated chloride of silver with warm water, that although the water first decanted from the precipitate was perfectly clear it became turbid when mixed with the successive washings; and on investigating the cause of this unexpected result we found that it was due to the chloride silver dissolved by the pure wash water and reprecipitated by the excess of nitrate of silver in the filtrate. As the solvent action of the water used for washing the precipitate evidently produced a marked effect on our chlorine determination, we determined at once to investigate the extent of the influence.

This subject has already been studied by Stas, whose observations are summed up by Dr. John Percy* in his recent volume on the Metallurgy of Silver in the following words:—

* Metallurgy of Silver and Gold, Part I. p. 60.

“The solubility of the chloride is greatest when in the flaky state, as precipitated in the cold from a sufficiently dilute solution of silver; the solubility diminishes as the flakes shrink when left to themselves, or as they are rendered pulverulent by long agitation with water. Flaky or pulverulent chloride of silver, dissolved in water, pure or acidified by nitric acid, is precipitated by the addition of a salt of silver, or of hydrochloric acid, or of an alkaline chloride. . . . The solution of the chloride is wholly effected by pure or acidified water, as the case may be, and is not caused by the soluble salt formed simultaneously with the chloride of silver. The presence of nitric acid in the water does not affect the solubility of flaky chloride of silver; but it increases the solubility of the pulverulent chloride in proportion to the quantity of acid present. The precipitation of the dissolved chloride is the exclusive result of its insolubility in the solution formed by adding an excess either of the silver salt or of the alkaline chloride.”

So also in Liebig and Kopp, *Jahresbericht*, 1871, 339: “According to Stas, the granular scaly and crystalline chloride is wholly insoluble in cold water: in boiling water the solubility is comparatively great, but decreases rapidly with the temperature.”

In our own investigation of this subject we have at once confirmed and extended these observations of Stas, and our results may be of interest as showing that in the very familiar method of determining chlorine by precipitation with nitrate of silver, which is generally supposed to be extremely accurate, a sensible error may arise from the solubility of the chloride of silver in the hot distilled water used in washing the precipitate. It would be well for every analyst to make the following very striking experiment, which will enable him to appreciate the extent of the action in question.

Take from five to ten cubic centimetres of pure hydrochloric acid, and precipitate the chlorine in the usual way with nitrate of silver, avoiding a large excess. After pouring off the supernatant liquid and washing the precipitate once or twice with cold distilled water, pour upon the white flaky chloride of silver a comparatively large volume of boiling water. As soon as the precipitate settles, pour off the clear hot water, dividing the solution between two precipitating jars. To one of these add a few drops of a solution of nitrate of silver, and to the other a few drops of hydrochloric acid. In both cases a precipitate of chloride of silver will fall, and most chemists, certainly, will be surprised at the effect; for it is not a mere turbidness that results, but a well-defined precipitate, whose amount is easily estimated. Successive portions of boiling water poured upon the precipitate give the

same reaction. In one experiment the reaction was still perceptible in the fourteenth wash-water. But under the action of the boiling water, the precipitate becomes crystalline or granular and the action lessens, until at last the water does not dissolve sufficient chloride of silver to cause even a cloudiness on the addition of nitrate of silver, as just described. Mr. G. M. Hyams, a student in this laboratory, washed two different portions of chloride of silver with boiling water until the action ceased, and then weighed and examined the residue. In the first experiment 1.4561 grammes of chloride of silver were washed with 66 litres of water. The chloride of silver was then collected, and found to weigh 1.2320 grammes. Hence, 0.2241 gramme, corresponding to 15.39 per cent, had passed into solution. In the second experiment 60 litres of water were used, and 16.03 per cent of the chloride of silver originally precipitated were dissolved. These numbers, however, are only approximately accurate; for, as the precipitate becomes granular, it settles with less readiness, and there was necessarily some loss in filtering off so large a volume of liquid.

In the experiments above described the boiling water produced only a very slight decomposition of the chloride of silver. The precipitate, granulated by the washing, readily dissolved in aqua ammonia, leaving less than a milligramme of a black powder, which was proved to be metallic silver.

The solvent power of water on freshly precipitated chloride of silver did not appear to be influenced by the presence of free nitric acid, even in large quantities. We tried the effect both of dropping the nitric acid on the precipitate before pouring on hot water, and also of previously adding nitric acid to the boiling wash-water. We used amounts of nitric acid ($\delta = 1.355$) varying from five to two hundred cubic centimetres to the litre of water, but without finding any marked difference in the result.

The presence of a small amount of nitrate of silver in the water entirely prevented its solvent action, so far as we could discover. In order to determine the limit of the action, we added different quantities of nitrate of silver to the boiling water before pouring it on to the precipitated chloride of silver. With one centigramme of nitrate of silver to the litre of water, there was a marked turbidness on subsequently adding an excess of the same reagent to the filtrate. With two, three, or even four centigrammes to the litre, an opalescence could still be distinguished, although constantly diminishing with the increasing amount of the salt. With five centigrammes, there was no opalescence, and we concluded that one decigramme of nitrate of

silver to the litre of boiling wash-water would certainly prevent all action.

A few drops of hydrochloric acid added to the wash-water greatly diminishes its solvent action on flaky chloride of silver, but does not wholly prevent it, as is evident from the fact shown in the table below, that hydrochloric acid does not precipitate chloride of silver from its solution in water nearly as effectually as nitrate of silver; and, as is well known, hydrochloric acid, if in any considerable excess, exerts a strong solvent action on the precipitated chloride.

As shown by Stas, the precipitation of chloride of silver, from its solution in hot water by the reagents we have named, depends solely on the change which the reagents produce in the solvent. That the action is an example of simple solution is shown by the fact that a considerable portion of the chloride of silver dissolved in boiling water is deposited when the solvent cools. This phenomenon is a striking one, and can easily be observed by pouring into a glass crystallizing pan some of the clear solution obtained in the experiment described above. As the water cools it becomes cloudy, and deposits a granular powder, which adheres to the bottom of the glass. The grains are usually very small; but if the solution cools slowly the crystalline form can readily be distinguished under the high powers of a good microscope, and the little cubes present all the characteristics of the native crystals of chloride of silver. It is evident, therefore, that the granular condition of chloride of silver is a crystalline condition, and this experiment may elucidate the manner in which the native crystals are produced.

We have thus far only spoken of the solubility of chloride of silver in boiling water. As is evident from the crystallization just described, the solubility rapidly diminishes as the temperature falls; but even at the ordinary temperature the solubility is distinctly marked. Luke-warm water poured on and off freshly precipitated chloride of silver, becomes decidedly opalescent on the addition of nitrate of silver, and even if cold water is used the opalescence is perceptible.

In order to obtain an approximate measure of the effects we have described, Mr. Hyams precipitated about fifteen grammes of chloride of silver, and, after thoroughly washing it, boiled the precipitate with a large volume of water in a glass flask. At the end of an hour he decanted through a filter about one litre of the boiling water, and, having divided the filtrate into two portions, he added to one portion nitrate of silver, and to the other, hydrochloric acid. The precipitated chloride of silver was in each case collected and weighed. At the end

XII.

CONTRIBUTIONS TO NORTH AMERICAN
BOTANY.

BY ASA GRAY.

Presented February 8, 1882.

I. *Studies of Aster and Solidago in the Older Herbaria.*

ASTER and SOLIDAGO in North America, like *Hieracium* in Europe, are among the larger and are doubtless the most intractable genera of the great order to which they belong. In these two genera, along with much uncertainty in the limitation of the species as they occur in nature, there is an added difficulty growing out of the fact that many of the earlier ones were founded upon cultivated plants, some of which had already been long in the gardens, where they have undergone such changes that it has not been easy, and in several cases not yet possible, to identify them with wild originals. Late flowering *Compositæ*, and Asters especially, are apt to alter their appearance under cultivation in European gardens. For some the season of growth is not long enough to assure normal and complete development, and upon many the difference in climate and exposure seems to tell in unusual measure upon the ramification, inflorescence, and involueral bracts, which afford principal and comparatively stable characters to the species as we find them in their native haunts. I am not very confident of the success of my prolonged endeavors to put these genera into proper order and to fix the nomenclature of the older species; and in certain groups absolute or practical definition of the species by written characters or descriptions is beyond my powers. But no one has ever seen so many of the type-specimens of the species as I have, nor given more time to the systematic study of these genera. The following notes should therefore be of use.

It is noticeable that the herbarium of Nees von Esenbeck for *Aster* is not referred to. *I cannot ascertain what has become of it.* But

the types of several of his species, or specimens named by him, have been met with in other herbaria, especially in that of Lindley and that of Schultz, Bip., the latter now a part of the large collection of Dr. Cosson. As to Asters, I do not here attempt anything beyond a report of the main results of the study of certain principal herbaria; and I leave the high northern and far western species out of the present view.

Besides general acknowledgments to the curators and botanists who have in all cases most obligingly facilitated my researches, special thanks are due to Professor Lawson, of Oxford, and Professor Eichler, of Berlin, who kindly sent to Kew, for leisurely examination and comparison, one the Asters and Solidagoes of the herbaria of Morison and of Sherard, the other those of Willdenow.

1. *Notes on the North American Asters in the Older Herbaria.*

I. *Species of Linnæus.*

A. SIBIRICUS. Founded on Gmelin's Siberian plant. Two specimens in the Linnæan herbarium: they belong to a robust form of the species which is represented in North America by the *A. montanus* of Richardson.

A. DIVARICATUS. Founded, as to the plant in the herbarium, on the upper part of a specimen of *A. corymbosus*, Ait., wanting the cordate petioled leaves, and with open inflorescence unusually foliolose. But the synonyms, both of Gronovius and of Plukenet, relate to *A. infirmus*, Michx., *A. cornifolius*, Muhl. The Linnæan name in this case should subside.

A. DUMOSUS. Herbarium specimen of the very early cultivated plant, and still in cultivation as a low and far more densely bushy plant than we find in the wild state. The figure in Hermann's *Paradisus* referred to by Linnæus answers well to the wild species; that of Plukenet more resembles the early cultivated form.

A. TENUIFOLIUS. This is founded upon an indigenous specimen in the herbarium, which is well described. As I have several years ago recorded, it is Nuttall's *A. flexuosus*, which must give place to the Linnæan name. The cited figure of Plukenet (which does not well correspond with Plukenet's phrase) belongs probably to *A. polyphyllus*, Willd.

A. LINARIIFOLIUS. Seemingly an indigenous specimen of this well-known species.

A. RIGIDUS. Not in the herbarium; founded wholly on Gronovius, Fl. Virg.; and Clayton's plant is identical with the preceding species.

A. LINIFOLIUS and *A. HYSSOPIFOLIUS*, Mant. 114, both belonging to *Galatella*, an Old World group, were erroneously referred to North America (where nothing of the kind has been detected), and are to all appearance mere varieties of *A. acris*, L. *A. linifolius* originated in Hort. Cliff. No. 15, and there is a specimen in Clifford's herbarium. The synonym of Morison relates to something else, perhaps to *A. tenuifolius*, L.; the plant of Gronov. Fl. Virg. referred to is *A. tenuifolius*, L. So that the name *linifolius* completely subsides, at least as regards the American flora.

A. CONCOLOR. Two specimens, one from Kalm ("K"), and perhaps the other also; probably collected in New Jersey.

A. UNDULATUS. Specimen from Kalm; the form with some cinereous pubescence, extending even to the involucreal bracts; lower part of the stem wanting; pretty clearly the *A. diversifolius* of Michaux, and not the *A. patens*. The character and good figure cited from Hermann's Paradisus are a part of the foundation of the species; from his phrase, "foliis undulatis," Linnæus took the specific name; and the figure is characteristic.

A. NOVÆ-ANGLIÆ. The species is wholly clear, and comes down, with its name, from Tournefort and Hermann. But in his herbarium Linnæus had somehow confounded it with *A. grandiflorus*, and Smith corrected the mistake.

A. ERICOIDES. In the second edition of the Species Plantarum this is brought next to *A. dumosus*. The specimen in the herbarium from the Upsal Garden is an attenuated floriferous state of the received species. But the Dillenian plant from which Linnæus drew the specific name, and also the plant of Clayton, the character of which, by Gronovius, Linnæus copied as that of his *A. ericoides*, are *A. multiflorus*, Ait. Solander, therefore, ought to have continued the name of *ericoides* for the Dillenian and Gronovian plant, unless he could ascertain that the specimen in the Upsal Garden was in the herbarium as early as the year 1753. That cannot be done. But the two species must now continue as named and characterized in Ait. Hort. Kew.

A. CORDIFOLIUS. The species largely rests on the plants of Cornuti and of Morison, both well figured, and the latter identified in his herbarium. There is a specimen in the Linnæan herbarium, unnamed

by Linnæus, however; but Smith has written "cordifolius verus, fide Cornuti." Kalm's specimen, ticketed *cordifolius* by Linnæus, is *A. corymbosus*, Ait.; so that Linnæus confounded the two, and Solander first distinguished them.

A. PUNICEUS. Specimen from Kalm; unequivocal, as also is the figure and character of Hermann, from the "puniceis caulibus" of which Linnæus drew the specific name.

A. ANNUUS. The *Erigeron annuus*.

A. VERNUS. The *Erigeron vernus*, not in the herbarium of Linnæus, but taken wholly from Gronov. Fl. Virg.

A. LEVIS. Credited to Kalm and described wholly from his specimen; it is the well-known species, in the form known as *A. rubri-caulis*, Lam., and *A. cyaneus*, Hoffm.

A. MUTABILIS. No trace of it in the Linnæan herbarium, although indicated as being there by the underscoring of the number in Linnæus's copy of the Spec. Pl. ed. 1. The species must be discarded as a complex one, the adduced plants being incongruous, and it being now impossible to know what materials were under observation. The original character, in ed. 1, 875, does not agree with "Pluk. Alm. 56, t. 326, p. 1," which is not to be found in Plukenet's herbarium, and which may be *A. dumosus* or a *Galatella*. There Linnæus compares it with a species, *A. serotinus*, which he never published nor preserved in his herbarium. Finally, in the second edition of the Spec. Pl., he reconstructed the character in a manner incompatible with the former one, introduced before the Plukenetian synonym one from Herm. Hort. Lugd. t. 67, which (on the authority of the contemporary herbaria of Royen and of Sherard) proves to be *A. levis*, L., and changed the comparison to one with *A. Tradescanti*. The new character agrees no better with either figure than these do with each other. The *A. mutabilis* of Ait. Hort. Kew. has an earlier and good name in *A. levigatus*, Lam.

A. TRADESCANTI. Likewise a compound, of which the elements have been variously employed; but the name may be kept up by going back to its origin, that is, to the *Aster Virginianus ramosissimus serotinus, parvis floribus albis Tradescanti*, Morison, Hist. iii. 121. This, as found in Morison's herbarium and in Sherard's, is the smallest flowered paniculate species, the *A. fragilis* Willd. (not Torr. and Gray), *A. leucanthemos*, Desf., *A. artemisiæflorus*, Poir., *A. parviflorus*, Nees., and a part of *A. tenuifolius*, Torr. and Gray. It is still continued in European cultivation, here and there becoming

naturalized. This, then, is *A. Tradescanti* of Linnæus, Spec. Pl., as to syn. Moris., which gave the name, and in part as to Hort. Cliff. That is, of the two specimens in Clifford's herbarium, one belongs to Morison's species; the other, which was taken up in Torr. and Gray's Flora as the foundation of the species, is the racemose *A. vimineus*, Lam., *A. Tradescanti fragilis*, Torr. and Gray. But I now understand that Clifford's herbarium is really no authority for Linnæan species. The specimen preserved in the Linnæan herbarium is from the Upsal Garden, of unknown date; but as "Hort. Ups. 262" is cited under the species, it was probably in hand when the character was drawn up. It belongs to a related species with larger heads, of which the next oldest name is *A. paniculatus*, Lam. This name should be employed for the larger-flowered, and *A. Tradescanti* for Tradescant's small-flowered species.

A. NOVI-BELGII. This is really founded wholly on the *A. Novæ-Belgiæ latifolius umbellatus floribus dilute violaceis*, Herm. Hort. Lugd. 67 and (tab.) 69, which, from early specimens, can be fairly identified with a polymorphous species still common in the gardens, in a variety of forms and under several names, *A. floribundus*, *serotinus*, *adulterinus*, *eminens*, *praaltus*, &c., all of them apparently derived from a common and most variable species of the Atlantic States near the coast, which has been by me referred (not correctly) to *A. longifolius*, Lam. But the indigenous specimen so named in the Linnæan herbarium, from Kalm, is clearly *A. puniceus*, L., and one from the Upsal Garden is *A. paniculatus*, Lam., or near it.

A. TARDIFLORUS, founded entirely on specimens cultivated in the Upsal Garden, is confidently identified with a low form of *A. patulus*, Lam., a northern species, not rare in cultivation, but little known by indigenous specimens. This low form is most like *A. prenanthoides*. The species dates only from the second edition of the Species Plantarum; it is said to have been cultivated for eighteen years before it flowered, and then late in the season. But the cultivated *Aster* which matches the Linnæan specimens (of two sterile stems with lower leaves, and a stronger flowering one destitute of them) blossoms unusually early. So it is doubtful whether the Linnæan name (which has commonly been applied to a form of *A. Novi-Belgii*) ought to be kept up.

A. GRANDIFLORUS. Not in the Linnæan herbarium; but this well-marked species is founded on the excellent figures of Martyn and

of Dillenius, and on Gronov. Fl. Virg. Clayton's plant came directly from the rather limited district which this species inhabits.

A. MISER. A name to be suppressed. It was wholly characterized, not upon any plant, but upon the figure of "*A. ericoides Meliloti agrariæ umbone*," Dill. Elth. 40, t. 35, fig. 39. Even the description by Dillenius must have been made mainly from the plate, for it is a caricature or exaggeration of the specimen (completely identified) in the Sherardian herbarium, said to be raised from New England seeds. It is either a sparsely-flowered state of *A. vimineus*, Lam., or a sub-racemose form of *A. dumosus*, L. The umbonate or much protuberant disk of the capitulum in the plate is quite fictitious (as is also the "*caulis crassus*"), at least there is no trace of it in the specimen which evidently served for the figure. Yet this umbo and the thick stem give the sole diagnosis of the Linnæan species.

A. MACROPHYLLUS is the well-known species.

A few specimens which had not been named or not taken up by Linnæus may be passed by. Linnæus did not well know his species of *Aster* and of *Solidago*. Consequently, while retaining most of his species, it is necessary to suppress three or four of his names.

II. *Species founded by Lamarck, 1783, in Dict. i. 301-308.*

The identifications gathered at Paris in Hort. Mus. Par., the General Herbarium, and those of Tournefort and of Jussieu. The proper herbarium of Lamarck at Rostock I have not been able to consult. But distinct traces of all the species, with one exception, have been found at Paris.

A. AMPLEXICAULIS. A form of *A. Novæ-Angliæ*, L.; but the synonym from herb. Tournefort is of *A. puniceus*, L.

A. AMYGDALINUS. The common northern form of *A. umbellatus*, Mill. Dict. 1759, the older name.

A. RUBRICAULIS. The *A. levis*, L.

A. AMENUS. The *A. puniceus*, L.

A. PANICULATUS. A common and multiform northern species, the *A. Tradescanti*, L., as to herb. and Hort. Ups. (but not of Morison), comprising *A. tenuifolius* and *A. simplex* of Torr. and Gray, Flora, mainly, excl. syn. Name changed by Nees to *A. Lamarckianus*, but to be restored, being older than the homonym of Aiton.

A. SALICIFOLIUS. Not found, nor was the "*Virga aurea Canadensis elatior, salicis minoris folio*, Nees," identified in the herbarium of Jussieu. I was informed by Professor Roeper that no specimen

was to be found in the herbarium of Lamarck. From the character, one may perhaps assume its identity with the later homonym of Ait. Hort. Kew.

A. VIMINEUS. The *A. Tradescanti* and var. *fragilis* of Torr. and Gray, Flora. A name to be employed.

A. LONGIFOLIUS. A form of the *A. junceus*, Ait., and *A. salicifolius*, Richardson; a northern species, for which this, the oldest name, must be employed.

A. LÆVIGATUS. The *A. mutabilis* of Aiton, common in European gardens under the name of *A. brumalis*, Nees. It was well compared by Lamarck with *A. lævis*, and as differing by its more simple or not imbricated involucre. Unequivocal indigenous specimens are hardly known; they are to be sought in Lower Canada and Nova Scotia.

A. HISPIDUS. By the character clearly *A. puniceus*, L., to which it has been referred.

A. PATULUS. The species still cultivated under this name, native of Canada, &c., a low form of which is *A. tardiflorus*, L.

A. MISER, Lam. (not L.), is the *A. purpuratus* of Nees, *A. virgatus*, Ell.

III. *Species of Walter, Flora Caroliniana, 1788.*

A. CAROLINIANUS. } Well-known species, taken up by Michaux.
A. SQUARROSUS. }
A. CILIATUS is quite unknown.

IV. *Species founded (by Solander) in Aiton, Hortus Kewensis, 1789.*

A. NEMORALIS. The well-known species.

A. UMBELLATUS. Credited to Mill. Dict. (1759), therefore much earlier than *A. amygdalinus*, Lam. The indigenous specimen from Nova Scotia is of a broad-leaved form, while those of Hort. Chelsea (Miller's) and of Hort. Kew. are narrower-leaved.

A. PALUDOSUS. Type of the section *Heleastrum*.

A. PATENS. Specimens from Miller, and from New York, Anderson. But the specimen collected by Bartram in East Florida is *A. Carolinianus*.

A. FOLIOLOSUS. A state of *A. vimineus*, Lam., verging to *A. dumosus*, L. The plant of Dill. Elth., on the figure of which Linnæus founded *A. miser* (*vide supra*), is referred here. Solander must have seen the specimen in the Sherardian herbarium; otherwise he could hardly have made it out.

A. ERICOIDES. Here the species originates, as distinguished from the next. The specimens are well marked, and bear also the name of *A. lucidus*, Solander.

A. MULTIFLORUS. The *A. ericoides dumosus* of Dill. Elth; and, being the Gronovian plant also, it would more properly have retained the Linnæan name, as already stated.

A. SALICIFOLIUS. A floriferous branch or summit of the plant which is named *A. carneus* in Torr. and Gray, Fl. N. Am., and which may also be *A. salicifolius*, Lam. The specimen is of "Hort. Kew. 1781." Another specimen, ticketed as a variety, is different, perhaps *A. polyphyllus*, Willd.

A. ÆSTIVUS. Two specimens on one sheet: Hort. Lee and Hort. Kew.; the species still in cultivation; not that of Torrey and Gray's Flora, but one more nearly related to *A. paniculatus*, Lam., apparently indigenous only in British America.

A. JUNCEUS. Apparently the *A. longifolius*, Lam., at least the indigenous plant from Nova Scotia; but the specimen from "Hort. Kew. 1771," on which the species may be said to be founded, seems to be a narrow-leaved form of *A. paniculatus*, Lam.

A. PENDULUS. A form of the next, with slender divergent branches; the *A. miser*, var. *diffusus*, Torr. and Gray.

A. DIFFUSUS. "Hort. Collinson, 1762, Hort. Kew. 1777, Hort. Lee, 1781." All forms of *A. miser*, var. *diffusus*, Torr. and Gray: and this common and well-marked species may take the name of *diffusus* rather than either the preceding or the following name.

A. DIVERGENS. "Hort. Kew. 1777," the specimen nearly destroyed, and "Nova Scotia, prope Halifax, Halbgren, 1779." Clearly of the preceding species.

A. MISER. "Hort. Kew. 1777," of course not the Linnæan plant; appears from the very small heads to be the Morisonian *A. Tradescanti*.

A. MUTABILIS. Specimens from "Hort. Kew. 1777, Hort. Collinson, Hort. Jacquin." Being all of the same species, this might be taken in place of the undeterminable Linnæan *mutabilis*; but it is the earlier published *A. lævigatus*, Lam., which, therefore, is the name to be adopted.

A. NOVI-BELGII. Specimens of various Asters, throwing no light upon the Linnæan species.

A. PANICULATUS. Name pre-occupied by Lamarck; the specimen (not a good one) is of "Hort. Gordon, e sem. Labrador," and is pretty

clearly the same as *A. Lindleyanus*, Torr. and Gray, which name may be continued, although *A. ciliolatus*, Lindley, is apparently only a small form of it.

A. SPECTABILIS. The well-marked species, cultivated at Kew Gardens in 1777.

A. RADULA. The recognized species, originally from Nova Scotia, near Halifax.

A. BLANDUS, Pursh, Fl. ii. 555, is a species of Solander's, in the Banksian herbarium, described and published by Pursh from too scanty material, a specimen collected on Bisque Island in the St. Lawrence by Halbgren. And Solander indicates as a variety of this a specimen from John Bartram. If not reduced and nearly smooth forms of *A. puniceus*, both must belong to the *A. tardiflorus*, L., which see.

V. *Species originating in Michaux, Flora Boreali-Americana, 1803.*

A. SOLIDAGINEUS. The *Sericocarpus solidagineus* of Nees.

A. MARILANDICUS. *Sericocarpus conyzoides*, Nees.

A. TORTIFOLIUS. *Sericocarpus tortifolius*, Nees.

A. INFIRMUS. Somewhat earlier published than *A. cornifolius*, Muhl. in Willd. Spec., for the volume containing the latter cites Michaux. The habitat, "a Canada ad Carolinam," is erroneous as respects Canada: the stations assigned in Michaux's Flora are not rarely incorrect in a similar way. As is well known, this is *A. divaricatus* of Linnæus as regards the synonymy, but not of his herbarium, nor of the specific character. The present name is to be adopted.

A. ACUMINATUS. The well-known species. It appears, from the herbarium of Jussieu, that this is the *A. divaricatus* of Lamarck, but not of Linnæus.

A. UNIFLORUS. A small and simple-stemmed form of the *A. nemoralis* of Aiton.

A. SUBULATUS. A mixture of the small-rayed and conyzoid coast species and of the nearly-related larger-rayed one (*A. divaricatus*, Torr. and Gray, Fl.), but in the proper herbarium mainly the former, to which only the character applies, especially the "ligulis radii minutis." This name to be employed, for it proves that no part of *A. linifolius*, L., belongs here.

A. ARGENTEUS. *A. sericeus*, Vent., slightly earlier published.

A. CORIDIFOLIUS. A marked variety of *A. dumosus*, L., of the pine-barren district of the Southern Atlantic States.

A. SPARSIFLORUS. A slender form of *A. dumosus*, L.

A. SURCULOSUS. The recognized species, from North Carolina.

A. DIVERSIFOLIUS. Same as *A. undulatus* of Linnæus and of most authors.

A. VILLOSUS. *A. ericoides*, var. *villosus*, Torr. and Gray.

A. AMPLEXICAULIS. *A. patens*, Ait.; and there is an earlier *A. amplexicaulis*, Lam.

A. BIFLORUS. A small northern variety of *A. radula*, Ait.

Nearly all the Michauxian species had already been well determined.

VI. *Species originating in Hoffmann, Phytographische Blätter, 1803.*

A. CYANEUS. Clearly *A. lævis*, L.

A. THYRSIFLORUS. The figure and detailed description point to the *A. Novi-Belgii*. The plant in cultivation under the name twenty to forty years ago, and preserved in herbaria, has smaller and narrower leaves.

VII. *Species originating in Willdenow, Species Plantarum, iii. part 3, published in 1803.* [Later than Michaux, whose species are mentioned, and farther on in the book the Flora is cited by volume and page.]

A. PILOSUS. The *A. villosus* of Michaux, whose name is given as a synonym, and whose specimen was described.

A. CILIATUS, Muhl. in litt. Is *A. multiflorus*, Ait.

A. SPURIUS. *A. Novæ-Angliæ*, a cultivated form.

A. PHLOGIFOLIUS, Muhl. The recognized plant, from Muhlenberg, *A. patens*, var. *phlogifolius*.

A. SAGITTIFOLIUS, "Weder Meyer." The specimens on fol. 1, 2, 3, represent the species in the herbarium; that of Torrey and Gray's Flora.

A. HUMILIS. The indigenous specimen from Muhlenberg is a low and broad-leaved form of *A. umbellatus*, Ait., i. e. the *Diplopappus amygdalinus* of Torr. and Gray's Flora. The cultivated specimen, answering to the figure in Hort. Berol. t. 67, is *A. infirmus*, Michx. The character appears to have been drawn from the former.

A. CORNIFOLIUS, Muhl. Same as the *A. infirmus*, Michx., and as the *A. humilis* figured in the Hortus Berolinensis.

A. ELEGANS. Described from a cultivated plant of unknown origin; the specimen in the herbarium is *A. spectabilis*, Ait., under which De Candolle cites the species, but also under *A. squarulosus*.

A. CONYZOIDES. *Sericocarpus conyzoides*, Nees.

A. VERSICOLOR. Name to be adopted for the species most closely related to *A. lævis*, L. It is represented in the herbarium by fol. 1, 2, and perhaps 3, which has no flowers. Fol. 4 is of *A. Carolinianus*, and fol. 5, of some other species, possibly *A. salignus*.

A. LÆVIGATUS. A mixture in the herbarium. Fol. 1 is either *A. lævis* or *A. versicolor*; fol. 2 is a fragment of *A. prenanthoides*, Muhl.; fol. 3, of *A. puniceus*; fol. 4 is wholly doubtful; and fol. 5 is of *A. lævigatus*, Lam., a far older homonym.

A. PRENANTHOIDES, Muhl. The well-marked species, from Muhlberg.

A. AMPLEXICAULIS, Muhl. Not the homonym of Lamarek, nor of Michaux. This is *A. lævis*, L.

A. RECURVATUS, Willd. The specimen, "Hort. Berol.," seems to be *A. paniculatus*, Lam., or near it; but something else would appear to be described, perhaps *A. diffusus*, Ait., surely not *A. thyrsiflorus*, Hoffm., to which De Candolle refers it in part, for the corolla is said to be no larger than in *A. Tradescanti*.

A. FLORIBUNDUS. Plant of the gardens, apparently *A. Novi-Belgii*.

A. SEROTINUS. Apparently either *A. lævigatus*, Lam., or a form of *A. Novi-Belgii*.

A. LANCEOLATUS. Seemingly the *A. paniculatus*, Lam.

A. DRACUNCULOIDES. Cultivated specimens: fol. 1, 2, are of *A. paniculatus*, Lam.; fol. 3 of same with smaller heads, verging to the Morisonian *A. Tradescanti*.

A. FRAGILIS. The Morisonian *A. Tradescanti*, not the *A. Tradescanti*, var. *fragilis*, Torr. and Gray:

A few notes are added upon the representatives of some earlier species in the Willdenovian herbarium.

A. NEMORALIS. Two sheets; not Aiton's plant, but a *Galatella* of the Old World; and to this the character evidently belongs, being the same as the

A. HYSSOPIFOLIUS. The "Am. Bor." is a continuation of an original mistake. Same of *A. LINIFOLIUS*.

A. SOLIDAGINOIDES. Michaux's *A. solidagineus*, with a Greek instead of the original Latin termination.

A. FOLIOLOSUS. Fol. 4 is *A. vimineus*, Lam., therefore Aiton's plant or near it; fol. 1 is *A. salicifolius*, Ait., "A. obliquus, Nees;" fol. 2, 3, *A. ericoides*, L. and Ait.

A. TENUIFOLIUS. Of course not the Linnæan plant; but at least four of the eight sheets belong to *A. ericoides*; the others are of various species.

A. SALICIFOLIUS. Apparently *A. æstivus*, Ait., which is represented by cultivated specimens resembling the original in the Banksian herbarium.

A. PANICULATUS is *A. cordifolius*, L. Intended, of course, for the Ait. Hort. Kew. species.

A. CORDIFOLIUS. The specimen from Muhlenberg is of *A. sagittifolius*.

A. SALIGNUS, the name changed from *A. salicifolius*, Scholler; the species referred to Europe (Germany and Hungary), where it probably is indigenous, or at least has long been domiciled.

A. MUTABILIS. Fol. 1, 2 are apparently the same as *A. versicolor*; fol. 3 is nearer *A. lævigatus*, Lam.

A. VIMINEUS. Not of Lam., but the *A. miser*, Lam., that is, *A. purpuratus*, Nees, and *A. virgatus*, Ell.

A. TRADESCANTI. Fol. 1 is of the Morisonian plant; while fol. 5 is *A. patulus*, Lam.

A. SPECTABILIS. Not the Aitonian species, but some long-cultivated one, of the *Novi-Belgii* sort.

A. TARDIFLORUS. Same as the *A. adulterinus*, Willd. Enum., and Lindl. Bot. Reg., the *A. Novi-Belgii* of Hort. Cliff., &c.

A. JUNCEUS. Apparently same as *A. æstivus*, Ait.

A. MISER.

A. DIVERGENS.

A. DIFFUSUS.

A. PENDULUS.

} All belong to the polymorphous species for which the name of *A. diffusus* is preferred, with some mixture of *A. dumosus* L.

VIII. *Species originating in Willdenow, Enumeratio Plantarum Hort. Reg. Bot. Berolinensis, 1809.*

A. SPARSIFLORUS. Michaux's species taken up and described; is *A. dumosus*, a large-leaved form.

A. ADULTERINUS. *A. Novi-Belgii*, answering to the specimens of the plant cultivated in early times, as preserved in herb. Morison and herb. Cliffort.

A. CONCINNUS. Apparently a good species, with small leaves and heads, but still obscure as a wild plant.

A. BELLIDIFLORUS. Apparently derived from *A. paniculatus*, Lam.

A. EMINENS. Apparently a state of *A. salicifolius*. Ait.

A. LAXUS. Probably a form of *A. æstivus*, Ait.

A. SIMPLEX. Appears to be referable to *A. salignus* of Willdenow, which, although related to *A. paniculatus*, Lam., is attributed to Europe.

A. POLYPHYLLUS. A well-marked species, related to *A. ericoides*, but much larger in all its parts; for which I know no earlier name. It is the *A. tenuifolius* of Nees, in part, and of De Candolle. It is a late-flowering species, showy in cultivation, and is little known by indigenous specimens.

In the Supplement to the above, edited by Schlechtendal (the father), 1813, after the death of Willdenow, the two following Willdenowian species originate.

A. PALLENS. A form of *A. patulus*, Lam.

A. PRÆCOX. Ambiguous; probably a form of the preceding.

IX. *Species, or rather Names originating in Poiret, Dict. Suppl. i. 1810.*

A. PRÆALTUS. A change of the name merely of the *A. salicifolius*, Ait. Hort. Kew.

A. PENNSYLVANICUS. Change of name of *A. amplexicaulis*, Muhl. in Willd., that is, *A. lævis*, L.

A. ARTEMISLEFLORUS. Change of name of *A. dracunculoides*, Willd., but from the character should be *A. Tradescanti*, L., the plant of Morison.

A. STRICTUS. No original seen; probably founded on *A. salignus* of Willdenow.

X. *Species originating in Pursh, Flora Americae Septentrionalis, 1814.*

A. LEDIFOLIUS. *A. nemoralis*, Ait., with changed name.

A. GRAMINIFOLIUS. Solander's, taken up from herb. Banks; the *Erigeron hyssopifolius*, Michx.

A. CANESCENS. Bradbury's plant, of the *Machæranthera* (*Dieteria*, Nutt.) section.

A. RETICULATUS. The plant which was subsequently named *A. obovatus* by Elliott.

A. BLANDUS. Taken up from Solander in herb. Banks., already noted under Ait. Hort. Kew., at the close.

A. PEREGRINUS. Solander's species in herb. Banks., near to *A. salsuginosus*, Richardson, if not a pubescent form of it.

A. STRICTUS (not of Poirét). A reduced and boreal form of *A. radula*, Ait.; same as *A. biflorus*, Michx.

XI. *Species of the Atlantic United States originating in De Candolle, Prodr.*
v. 1836.

A. PATENTISSIMUS, Lindley, in DC., is a form of *A. patens*, Ait., with long branches.

A. AURITUS, Lindley, in DC., is *A. patens*, var. *phlogifolius*.

A. UROPHYLLUS. } Also of Lindley; may both be referred to *A.*

A. HIRTELLUS. } *sagittifolius*, Willd.

A. DRUMMONDII, Lindley. A recognized heterophyllous species of the Mississippi Valley, but ambiguous between *A. sagittifolius* and *A. undulatus*.

A. CILIOLATUS, Lindley. A reduced form of *A. paniculatus*, Ait., that is *A. Lindleyanus*, Torr. and Gray.

A. CÆRULESCENS. Species to be admitted, yet has seemed to pass into *A. salicifolius*, Ait.

A. MULTICEPS, Lindley. Only the *A. oblongifolius*, Nutt., from St. Louis.

A. SUBASPER, Lindley. *A. salicifolius*, Ait., var. *subasper*.

A. HEBECLADUS. } Texan forms of the polymorphous *A. multi-*

A. SCOPARIUS. } *florus*, Ait.

A. HIRSUTICAULIS, Lindley. A narrow-leaved and hairy variety of *A. diffusus*, Ait.

A. STENOPHYLLUS, Lindley. Narrow-leaved form of *A. salicifolius*, Ait.; or the specimen sent to Nees may be the nearly related *A. paniculatus*, Lam.

A. BIFRONS, Lindley. *A. diffusus*, Ait., var. *bifrons*.

A. MICROPHYLLUS, Torr. in Lindley, adn. This is *A. cdnatus*, Nutt., earlier published.

A. AZUREUS, Lindley. A well-recognized heterophyllous species.

A. RETROFLEXUS, Lindley. Apparently same as *A. thyrsiflorus*, Hoffm.

A. TURBINELLUS, Lindley. A well-recognized and very distinct species.

The species of the high northern and of the western portions of North America, of which several originate in De Candolle's Prodrômus, are not here considered.

2. *Determination of the Species of Solidago.*I. *Species of Linnaeus, as represented in the Linnæan Herbarium and from the earlier sources.*

S. SEMPERVIRENS. An undeveloped specimen of the sea-side species of Atlantic North America. All the synonyms cited in the Species Plantarum appear to belong here; that of Plukenet has been verified.

S. CANADENSIS. Two sheets pinned together: one is a minutely pubescent form of the received species; the other, from Kalm, belongs to *S. rugosa*, Mill., viz. to the plant which has long passed for *S. altissima*. The syn. Pluk. Alm. t. 236, fig. 1, which may have suggested the specific name, is to be excluded.

S. ALTISSIMA. The true original of the Linnæan species is the "Virga aurea altissima serotina, panicula speciosa patula, Mart. Cent. 14, t. 14," i. e. Martyn's Hist. Pl. 1728, fol., represented by an excellent plate, clearly representing a large form of *S. Canadensis*, to which Linnæus declares it is very similar. He distinguishes it by "foliis nerviis subintegerrimis;" the last word was changed in the second edition to "serratis." It is a form with thicker and more obscurely triple-nerved leaves than the ordinary *S. Canadensis*. The specimens in the herbarium are confounded, apparently from the first, also by attempted rectifications by Smith. A sheet ticketed by Linnæus "*altissima*," is noted, apparently by Smith's hand, as "*S. Canadensis*," but it probably is not. Another sheet holds specimens numbered 1, 2, 3: the first of these is a panicle of *S. nemoralis*, the second is a branch of *S. bicolor*, the third belongs to *S. odora*. A specimen ticketed "*serotina*" by Linnæus, and by Smith "*altissima*," is the species which has so long passed as *S. altissima*, viz. *S. rugosa*, Mill. The Dillenian figures appended by Linnæus as "*plantas vix genuinas*" belong to the latter species, as the plates themselves show, and the originals in the Sherardian herbarium confirm. These have been wrongly taken as the type of *S. altissima*, which, however, must now be reduced to a synonym of *S. Canadensis*, while the species of Dill. Elth., in all three plates, may assume the old name of *S. rugosa*, Mill., which is much more appropriate than *altissima* for a plant which is seldom tall. The other *Solidago*, "*Virga aurea Marilandica*," &c., of Martyn, t. 13, I cannot identify from the figure. It may be the var. *procera* or var. *scabra* of *Canadensis*, but the heads seem much too large.

S. BICOLOR. This species, published in the Mantissa, is in the herbarium under the name of *S. discolor*. Two other sheets are fastened together, both of specimens from Kalm. One of them, ticketed "K. 77, radio albo," and "*bicolor*" in the hand of Linnæus, is not of that species, but seems to be a form of *S. rugosa*. The other, marked only "K.," judging from the character and other indications, must be the original of

S. LATERIFLORA; otherwise that is not in the herbarium. It is a familiar form of the *Aster miser*, var. *diffusus*, Torr. and Gray, Fl., that is, of *A. diffusus*, Ait.

S. LANCEOLATA, also of the Mantissa, is in the herbarium from Kalm, "30," with another specimen, doubtless the original from Royen.

S. MEXICANA. The "*Virga aurea limonii folio*," &c., of Tournefort, an obtuse-leaved form of *S. sempervirens*, L., which is the name to be adopted. Came in all probability from the temperate North American coast, not from Mexico.

S. CÆSIA. Not in the herbarium under this name. The species was founded on the "*Virga aurea Marilandica cæsia glabra*" of Dill. Elth. 414, t. 307, f. 395, which, as the plate shows and the original at Oxford proves, is the well-known *S. cæsia*.

S. FLEXICAULIS. The specimen is *S. cæsia*, with which, however, the character "*foliis ovatis*" and the figures cited from Plukenet and from Hermann do not accord. The syn. "*Virga aurea Canadensis, asterisci folio*," Herm. Parad. t. 244, apparently from the figure and certainly from the "*Canadensis*," is the broad-leaved relative of *S. cæsia*, for which I have always kept the name of *S. latifolia*, L. Hermann indicates that it is *V. Canadensis Scrophulariæ folio*, of the Paris Garden in his time. Plukenet's figure and specimen, t. 235, f. 3, are pretty clearly the same.

S. LATIFOLIA. The specimen which appears to be the original of the species is our *latifolia*, and the habitat is a confirmation. The name written by Linnæus on the sheet is "*lateriflora*," which Smith has corrected to "*latifolia, vide Sp. Pl.*" But it is not the ordinary thin-leaved and flexuous-stemmed form of our shady woods and dells; it is rather a state which this species takes on when cultivated in open ground. The syn. of Plukenet, t. 235, f. 4, should be this, by the phrase "*latissimo folio, Canadensis glabra*;" but the preserved specimens, which quite accord with the figure, must belong to the *S. latissimifolia* of Miller, a broad-leaved axillary-flowered state of *S. elliptica*,

Ait., which appears to have been early cultivated in European botanic gardens.

The conclusion formerly reached is to be adhered to, namely, that of the three antecedent names, *S. casia*, *flexicaulis*, and *latifolia*, the first and the last are to be maintained, and the *S. flexicaulis* dropped; the plant of the herbarium under this name being only *S. casia*, the character and synonymy belonging to *S. latifolia*, while the sole synonym (of Plukenet) under *latifolia* goes to *S. elliptica* of Aiton.

S. VIRGAUREA. The Linnæan specimens are wholly of the European plant.

S. RIGIDA. An unmistakable species; the name suggested by Herm. Parad. Bat., whose figure is cited.

S. NOVEBORACENSIS. Single specimen, its source not recorded. It has long been a puzzle, but it is certainly no *Solidago*, almost certainly not from America, and pretty clearly the *Aster Tartaricus*, Linn. f.

II. *Of Aiton, Hortus Kewensis, 1789, preserved in the Banksian Herbarium.*

This is the next authority on the genus, except the edition of Miller's Dictionary cited in the work, in which specific names are given in a tentative way, within brackets. As is well known, the whole editorship was by Solander; but his name not appearing, the work is necessarily cited as that of the elder Aiton, whose name only is on the titlepage. Accordingly, to the latter the species of *Solidago*, *Aster*, &c., published in the Hortus Kewensis have always been attributed.

S. CANADENSIS, L. Various forms of the Linnæan species.

S. PROCERA. Two specimens on one sheet, "Hort. Kew. 1778," the date which is borne by very many of the specimens in the herbarium. They are of *S. Canadensis*, var. *procera*, Torr. and Gray, Fl., which has larger heads than the type, very commonly in ascending dense racemiform clusters, as expressed in Solander's phrase "racemis spiciformibus erectis, inuptis nutantibus;" but he notes in his manuscript, "an racemi semper erecti?" The pubescence of the stem and leaves is hardly "villous," but rather puberulous.

S. SEROTINA. Not really the plant of Torr. and Gray, Fl., but their *S. gigantea*, that is, the completely glabrous form, the *S. glabra*, Desf. &c.

S. GIGANTEA. The *S. serotina* of Torr. and Gray, Fl., &c., namely, the form with some sparse hairiness on the midrib and often the lateral ribs or veins underneath; also "pedunculis hirtis" rather more manifestly than in the preceding. The two are to be taken as of one species, for which the name *serotina* is preferable. The glabrous form is seldom gigantesque; the present one often is so, and may be distinguished as var. *gigantea*.

S. REFLEXA. The specimen, as of the preceding species, is of Hort. Kew. 1778, but all three are in the work said to have been cultivated in 1758 by Philip Miller. This is a badly grown form of *S. Canadensis*. Indeed Solander in his manuscript notes, "Planta primo intuitu videtur monstrosa varietas *S. Canadensis*."

S. LATERIFLORA. Two sheets from "Hort. Kew. 1778," not the Linnæan plant, nor of certain determination, probably a form of *S. ulmifolia*, Muhl. Solander, in his manuscript, notes a resemblance to *S. cæsia*, to which, however, the Linnæan plant (which is *Aster diffusus*) has more likeness.

S. ASPERA. Name taken from Dill. Elth. 411, t. 305, on which the species is founded; specimen from Hort. Kew., 1778, a form of the next species with rather broad and short rugose-veiny leaves, the upper face quite scabrous.

S. ALTISSIMA. Not the Linnæan plant (*vide supra*, p. 177), but that which from this date has passed for it, and for which we must now fall back to the oldest and in the main most appropriate name, *S. rugosa*, Mill. Dict. All the indicated varieties of this polymorphous but well-marked species belong to it, including that which Pursh published as *S. villosa*.

S. NEMORALIS. The species which has always gone by this name. An indigenous specimen from "Virginia Dr. Mitchell," and a cultivated one of Hort. Kew. 1778.

S. ARGUTA. Two sheets; one of Hort. Fothergill, 1778; the other of unknown source, probably an indigenous specimen. Both are the *S. arguta* of Muhlenberg and of most authors anterior to Torr. and Gray's Flora, in which this species was taken up as *S. Muhlenbergii*, Torr. and Gray. I was misled by a wrong identification made by Dr. Boott, to which in 1839 I mistakenly acceded. A third specimen, ticketed by Solander "*S. argutæ* affinis, Hort.," is manifestly of the same species. This restoration brings back the specific name to a plant for which it is appropriate, as it was not for the following species.

S. JUNCEA. The true original of this species, as the Solander manuscript shows, is a small and perfectly characteristic specimen, ticketed "Hudson's Bay, Hutchinson." The specific name was manifestly suggested by the slender and naked racemiform flower-clusters of small heads. It is the *S. arguta*, var. *juncea*, of Torr. and Gray's Flora, the larger and broad-leaved form of which was wrongly taken up as *S. arguta*. The other sheet, of cultivated specimens, one, if not both, from Kew Gardens, may be of the same species, or may be *S. neglecta*, Torr. and Gray, with unusually spreading inflorescence.

S. ELLIPTICA. Two sheets; each with a single specimen. One is of Hort. Kew. 1778, is the upper part of a large plant, with "racemis paniculatis secundis," and is more like the *Solidago* referred to this species in Torr. and Gray's Flora, now viewed as a large form of *S. Elliottii*, found near the sea-coast of southern New England and New York, the leaves only inconspicuously serrate. The other, brought from "Hort. Reg. Parisiensis" by Houston, is the plant there cultivated of old under the name of *S. latifolia* or *lateriflora*, the *S. latissimifolia* of Miller, as Solander indicates, and probably Plukenet's t. 235, f. 4. It appears to be the species still under cultivation in Europe, with flower-clusters abbreviated and mainly in the axils of comparatively ample leaves, so as to resemble long-cultivated *S. latifolia*, L. It will take the name of *S. elliptica*, var. *axilliflora*. No indigenous specimens known.

S. SEMPERVIRENS, L. Three specimens on two sheets, an indigenous one from Dr. Mitchell, and cultivated ones from Miller and from Kew; all narrow-leaved forms of the Linnæan species.

S. ODORA. Three sheets: one with an indigenous specimen, "Cherokee Country, W. V. Turner, 1769," with an aboriginal name recorded, and is the true plant; so is the original of Plukenet's t. 116, f. 6, preserved among the Plukenet plants at the British Museum. The other specimens are from Kew and from Miller, the latter not clearly of this species; and two large leaves affixed to the sheet belong to something quite different, probably to *Erechthites hieracifolius*.

S. LANCEOLATA, L. One of the sheets contains a specimen of *S. tenuifolia*, indicated as a variety.

S. LÆVIGATA. Same as *S. sempervirens*, L., a form with lanceolate and acute leaves.

S. MEXICANA, L. The Linnæan plant, from Kew Gardens and from Paris. Clayton's plant is a form with narrower and acute upper leaves, nearly the *S. lævigata*, Ait.

S. VIMINEA. Hort. Kew. 1778, a form of the *S. sempervirens*, L. (the name to be adopted for this maritime species), with some pubescence on the upper part of the stem.

S. STRICTA. The cultivated plants, from Miller and from Kew, 1778, on which the species was characterized and published, prove to be identical with the well-marked and much later *S. virgata*, Michx., a pine-barren species of the Atlantic coast. The way in which the name was appropriated to more northern species is as follows. Solander first characterized in his manuscript and ticketed in the herbarium a "*S. parviflora*," on a specimen from Hudson's Bay, collected by Banks (the *S. Terræ-Novæ*, Torr. and Gray), afterwards changed that name for *S. stricta*, at the same time erasing his phrase "paniculato-corymbosa racemis recurvis" and adding to the habitat "prope Novum Eboracum," but not erasing "ad Sinum Hudsonis." The early-cultivated specimens in the herbarium are not good ones, the inflorescence becoming compound, as it often does in the indigenous state; yet the species ought not to have been so mistaken. The name has been used for more than one northern species, but as published in the Hortus Kewensis and cultivated at the time, it belongs altogether to the well-known *S. virgata* of Michaux, which name it supersedes.

There is a specimen from Kew Gardens, 1778, noted by Solander in manuscript as *S. stricta*, var., which is a form of *S. speciosa*, Nutt., and apparently is the original of *S. erecta*, Pursh: *vide infra*, p. 187.

S. LINOIDES of Solander, in herb. (Hort. Lee, 1779), proves to be identical with the original *S. stricta*, that is, *S. virgata*, Michx.; and with this his unpublished character agrees, especially the "caule stricto simplicissimo," and the "racemus terminalis spiciformis," as it does not with the species which Dr. Boott thought he had identified with it.

S. PETIOLARIS. The authentic plant, of Hort. Kew. 1778, was rightly identified by Dr. Boott long ago, and taken up in Torr. and Gray's Flora, and the specimen is not very undeserving of the name. Solander in his manuscript distinguishes two forms, viz., "*α*, foliis integerrimis, calycibus squarrosis," thus noting a distinctive feature, and "*β*, foliis serratis;" the latter, marked "Hort.," is of a very different species, not well made out, but apparently of *S. Virgaurea* of Europe.

S. BICOLOR, L. The Linnæan species.

S. RIGIDA, L. The well-marked Linnæan species.

S. CÆSIA, L. A cultivated and branching form, from "Hort. Chelsea," with unusually racemose-paniculate inflorescence, the *S. gracilis* of Schrader. There is a depauperate indigenous specimen, from "New York, Anderson, 1778," which naturally was thought different, and is ticketed "*S. tenera*." There is also one of the more normal form of the species, upon which is founded *S. axillaris*, Pursh.

S. AMBIGUA. No native country assigned; but, from the specimen, it may be probably referred to the European *S. Virgaurea*. Under this name, also, an altered form of *S. latifolia*, L., was in early cultivation.

S. MULTIRADIATA. The original in Solander's manuscript is from Labrador, 1765, and is designated as "*Solidaginis minutæ maxime affinis, cujus forte sole varietas radiis plurimis*." Upon the same sheet are similar but more dwarfed specimens, of later date, from "North-west Coast, Sledge Island, Dav. Nelson;" and from the same station and collector there is a sheet filled with a larger form, which Solander was disposed to refer to *S. Cambrica*; on a third sheet are specimens from Kew Gardens, 1780, also from "Gordon ad Mile End, 1777, Decembri," ticketed "var. *ramosa*," abnormal plants, flowering out of season.

For the species taken up by Pursh from Herb. Banks., see further on, viz. p. 187.

III. Of Michaux, *Flora Boreali-Americana*, 1803.

It is known through tradition that this work was prepared by L. C. Richard, from the collections of the elder Michaux; but he wholly withheld his name, which therefore cannot be cited.

Of the twelve species of *Solidago*, all well determined, four here originate; viz. —

S. PAUCIFLOSCULOSA. A peculiar species of the Florida coast, the only shrubby one.

S. GLOMERATA. A robust large-flowered species of the Alleghany Mountains.

S. VIRGATA. Proves to be the original *S. stricta*, Ait.; vide p. 182.

S. RETRORSA. Is *S. odora*, Ait., while the *S. odora* of Michaux is *S. tortifolia*, Ell.

IV. *Of Willdenow, Species Plantarum, 1803.*

Volume III, part 3, containing the Compositæ, is later than Michaux's Flora, which in some places it refers to.

The species in Willdenow's herbarium are numbered consecutively, and under the several species the sheets are numbered. This was probably done after Willdenow's death. The folios bearing the higher numbers are usually the older and the more authentic for the species. Many of the earlier numbers are badly misnamed, and may be later additions. The Muhlenbergian species here originate, and are represented in the herbarium by named and determinable specimens, which is not the case in Muhlenberg's own herbarium at Philadelphia. The latter proves to be of no account for this genus and *Aster*.

S. CANADENSIS, L. Mostly true; but fol. 1 is *S. cæsia*, and fol. 5 is *S. odora*.

S. PROCERA, Ait. The plant of the Hortus Kewensis.

S. SEROTINA, Ait. The plant of Torr. and Gray's Flora, having some pilosity on the ribs of the leaf beneath, the *S. gigantea*, Ait.

S. GIGANTEA, Ait. Fol. 3 is the authentic specimen, from Muhlenberg, glabrous, the true *S. serotina* of Aiton; fol. 1, 2, are undeveloped cultivated specimens of other species.

S. CILIARIS, Muhl. in litt. Is *S. juncea*, Ait.

S. REFLEXA. Fol. 2 is the authentic plant, and apparently of Aiton, viz. a form of *S. Canadensis*; fol. 1 may be a form of *S. rugosa*, Mill.

S. LATERIFLORA. Not the Linnæan plant, but the plant early cultivated under this name, viz. *S. elliptica*, var. *axilliflora*.

S. ASPERA, Ait. The plant of Aiton, viz. a form of *S. rugosa*, Mill.

S. ALTISSIMA, L. Fol. 1 is a form of *S. Canadensis*; fol. 2, which accords with Willdenow's character, is *S. rugosa*, Mill., with narrow leaves.

S. RUGOSA, Mill. From Muhlenberg; with broadly oblong and not rugose but unusually scabrous leaves.

S. SCABRA, Muhl. in litt. Same as the preceding, with smaller and more serrate leaves, rugose-veiny and scabrous beneath, glabrous and nearly smooth above. But Muhlenberg in his manuscript *Florula Lancastriensis* evidently describes not this, but *S. procera*, Ait.

S. NEMORALIS, Ait. Only a radical leaf represents the species; the flowering specimen and two large radical leaves are of *S. patula*,

Muhl. Ticketed "Fintlemann," therefore cultivated. Willdenow's own description is incongruously made up of the two.

S. PATULA, Muhl. in litt. Three sheets, apparently all from Muhlenberg. One is named "*S. angulata*, Muhl.," in the handwriting of Sprengel. Willdenow singularly omits all mention of the characteristic scabrosity of the upper surface of the leaves, which under the preceding species he has described from similar and misplaced leaves.

S. ULMIFOLIA, Muhl. in litt. Dwarf and scanty specimen of the Muhlenbergian species.

S. ARGUTA, Ait. No specimen.

S. JUNCEA, Ait. No specimen which belongs here, but one so named is *S. nemoralis*, from Muhlenberg.

S. ELLIPTICA, Ait. No specimen.

S. SEMPERVIRENS. Cultivated specimens of the species, with narrow and acute leaves.

S. ODORA, Ait. Three folios of this species, and one of *S. nemoralis*, from Kinn.

S. BICOLOR, L. The well-known species.

S. PETIOLARIS, Ait. The plant of fol. 2 "v. v." is European *S. Virgaurea*. Fol. 1 contains an indigenous *S. speciosa*, Nutt., from Muhlenberg.

S. STRICTA, Ait. Truly the species of Solander, viz. *S. virgata*, Michx., a leafy cultivated specimen, from Hunnemann, probably sent from some English garden.

S. LANCEOLATA, L. A cultivated and an indigenous specimen, the latter from Richard.

S. CÆSIA, L. Fol. 2 and 3 are true, from Muhlenberg; fol. 1 is some other cultivated plant.

S. HISPIDA, Muhl. in litt. Upper part of a plant of *S. bicolor*, var. *concolor*.

S. LEVIGATA, Ait. Two folios of the broader-leaved *S. sempervirens*, sent by Muhlenberg. "Pedunculi villosi" does not apply to them; they are barely pubescent.

S. MEXICANA, L. From Hunnemann; same as the foregoing.

S. VIMINEA, Ait. Cultivated specimen of a narrow-leaved, less succulent, open-paniculate state of *S. sempervirens*, L.

S. FLEXICAULIS, L. Three folios of *S. latifolia*, Torr. and Gray.

S. AMBIGUA, Ait. Cultivated forms, apparently of European *S. Virgaurea*, and a specimen perhaps of *S. latifolia*, L., in an altered condition.

S. MULTIRADIATA, Ait. Some of the specimens apparently true; one is *S. rugosa*, Mill.

S. RIGIDA, L. From Muhlenberg.

S. no. 15986, sent by Muhlenberg as No. 300, is *S. Canadensis*, var. *scabra*, Torr. and Gray's Flora, and apparently the *S. scabra* of Muhlenberg, according to the description in his unpublished Flora Lancastriensis. Muhlenberg's own herbarium in its existing state throws no light upon the question.

V. *Of Willdenow, Enumeratio Plantarum Hort. Reg. Berlinensis*, 1809.

S. RECURVATA. Cultivated plant, best described as between *S. gracilis*, Poir. (a derivative of *S. casia*) and *S. ulmifolia*, not matched by any indigenous specimens. A plant cultivated under this name in the Berlin Garden, 1838, 1839, seems like a hybrid between *S. casia*, var. *paniculata*, and *S. Canadensis*.

S. LIVIDA. Cultivated plant, best described as between *S. fuscata*, Desf., and *S. casia*, var. *paniculata*. Some indigenous specimens of *S. casia* seem to indicate this as its original.

S. HIRTA. Folios 2 and 3 belong to *S. rugosa*, Miller, a form with erect inflorescence and rather large heads; and fol. 1, an imperfect and uncertain specimen, may be of the same species.

S. LITHOSPERMIFOLIA. Two sheets; same as *S. viminea*, Ait., but more puberulent and broader-leaved; being probably a state of *S. sempervirens* much changed under long cultivation. But the aspect of the cultivated plant is very unlike that of *S. sempervirens*.

S. FRAGRANS. Cultivated plant: a narrower-leaved form of *S. lateriflora*, Willd., Spec., viz. *S. elliptica*, var. *axilliflora*.

VI. *Of Poiret, Dict. (Enc. Meth.)* viii. 1808.

The original species are the following, including those of Desfontaines, Cat. Hort. Par., or rather Tableau, Bot. Mus. 1804.

S. GLABRA, Desf. The *S. serotina*, Ait. Still common in European cultivation.

S. CONFERTA, Poir. Described from herb. Desfontaines; is *S. nemoralis*, Ait., as appears from the original, now in the herbarium of Dr. Cosson.

S. GRACILIS, Poir. A slightly changed form of *S. casia*, L., cult. Hort. Paris. &c.

VII. *Of Poiret, Suppl. v. 461, 1817.*

S. CORYMBOSA, Poir. ; of unknown origin, was founded on a form of *S. Virga-aurea*, preserved in herb. Poir., now Cosson.

S. MULTIFLORA, Hort. Par. See Desf. Cat. *infra*.

VIII. *Of Pursh, Flora America Septentrionalis, 1814 ; original species only, most of them taken up from Herb. Banks, really from Solander's names.*

S. VILLOSA. The *S. altissima* β , Ait. Kew., a thin-leaved and hairy-stemmed variety of *S. rugosa*, Mill.

S. PYRAMIDATA. From "Herb. Enslen." The *S. pilosa*, Walt., which is also *S. fistulosa*, Mill. Dict.

S. ASPERATA. Is *S. patula*, Muhl. Not now observed in the Banksian herbarium, but was once identified there by Dr. Boott, and it was named by Pursh in that of Lambert.

S. SAROTHRÆ. From Lewis and Clark's collection ; *Gutierrezia Euthamiae*.

S. ERECTA. No specimen in the Banksian herbarium is so named ; but Pursh probably had in view the plant referred to as the *S. stricta* β of Solander in that herbarium, which is probably a narrow-leaved form of *S. speciosa*, Nutt. More evidence would be required to supersede the latter name.

S. MACROPHYLLA. There is no specimen so named to be found in the Banksian herbarium (nor is there any of *S. squarrosa* of Pursh's time) ; but I confidently identify Pursh's species with a large specimen of *S. thyrsoides*, Meyer, collected in 1779 by Halbgren on Bisque Island in the Bay of St. Lawrence, which is ticketed by Solander, "*S. pratensis*, var. caule villosiusculo." Pursh's is the earliest-published name of this species, and may be adopted.

S. HUMILIS. Founded by Solander on a specimen collected by Banks himself in Newfoundland, and on the shores of Hudson's Bay, taken up by Richardson, Boott, &c.

S. ELATA. The character is only "*S. caule piloso tereti, foliis lanceolatis subtus pilosiusculis, racemis erectis, ligulis elongatis.* Herb. Banks, MSS." It is not referred to by Solander in his note-books. There are two specimens so named by him, on separate sheets ; but it seems that they were thought too uncertain for publication, as indeed they are.

IX. *Of Desfontaines, Cat. Hort. Reg. Paris., ed. 3, 1829.*

- S. GLABRA. Same as *S. serotina*, Ait., first published in Poir. Dict.
- S. NUTANS. A form of *S. Canadensis*, L.
- S. INTEGRIFOLIA. A cultivated state of *S. sempervirens*, L.
- S. HUMILIS. A low form of *S. rugosa*, Mill., with inflorescence not normally developed under cultivation.
- S. FUSCATA. Species of unknown source, introduced into the Paris Garden about the year 1828, first mentioned in the *additamentum* to Desfontaines' Catalogue, p. 362, as *S. fusca*, Hort. Par.; in the *adnotationes*, p. 402, characterized as *S. fuscata*. It is a smooth and glabrous and rather freely branching plant, in the virgately thyrsoidal and not at all secund inflorescence recalling *S. puberula*, but with broader and obtuse involucre bracts, the stems purplish. Not identified with any indigenous species.
- S. PLANTAGINEA. The same as *S. elliptica*, Ait.
- S. MULTIFLORA. First published in Poir. Suppl. v. 461, in cultivation down at least to 1869; it appears to be related to *S. ulnifolia* as *S. humilis* is to *S. rugosa*, viz. a form in which the leaves have become firmer and the panicles less evolute by exposure under cultivation. No indigenous specimens well correspond.
- S. ASPERULA. Apparently the same as the plant cultivated in the Paris Garden under the unpublished name of *S. rigidula*, Bosc, from about 1828 to 1831, not recognized in the wild state, perhaps derived from the preceding or from *S. Elliottii*, or from *S. rugosa*, which the hirsute pubescence of the upper part of the stem strongly suggests.
- S. GRANDIFLORA. This I take to be a tall cultivated state of *S. littoralis*, Savi, of the Italian coast, a species quite distinct from *S. Virgaurea*. "*S. Narbonensis*, Pourret, in Act. Tolos. iii. 329," which, if actually published, has been overlooked, is perhaps the same species.

X. *Of De Candolle, Prodrumus, v. 1836.*

- S. CLELLE. Probably *S. elliptica*, Ait., var. *axilliflora*, Gray, and the same as *S. dubia*, Scop. Del. Insub. t. 10.
- S. SCABRIDA. A Mexican species, seemingly only a larger-flowered *S. Canadensis*, var. *scabra*.
- S. DECEMFLORA, is *S. nemoralis*, Ait., from Texas.
- S. FLABELLIFORMIS, Wendl. (*S. flabellata*, Schrader, cited by

Sprengel as a syn. of his *S. arguta*), appears to be *S. livida*, Willd. Enum.

S. SCHRADERI. Cultivated plant; looks like a hybrid between *S. cæsia*, var. *paniculata*, and *S. Canadensis* (inflorescence not well developed); while the plant cultivated under the name in the Paris Garden in 1869 is purely the former.

S. CARINATA, Schrader, in litt., is *S. viminea*, Ait., viz. *S. semper-virens*, var. *viminea*, Gray.

S. LEPIDA. A species of the Northwest coast, collected by Hanke, to which *S. elongata*, Nutt., very closely approaches.

S. CONFERTIFLORA. Another plant of Hanke's collection on the Northwest coast, very near the variable *S. humilis*, Pursh, probably only a quite glutinous form of it, the *S. glutinosa*, Nutt.

S. SPATHULATA. Came not from "Mexicanis terris," properly so called, but from Monterey in California, and is *S. spiciformis*, Torr. and Gray, Fl., which thus becomes a synonym.

S. ROTUNDIFOLIA. Is a round-leaved form of *S. radula*, Nutt., from Texas.

3. *SOLIDAGO: General Disposition of the Admitted North American Species, with the principal Synonyms, at least those not already adduced in Torr. & Gray, Flora N. America.*

§ 1. *VIRGAUREA*. (*Virga-aurea*, Tourn.)

* *SQUARROSE*. (§ 1. *Chrysastrum*, Torr. & Gray.)

S. DISCOIDEA, Torr. & Gray. A uniformly rayless species.

S. SQUARROSA, Muhl.

S. PETIOLARIS, Ait., & var. *ANGUSTA*, *S. angusta*, Torr. & Gray, Fl.

* * *GLOMERULIFLORE*.

+ Akenes canescently hirsute or pubescent: stem and branches terete, often glaucous.

S. CÆSIA, L., with var. *AXILLARIS* (*S. axillaris*, Pursh) and var. *PANICULATA*. To the latter is referred *S. gracilis*, Poir., *S. arguta*, Spreng. Syst. (not Ait.), *S. argentea*, Hornem., *S. Schraderi* of the Gardens (that of DC. seems to be an abnormal or hybrid form), and even *S. recurvata*, Willd., all from the Gardens, and altered by cultivation. This species is also the probable parent of *S. livida*, Willd., including *S. flabellata*, Schrader, or *S. flabelliformis*, Wendl.

+ + Akenes canescently hirsute: stem and branches angled, not glaucous.

S. LATIFOLIA, L. excl. syn. Pluk. *S. flexicaulis*, L., ex. syn. & char., not of herb.

S. LANCIFOLIA, Torr. & Gray, in Chapm. Fl. 209.

S. CURTISII, Torr. & Gray; with var. PUBENS, the *S. pubens*, Curtis, in Torr. & Gray.

+ + + Akenes glabrous: inflorescence virgately thyrsoid.

S. MONTICOLA, Torr. & Gray, in Chapm. Fl. *S. Curtisii*, var. ? *monticola*, Torr. & Gray, Fl.

S. BICOLOR, L. *S. viminea*, Bosc in herb. Poir.; therefore *S. erecta*, DC. Prodr. — Var. CONCOLOR, Torr. & Gray. *S. hispida*, Muhl. in Willd. *S. hirsuta*, Nutt. — Var. LANATA. *S. lanata*, Hook. Fl.

* * * THYRSIFLORE.

+ Southwestern species, fully two feet high, with very numerous short and firm entire leaves, uniform up to the inflorescence: pubescence minute, somewhat scabrous and cinereous: heads four lines long.

S. BIGELOVII, Gray, Proc. Am. Acad. xvi. 80. Cinereous-puberulent; leaves oval and oblong, mostly obtuse at both ends, and hispidulous on the margins; thyrsus simple or compound, rather dense, or at length open; involucre broadly campanulate, puberulent; akenes minutely pubescent or glabrate. *S. petiolaris*, Gray in Bot. Mex. Bound. 79, not Ait. Mountains of New Mexico and Arizona; also adjacent Mexico. — It passes into var. WRIGHTII. A form with sometimes narrower leaves, and a simple thyrsus of few heads, inclining to corymbose. *S. petiolaris*, var., Gray, Pl. Wright, i. 94. *S. Wrightii*, Gray, l. c. Southwestern Texas to Arizona.

S. LINDHEIMERIANA, Scheele in Linnæa, xxi. 599. *S. speciosa*, var. *rigidiuscula*, Gray, Pl. Lindh. ii. 222, not Torr. & Gray.

+ + S. Alleghanian species, with thinner and bright green mostly ample and serrate leaves.

+ + Of the middle country.

S. BUCKLEYI, Torr. & Gray. A somewhat stately species, obtained from Middle Alabama by Buckley, perhaps even earlier from Lincoln Co., North Carolina, by M. A. Curtis, and later in Jasper Co., Georgia, by Professor Porter.

++ ++ Of the high mountains.

S. GLOMERATA, Michx. Does not well accord with the name, the large heads when well developed being loosely disposed or scattered.

S. SPITHAMEA, M. A. Curtis.

+ + + Boreal-montane, of difficult and uncertain limitation.

++ Bracts of the involucre acute.

S. MACROPHYLLA, Pursh. *S. thyrsoides*, E. Meyer, Torr. & Gray, Fl., &c. *S. leiocarpa*, DC. N. New England and Lake Superior to Hudson's Bay.

S. MULTIRADIATA, Ait. *S. Virgaurea*, var. *multiradiata*, Torr. & Gray, Fl. Labrador to Northern Rocky Mountains and Unalaska. — Var. SCOPULORUM. *S. corymbosa*, Nutt. in Trans. Am. Phil. Soc. Higher Rocky Mountains to New Mexico, Utah, &c. — Var. NEO-MEXICANA. A tall form, perhaps quite distinct, two feet high, with numerous heads loosely disposed in approximate axillary as well as terminal clusters, forming a narrow elongated thyrsus. High summit of one of the Mogollon Mountains, H. H. Rusby, 1881. And a form approaching it was collected by Dr. Palmer in Utah.

S. VIRGAUREA, L., var. ALPINA, Bigelow. Alpine region of the mountains of Maine, New Hampshire, and Northern New York. Also Hudson's Bay (?).

++ ++ Bracts of the involucre obtuse.

S. HUMILIS, Pursh, not Desf. — Var. GILLMANI is an extreme form of this variable species, with dentate even lacinate leaves and an open compound panicle: growing on sand hillocks on the shores of Lakes Superior and Michigan.

S. CONFERTIFLORA, DC., *S. glutinosa*, Nutt., of Oregon to British Columbia, near the coast, is probably only another form of *S. humilis*.

+ + + + California coast species, with few heads and inconspicuous rays.

S. SPATHULATA, DC. *S. spiciformis*, Torr. & Gray, Fl. Hænke's plant is from Monterey, California.

* * * * PANICULATE.

+ *Maritimæ, levigatæ.*

S. CONFINIS. Apparently pale green; leaves lanceolate and rather short, or the radical obovate; heads small (two lines long), crowded

in a dense oblong panicle, not secund; rays small, not surpassing the disk-flowers; akenes canescently pubescent. *S. sempervirens* Gray, Bot. Calif. i. 319, in part. Southern borders of California, collected by Palmer, Cleveland, and Parish.

S. SEMPERVIRENS, L. Besides the synonyms, *S. Mexicana*, L., *S. laevigata*, Ait., and *S. limonifolia*, Pers., the *S. Azorica*, Hochst. in Seubert, Fl. Azorica, is to be added. The indigenous plant is apt to acquire some hirsute pubescence on the inflorescence and the upper part of the stem, and even on some of the leaves, when it grows beyond the influence of salt or brackish water. — Var. VIMINEA, the *S. viminea*, Ait., *S. integerrima*, Mill. Dict., *S. integrifolia*, Desf., and *S. carinata*, Schrader; these are duller-leaved cultivated forms, with some fine appressed pubescence on the inflorescence, evidently the result of prolonged cultivation in European gardens. And *S. lithospermifolia*, Willd., must be a still more altered state, with larger leaves, these somewhat puberulent. No indigenous specimens like it have been found.

S. STRICTA, Ait., also of Pursh, not of later authors. *S. virgata*, Michx. *S. linoides*, Solander, ined. *S. genistoides*, Bertol. This was an unexpected discovery, which leaves no choice other than the restoration of the original name to the species which was well named *S. virgata* by Michaux. — Inseparable from it is var. ANGUSTIFOLIA, *S. angustifolia*, Ell., which in brackish soil appears to pass into the most slender and narrow-leaved form of *S. sempervirens*.

S. FLAVOVIRENS, Chapm. Fl. 211. Even this shows indications of passing into a broad-leaved form of *S. stricta*, Ait.

+ + *Unicostata*, *agrestis*.

+ + Slender, wholly glabrous and smooth, always rayless.

S. GRACILLIMA, Torr. & Gray.

+ + Minutely puberulent, obscurely venulose: thyrsoid panicle of small heads not at all secund.

S. PUBERULA, Nutt. — Var. PULVERULENTA, Chapm., viz. *S. pulverulenta*, Nutt., and *S. obovata*, Bertoloni.

+ + + Leaves obscurely veined, with only midrib prominent, mainly entire; cauline closely sessile: heads small, in a broad panicle of racemiform recurving clusters: rays 3 to 5, rarely none.

= Leaves all entire and glabrous, more or less pellucid-punctate.

S. ODORA, Ait., with var. INODORA.

S. CHAPMANI, Gray, Proc. Am. Acad. xvi. 80. *S. odora*, in part, Chapm. Fl. *S. tortifolia* of Curtiss, distrib. no. 1351. Florida. Between *S. odora* and *S. pilosa*.

= = Leaves more or less serrulate, scabrous or pubescent, very numerous up to the inflorescence.

S. TORTIFOLIA, Ell. *S. retrorsa*, Pursh, and Nutt, not Michx.

S. PILOSA, Walt. *S. fistulosa*, Mill. Dict. and the synonymy in Torr. & Gray, Fl.

++ ++ ++ ++ Leaves comparatively ample and obviously but not prominently veiny, of rather firm texture, perfectly glabrous and smooth, never much serrate: heads middle sized, crowded in usually narrow and erect thyrsoïd inflorescence, not secund.

= Atlantic species: akenes glabrous or nearly so: rays conspicuous, five or six.

S. ULIGINOSA, Nutt. Jour. Acad. Philad. vii. 101. *S. stricta*, Hook. Fl. ii. 4, in part; Torr. & Gray, Fl. ii. 204, not Ait. Although Nuttall appears to have had more than one plant in view, this is really the one upon which his species was founded.

S. SPECIOSA, Nutt., with var. ANGUSTATA, and var. RIGIDIUSCULA, Torr. & Gray.

= = Pacific and Rocky Mountain species: akenes pubescent: rays more numerous and smaller.

S. GUIRARDONIS, Gray, Proc. Am. Acad. vi. 543.

S. SPECTABILIS. *S. Guirardonis*, var. *spectabilis*, Eaton, Bot. King. 154.

++ ++ ++ ++ ++ Leaves veiny, and at least the lower serrate; heads racemosely paniculate and when well developed secund, commonly in recurving racemiform clusters: Atlantic species.

= Leaves shagreen-scabrous on the upper face, ample; stem strongly angled.

S. PATULA, Muhl. *S. asperata*, Pursh, as to herb. Lamb. *S. angulata*, Spreng. in herb. Willd.; Schrader in DC. Prodr. Var. STRICTULA, a southern small-leaved and stricter form. *S. salicina*, Ell., ex char. *S. scabra*, Hook. Comp. Bot. Mag.

= = Leaves on both faces and stem minutely cinereous-pubescent: flowering in spring; the inflorescence hardly secund.

S. VERNALIS. M. A. Curtis in Torr. & Gray, Fl.

= = = Leaves thin and loosely veiny, or firmer when growing in arid places; but veins and veinlets on the lower face generally conspicuous and reticulated; heads small; bracts of the involucre rather few and narrow; akenes pubescent.

[S. ELLIPTICA, Ait. Unknown in the wild state; see p. 181. *S. plantaginea*, Desf., is the same.]

a. Rays few (1 to 3) or none: leaves clasping.

S. AMPLEXICAULIS, Torr. & Gray, but not of Martens.

b. Rays 4 to 6, or rarely none: leaves sessile by a narrow base, pinnately veiny: pubescence of spreading hairs, or none.

S. RUGOSA, Mill. Dict. ed. 6; Willd. Spec. iii. 2058. *Virga-aurea*, &c., Dill. Elth. 406, 410, 411, t. 304, 305, 308, mentioned by Linnæus under his *S. altissima*, but not referred to it, as was commonly supposed, and not really any part of the Linnæan *S. altissima*, for which it was taken by subsequent botanists. *S. altissima* and *S. aspera*, Ait. Kew.; Willd., &c. *S. scabra*, Muhl., in Willd., l. c. *S. villosa*, Pursh. *S. humilis*, Desf., a low form, with inflorescence hardly spreading or secund. *S. hirta*, Willd. Enum. *S. rigidula*, Bosc, in hort. Par. (?) *S. asperata*, Soland. in herb. Banks., therefore of Pursh as to the type. *S. pilosa*, *recurvata*, *Virginiana*, and *altissima*, as well as *rugosa*, Mill. Many but indefinite varieties.

S. ULMIFOLIA, Muhl. in Willd. *S. lateriflora*, Ait. Kew., but not of Linnæus. *S. multiflora*, Desf., appears to be a cultivated form of it. — Var. MICROPHYLLA, *S. microphylla*, Engelm. in herb., is a rigid and small-leaved southern form, from Texas.

= = = = Leaves of firmer texture and less conspicuous reticulation, not scabrous or hardly so, commonly glabrous as are the stems: bracts of the involucre broader, obtuse.

S. ELLIOTTII, Torr. & Gray, connects with the preceding. It is *S. elliptica* (?), Ell., also of Torr. & Gray, Fl., as to plant from New York, &c. But not the original *S. elliptica*, of which no indigenous representative has yet been identified.

S. LINOIDES, Torr. & Gray, Fl., but not of Solander.

- S. *NEGLECTA*, Torr. & Gray, Fl. Not identified with any older species.
- S. *TERRÆ-NOVÆ*, Torr. & Gray, Fl. Still insufficiently known.
- S. *BOOTII*, Hook., Torr. & Gray, Fl. *S. juncea*, DC., not Ait. —
 VAR. *LUDOVICIANA*, is a dubious form, with larger heads and leaves.
 VAR. *BRACHYPHYLLA*, the *S. brachyphylla*, Chapm. in Torr. & Gray, Fl., is a remarkably small-leaved and usually rayless form of Georgia and Florida, passing into the typical *S. Bootii*.
- S. *ARGUTA*, Ait., Muhl., Pursh, DC., &c.; the *S. Muhlenbergii*, Torr. & Gray. See p. 180. *S. verrucosa*, Schrader, is probably the same, but is known only by the figure.
- S. *JUNCEA*, Ait., &c. *S. ciliaris*, Muhl. in Willd. *S. arguta*, Torr. & Gray, Fl., not Ait. Name refers only to the inflorescence, which reminded Solander of that of some species of *Juncus*.

+ + + Not maritime: leaves more or less triple-ribbed (of which there are indications in the lower leaves of one or two of the preceding species, and some of the following show it obscurely). — *Triplinervia*.

++ At least the stem and mostly the bright green leaves smooth and glabrous or nearly so, not cinereous or canescent: inflorescence (when well developed) secund in commonly spreading racemiform clusters which are collected in a terminal compound panicle: akenes more or less pubescent.

= Leaves of firm texture, rather rigid, acute or acuminate, the slender lateral ribs hardly seen in the upper cauline: bracts of the involucre firm and broadish, all obtuse.

- S. *MISSOURIENSIS*, Nutt., with syn. as in Torr. & Gray, Fl. — Var. *MONTANA*. The low or dwarf mountain form, with panicle usually compact, the heads sometimes hardly secund, the leaves mostly all entire. This is the original *S. Missouriensis*, Nutt. Jour. Acad. vii. 32, from the "Upper branches of the Missouri," collected by Wyeth, and it extends from Saskatchewan nearly to the Pacific. — Var. *EXTRARIA*, is a robust and broad-leaved form, with larger heads and more conspicuous rays; of the Rocky Mountains in Colorado and New Mexico.
- S. *SHORTII*, Torr. & Gray. Formerly known only on the banks of the Ohio, it has recently been detected in Northern Arkansas, by Professor F. L. Harvey.
- S. *MARSHALLI*, Rothrock, in Wheeler, Rep. vi. 146. S. Arizona.

= = Leaves thinner, sometimes membranaceous: bracts of the involucre chiefly linear, obtuse.

- S. LEAVENWORTHII, Torr. & Gray. Southern Atlantic States near the coast.
- S. RUPESTRIS, Raf. Probably an extreme glabrous and slender form of *S. Canadensis*, growing in shade.
- S. SEROTINA, Ait., which, as already stated, is the *S. gigantea* of Willdenow and American botanists, the *S. glabra*, Desf.; and a form of it *S. Pitcheri* of Nuttall. — Its var. GIGANTEA, that is, *S. gigantea*, Ait., but the *serotina* of Willdenow and of later authors, differs only and very variably in having some pilose or hirsutulous pubescence on the veins or the under surface of the leaves.

++ ++ Minutely pubescent or glabrate, not cinereous or scabrous: leaves thinnish, veiny, and with lateral ribs sometimes evident but often obsolete: panicle usually erect and thyriform, with the heads hardly at all secund: involucre bracts small, thin and narrow. Intercalated between the preceding and the following, to both which the species are nearly related, yet as much so to *S. rugosa*. Northwestern species.

- S. LEPIDA, DC. Not too well distinguished from the next, by its fewer and larger usually glomerate heads, little surpassing the upper leaves, and the subulate-linear acute involucre bracts. Belongs to the Northwest Coast, Alaska, &c.
- S. ELONGATA, Nutt. *S. stricta*, Less. in Linnæa. *S. elata*, Hook. Fl. Eastward it seems to pass into *S. Canadensis*.

++ ++ ++ At least the stem pubescent or hispidulous-scabrous, either hirsutely or canescently: branches of the panicle when well developed secund.

= Leaves tapering gradually to an acute or acuminate apex: panicle open: bracts of the involucre narrow and thin: rays small and short.

- S. CANADENSIS, L. Also the original *S. altissima*, L., founded on Martyn's Hist. Pl. 14, t. 14, but not of most subsequent authors, who have followed the conjectural references to Dill. Elth. (See *S. rugosa*.) *S. reflexa*, Ait., Willd., &c. *S. nutans*, Desf. *S. longifolia*, Schrader in DC. — Var. PROCERA, Torr. & Gray, the *S. procera*, Ait., &c., and *S. eminens*, Bischoff. — Var. SCABRA, Torr. & Gray. Chiefly a southern form, apparently extending well into

Mexico, under the name of *S. scabrida*, DC. — Var. *CANESCENS*, of S. W. Texas and S. New Mexico, is an outlying form, perhaps a distinct species, which from its hoariness and the broader bracts of the involucre, might be confounded with narrower-leaved and soft pubescent forms of *S. nemoralis*. — Var. *ARIZONICA*, the *S. mollis*, Rothrock in Wheeler, Rep. vi. 146, and in the heads approaching the Mexican *S. velutina*, DC., is another ambiguous plant, with low stems and comparatively large heads, the thin involucral bracts acutish; of New Mexico and Arizona.

= = Leaves obtuse, or abruptly apiculate or acutish, of firm or coriaceous texture, the upper entire; pubescence all close, cinereous or canescent, or scabro-hispidulous; the lateral ribs commonly incomplete and not rarely obscure or even wanting: panicle mostly compact: bracts of the involucre broadish, obtuse, and of firm texture: rays rather few but large, golden yellow.

- a. From cinereous to canescent with fine and soft or at length minutely scabrous pubescence: leaves firm, but not rigid.
- S. CALIFORNICA, Nutt. *S. velutina*, var. *panicula contracta*, DC. The plant of Hænke is from Monterey, California, not Mexico. — Var. *NEVADENSIS* is hardly to be distinguished from the next species.
- S. NEMORALIS, Ait. *S. hispida*, Muhl. in Willd. *S. conferta*, Poir. Dict. viii. 549. *S. cinerascens*, Schweinitz in Ell. *S. decemflora*, DC. *S. puberula*, DC., not Nutt. — Var. *INCANA*. *S. mollis*, Bartl. in DC. &c. *S. incana*, Torr. & Gray.
- S. NANA, Nutt., of the Rocky Mountains, &c.; has few and larger almost corymbosely disposed heads, and broader involucral bracts; otherwise the larger forms are too like *S. nemoralis*.

b. Hispidulous-scabrous, rigid, green.

- S. RADULA, Nutt. *S. rotundifolia*, DC. *S. scaberrima*, Torr. & Gray, Fl. *S. decemflora*, Gray, Pl. Lindh., not DC.
- c. Scabro-puberulent, somewhat cinereous; the very small leaves with hardly any lateral ribs.
- S. SPARSIFLORA, Gray, Proc. Am. Acad. xii. 58. A var. *SUBCINEREA*, from S. Arizona, *Leemmon*, indicates an unsuspected relationship with *S. nemoralis*. And, from the Mogollon Mountains, New Mexico, Mr. Rusby sends a form between the latter and *S. Canadensis*, var. *canescens*. Further study of fuller materials is required.

== = Leaves thinnish, puberulent, but green, broad, acute, divergently triplinerved and veiny, serrate: involueral bracts narrowly oblong, obtuse: rays few.

S. DRUMMONDII, Torr. & Gray. Triplinerved, but most related to such venose species as *S. amplexicaulis* and *S. rugosa*.

* * * * * CORYMBOSÆ.

+ Leaves not triplinerved, flat; cauline very numerous: akenes glabrous,

++ Turgid, 10-15-nerved.

S. RIGIDA, L.

S. CORYMBOSA, Ell., not Poir., which is only *S. Virgaurea*.

++ ++ Akenes barely 5-nerved.

S. OHIOENSIS, Riddell.

+ + Leaves somewhat conduplicate-carinate; lower slightly triplinerved.

S. RIDDELLII, Frank in Riddell, Synops. *S. amplexicaulis*, Martens.

S. HOUGHTONI, Torr. & Gray, in Gray, Man., ed. 1, 211.

+ + + Leaves flat, smooth and glabrous, narrow, somewhat triplinerved or 3-nerved, lucid.

S. NITIDA, Torr. & Gray. Louisiana and Texas.

S. PUMILA, Torr. & Gray. *Chrysoma pumila*, Nutt.

§ 2. EUTHAMIA.

* Western species, more paniculate.

S. OCCIDENTALIS, Nutt.

* * Eastern species; fastigate-cymose and glomerate.

S. LANCEOLATA, L.

S. TENUIFOLIA, Pursh. This proves to be the *Erigeron Carolinianum*, L., that is, *Virga-aurea Carol.*, &c., Dill. Elth. 412, t. 306, fig. 394.

S. LEPTOCEPHALA, Torr. & Gray. Louisiana and Texas.

§ 3. CHRYSOMA.

S. PAUCIFLOSCULOSA, Michx. *Chrysoma solidaginoides*, Nutt.

* * * *Mexican Species*. Remarkably few are known, and these have nearly all been mentioned in the foregoing enumeration.

- S. SCABRIDA, DC., is hardly other than an extreme form of *S. Canadensis*, var. *scabra*.
- S. VELUTINA, DC., seems to be a distinct species of the same group, and has recently been collected by Dr. Palmer in the north of Mexico. The variety from "Real del Monte, Hænke," is to be excluded, being *S. Californica* from Monterey, California.
- S. GONOCLADA, DC., is a peculiar species not to be confounded with *S. odora* (a form of which, named *S. gonoclada* by Schultz, occurs in Mexico), which is also *S. puncticulata*, DC.; but that was from Texas, not Mexico.
- S. PANICULATA, DC., is the same as *S. gonoclada*. But the *S. Mexicana*, HBK., doubtfully referred to it, is truly the *S. Mexicana*, L., viz. *S. sempervirens*, L. To it belongs no. 124 of my distribution of plants of Ghiesbreght from Chiapas.
- S. SIMPLEX, HBK., is a peculiar species, of the *S. Virgaurea* group, which Dr. Schaffner has apparently rediscovered in his *S. Pseudo-Virgaurea*, ined.
- S. SPATHULATA, DC., of the same group, proves to be Californian. See p. 189.

II. *Novitiæ Arizonicæ, etc.: Characters of the New Plants of certain Recent Collections, mainly in Arizona and adjacent Districts, &c.*

The principal *Polypetalæ*, as well as the *Apetalæ*, &c., of the recent collections in our hands will soon be published by Mr. Watson.

BRAYA OREGONENSIS. Humillima, fere glabra; caulibus foliosis subpollicarsibus e caudice multicipiti cæspitosis; foliis confertis spathulato-linearibus integerrimis ciliolatis coriaceis glaucescentibus; racemo intra folia sessili vel in pedunculo scapiformi parum exserto paucifloro; silicula ovata sectione subtereti acuta stylo gracili persistente superata 1-2-sperma (ovulis in loculis binis pendulis), valvis rigidocoriaceis, septo pertenui. — Union Co. Oregon, on sterile subalpine ridges, coll. June, 1880, in fruit, May, 1881, in flower, *W. C. Cusick*. This peculiar little Cruciferous plant I had named *Cusickia*, and the discoverer has partially distributed it under this name. But I perceive that it should be referred to the somewhat polymorphous genus *Braya*

(including Brown's *Platypetalum*), and that it may fairly be associated with *B. pilosa* and *B. purpurascens*, both illustrated by Hooker, notwithstanding the reduction of the ovules to a pair in each cell and the maturation of only one or two large seeds.

ÆSCULUS PARRYI. *Æ. Californicæ* affinis, frutex humilis; foliis 3-5-foliolatis; foliolis obovatis obtusis subcoriaceis brevissime petiolulatis subtus cano-tomentosis; floribus brevipedicellatis; calyce campanulato ad medium usque æqualiter 5-fido petalisque extus tomentosis; filamentis validioribus minus exsertis. — Northern part of Lower California, April, 1882, *Parry, Jones, and Pringle.*

CROTALARIA PRINGLEI. *Simplicifolia*, e basi suffrutescente perenni ramosissima, pilis longis albidis villososericea; foliis oblongolanceolatis (semipoll. ad pollicarem) subsessilibus utrinque obtusis mucronatis, aliis exstipulatis, aliis stipulis solitariis vel binis lanceolato subulatis secus caulem breviter decurrentibus instructis; pedunculis 2-3-floris folium raro superantibus; calycis lobis hæqualibus; legumine ovali glaberrimo. — Santa Catalina Mountains, South Arizona, *Pringle.* This is from an interesting collection made by Mr. C. C. Pringle, in the southern part of Arizona, in the summer of 1881.

DALEA LEMMONI, Parry in coll. *D. brachystachi* affinis (vide Pl. Wright, ii. 40), gracilior; foliolis 3-5-jugis paullo angustioribus; spicis longius pedunculatis ovatis; bracteis (exterioribus fere glabris) calycisque lobis longius aristato-productis, illis insigniter albo-plumosis; corolla ut videtur purpurascens. — Near Fort Bowie, Apache Pass, South Arizona, Lemmon, 1881. This and numerous following species form a part of the fruits of two laborious and trying explorations in Southern Arizona, made by Mr. J. G. Lemmon and Mrs. Lemmon. This interesting district has been made accessible by the opening of the Southern Pacific Railroad, the directors of which have rendered very essential and highly appreciated service to science by the facilities which they have afforded to the above-mentioned and to other botanists.

DALEA ORDÆ. *D. albifloræ* sat similis, sed glabella, caulibus suffruticosis foliisque tantum puberulis; foliolis sæpius angustioribus; spicis numerosioribus brevius pedunculatis ex ovata cylindraceis tenuiter sericeis; bracteis minoribus; calycis lobis lato-subulatis tuboglandulis insigniter notato fere dimidio brevioribus; corolla læte alba. — Plains near Bowie and Rucker Valley, S. Arizona, *Lemmon*, 1881. Also collected in the previous year by Mrs. Dr. Ord, whose name this handsome and abundantly floriferous species may commemorate.

DALEA PRINGLEI. *D. lavigatæ* proxima, etiam glaberrima spicis oblongis cylindraceisque villosissimis exceptis; caulibus gracilibus e basi suffrutescente pedalibus; foliis (lin. 1-2 longis) obovatis seu ovalibus punctatis; bracteis ex ovata acuminatis flore parum brevioribus; calycis lobis deltoideo-subulatis tubo æquilongis corolla parva late purpurea æquantibus. — Foot-hills of the Santa Catalina Mountains, S. Arizona, *Pringle*, April and May, 1881.

COURSETIA MICROPHYLLA. Foliolis 5-8-jugis absque impari (lin. 1-3-longis) subcoriaceis oblongis cuspidato-mucronatis sericeo-pubescentibus demum glabratis, venis perobscuris; racemis laxè paucifloris; calycis glandulosi lobis e basi lata lanceolatis tubo sublongioribus; corolla alba nunc roseo tineta, carina obtusiuscula; legumine glanduloso toroso compresso 5-8-spermo. — Rocky cañons of the Santa Catalina Mountains, S. Arizona, flowering in April, *Pringle, Lemmon*. — Shrub with long and slender flowering branches; the fruit obtained only by Mr. and Mrs. Lemmon.

CRACCA EDWARDSII, Gray, Pl. Wright, ii. 35. *C. glabrescens*, Hemsley, Biol. Centro-Amer. i. 262, as to Mexican plant, here referred by an oversight. Seems to vary widely. Taking the loosely branching and diffuse specimens with sparse sericeous pubescence as the type, the leaflets of which are commonly 9 or 7, and are sometimes an inch long, there are two marked varieties to be noted, viz.

Var. SERICEA, with dense sericeous pubescence apparently persistent on the lower face of the smaller oblong leaflets. This Mr. Lemmon collected, in the spring of 1881, in Spring Creek Cañon, of the Santa Catalina Mountains; and Mr. Pringle about the same time in the Santa Rita Mountains. It is distinguished from *C. mollis*, Benth. (as is the species), by the less attenuated calyx-segments being decidedly shorter than the carina, inflorescence less villous, and the ovary glabrous.

Var. GLABELLA, with far less and minuter or sometimes quite deciduous pubescence, lower and strict stem, and more numerous leaflets, these from oval to roundish, on the lower leaves 9 or 11, on the others 15 to 17 in number. This was collected by *Wright*, and again by *Lemmon* in 1881, along with the typical form.

RUBUS LASIOCOCCUS. Inter *R. pedatum* et *R. Chamæorum*; caulibus herbaceis humifusis cinereo-puberulis; stipulis ovatis subsarciosis; foliis cordato-rotundis 3-5-lobatis cum paucis trisectis, lobis segmentisve obtusissimis crebre duplicato-dentatis; pedunculis ramos breves paucifolios terminantibus 1-2-floris; calycis segmentis ovatis

acuminatis integerrimis petalis obovatis albis brevioribus; ovariis paucis (5-9) etiam drupellis carnosis tomentulosis. — Oregon, near Mount Hood, *E. Hall*, 1871 (no. 140), *J. Howell*, 1878. — In the account of Hall's collection this was inadvertently called *R. pedatus* (some of which was mixed with it); from which it is quite different, being much less slender, with thicker leaves which are seldom divided, some of the larger not unlike small ones of *R. Chamamorus*. Flowers not much larger than those of *R. pedatus*, the petals broader, five lines long. The canescent dense tomentum of the ovaries is seen even on the mature drupelets.

RIBES VIBURNIFOLIUM. *Ribesia*, modo *R. nigri* resinoso-atomiferis; foliis ovato-rotundis utrinque obtusissimis (nec cordatis nec plicatis) inciso-paucidentatis nunc obsolete trilobis glabris (petiolo excepto) demum coriaceis (pollicem longis): racemo subsessili corymbiformi plurifloro, pedicellis filiformibus, bracteis scariosis caducis; calycis tubo turbinato demum oblongo, limbo rotato 5-partito roseo, lobis ovalibus; petalis minimis patentissimis viridulis filamentisque brevissimis margini disco lato plano insertis. — Northern part of Lower California, near All Saints Bay, *Parry*, *Pringle*, and *Marcus Jones*, April, 1882. A straggling bush, so peculiar that the acute collectors did not recognize the genus. Yet the flowers have all the characters of the *Ribesia* section, and the conspicuous glands of the leaves, young shoots, pedicels, &c., are just like those of *R. nigrum*.

HOUSTONIA WRIGHTII. Pumila (2-5-pollicaris), e radice ut videtur perenni multicaulis, suberecta, fere glabra; stipulis scariosis subintegris; foliis linearibus muticis, imis sublanceolatis; cymulis foliosis; calycis lobis subulato-lanceolatis tubo brevissimo 2-3-plo longioribus corollæ subinfundibuliformis (lin. 3-4-longæ) tubo sæpius dimidio brevioribus; capsula subdidymo-globosa $\frac{3}{4}$ libera; seminibus in loculis 5-8 crateriformibus. — *Hedyotis humifusa*, Gray, Pl. Wright, i. 82, & *Oldenlandia humifusa*, Pl. Wright, ii. 68, non Pl. Lindh. ii. 216. On the Limpio, Western Texas, *Wright*, Fort Whipple, Arizona, Palmer, 1865, no. 75. New Mexico, *Thurber* (?), *Greene*, 1877. Arizona in the San Francisco Mountains, *Greene*, 1880, no. 460. Arizona, *Dr. Budd*, *Pringle*, *Lemmon*, 1881, no. 512. Santa Magdalena, New Mexico, 1881, *G. R. Vasey*. The tube of the corolla is sometimes almost twice the length of the lobes, sometimes shorter, broader, and hardly longer than the lobes.

HOUSTONIA PALMERI. *H. asperuloides* et *H. angustifoliæ* sat proxima, fere glabra; caulibus e radice perenni diffuso-ramosissimis

gracillimis; stipulis parvis nudis; foliis lineari-filiformibus (semipollicaribus) pedunculis sparsis gracilibus adscendentibus (nunc pollicaribus) brevioribus vel æquilongis; calycis lobis subulatis tubo sæpius 2-3-plo longioribus; corolla (purpurea) hypocraterimorpha, lobis intus crebre albo-puberulis tubo dimidio brevioribus; seminibus paucis turgidis circumscriptione rotundis. — Coahuila, Mexico, in the mountains east and south of Sattillo, *Palmer*, 1880, no. 397, 398.

HOUSTONIA (EREICOTIS) FASCICULATA. Fruticosa, ultrapedalis, ramosissima; ramis rigidis foliosis, junioribus tetragonis hirtello-puberulis; stipulis brevissimis scariosis sæpius biacuminatis; foliis lariciformibus vel subulato-linearibus rigidulis glabris (lin. 4-3-1-longis) internodio parum brevioribus et in axillis plerumque copiosis; cymulis paucifloris; floribus parvis (lin. 2 longis) brevi-pedicellatis; corollæ tubo calycis lobis obtusiusculis subduplo et lobis suis parum longioribus; capsula ovali ab apice libero integro loculicida; seminibus in loculis 4-5 majusculis elongato-oblongis peltatis ventre vix concavis, testa læviuscula. — Southwestern border of Texas, at Presidio, *Bigelow* in Mexican Boundary Survey. Organ Mountains, New Mexico, *G. R. Vasey*, 1881, Coahuila in Mexico, near Parras and Monclova, *Palmer*, 1880, no. 404, 406. — Except for the narrow seeds, this is a much less anomalous *Houstonia* than is my *H. acerosa*, of the same region, and the two must go together into a section for which I incline to preserve De Candolle's name of *Ereicotis*, some species of which certainly have loculicidal dehiscence; and I doubt if the genus *Mallostoma* can be maintained.*

GALIUM ROTHROCKII. Facies *G. Wrightii*, Gray, pariter suffruticosum, erectum, sed glabrum, læve; foliis quaternis minoribus linearibus subcoriaceis eveniis mucronatis; panicula laxa floribunda; fructu parcius hirsuto. — S. Arizona, *C. Wright* (part of no. 1113), *Rothrock* (no. 675, not mentioned in his volume, the fruit hardly formed); *Lemon*, 1881, with good fruit; New Mexico, *Rusby*.

VERNONIA ERVENDBERGHII. *Lepidaploa*, herbacea, glabella; caule ramoso; foliis lanceolatis vel oblongo-lanceolatis serrulatis supra scabris; capitulis laxè corymboso-cymosis sparsis longiuscule pedun-

* **HOUSTONIA (EREICOTIS) ACEROSA**, first published as *Hedyotis (Ereicotis) acerosa*, in *Pl. Wright*, i. 81, has been referred to *Mallostoma* by Hemsley, in *Biol. Centr. Amer.* ii. 31, notwithstanding the note in *Gen. Pl.* The roundish seeds have a deep but small ventral excavation. *Houstonia humifusa*, Gray, *Proc. Am. Acad.* iv. 314, as Hooker remarks, has the stipules sparsely ciliate with setiform teeth: no. 400-403 of *Palmer's* 1880 coll. are forms of it.

culatis 25-40-floris: involucrio lin. 3-4 alto subcampanulato, bracteis gradatim imbricatis acutis vel apiculato-acuminatis; pappi setis lin. 3 longis, squamellis exterioribus diam. achenii haud excedentibus. — *V. liatroides*, Gray in coll. Ervendb., Proc. Am. Acad. v. 181, excl. syn. & pl. Coult. — Mexico; near Tantoyuca, *Ervendberg*. Near Monclova, *Palmer*, no. 750. Apparently also near Monterey, *Gregg*. *V. liatroides*, DC. (which, according to Schultz Bip., is also his *V. Ehrenbergiana*), has much more numerous, smaller, and fewer-flowered heads, and mostly broader leaves more rugosely veiny beneath.

VERNONIA SCHAFFNERI. *Lepidaploa*, herbacea, scaberula, 1-2-pedalis: foliis ovalibus oblongisque (obtusis) basi acutis; capitulis paucis subumbellato-cymosis longiuscule pedunculatis circa 40-floris; involucrio hemisphaerico lin. 4-5 alto, bracteis pluriseriatis oblongis obtusis, extimis minimis nunc acutis; pappi setis lin. 3 longis squamellis brevibus conspicuis circumdati. — Mexico, San Louis Potosi, in the mountains near Morales, *Schaffner*, no. 347. Coulter's no. 229 may be a form of the same species.

VERNONIA GREGGII. *Lepidaploa*, herbacea, subpubescens; caule sat robusto; foliis oblongo-lanceolatis mox scabris acutis denticulatis; capitulis paucis sparsive longiuscule pedunculatis circa 50-floris; involucrio hemisphaerico lin. 5 alto, bracteis pluriseriatis oblongo-lanceolatis acutis vel acuminatis; pappi setis lin. 3-4 longis et squamellis angustissimis lineam longis. — Northern Mexico, *Gregg*, 1848-9, no. 102.

VAR. PALMERI. Capitulis majoribus; squamellis pappi validioribus brevioribus. — Lerios, a mountain district east of Saltillo, *Palmer*, no. 753.

STEVIA LEMMONI, Gray in Syn. Fl. ined., is fruticose, puberulent, leafy up to the dense clusters of very numerous heads: leaves all opposite, linear-oblong, obtuse, thinnish, obscurely triplinerved: involucre somewhat viscid-pubescent: flowers apparently white: pappus a cupulate and almost entire short crown. — S. Arizona, in the Santa Catalina Mountains, *Lemmon*, 1880.

STEVIA PLUMMERÆ, Gray, l. c., is herbaceous, puberulent and the bright green foliage almost glabrous, leafy up to the dense clusters of heads: leaves commonly opposite, oblong-lanceolate or broader, acute, incisely serrate, very conspicuously nervose-veiny and reticulated, hardly punctate: flowers deep rose-purple: pappus of 4 broad and truncate fimbriate-denticulate paleae. — S. Arizona, in the Rucker Valley, Chiricahua Mountains, *Mr. & Mrs. Lemmon*, 1881. Also on the

divide of the Mogollon Mountains, New Mexico, *Rusby*.—A very pretty and distinct species of *Stevia*, which may appropriately bear the name of one of the discoverers, Mrs. Lemmon, botanically still best known by her maiden name of Plummer, having shared the labors and privations of her husband in the arduous exploration of which this is one of the fruits. These two species are the only ones of the genus yet known as peculiar to the United States, the three others ranging through Mexico.

EUPATORIUM PAUPERCULUM. *E. grege E. ageratoides*, glabrum, ultrapedale; foliis ovato-lanceolatis; foliis (pollicaribus) ovato-lanceolatis basi sæpius rotundatis obtusiuscule serratis sat petiolatis; ramis floridis brevibus cymis oligocephalis terminatis paniculam foliosam referentibus; capitulis 25-floris parvis (lin. 2 longis); involucri bracteis lanceolatis acutiusculis dorso hirto-puberulis; corollæ albæ lobis extus parce tenuiterque barbellatis mox nudis; pappo albo molli, setis barbellulatis.—On dripping rocks in the Santa Rita Mountains, S. Arizona, *Pringle*.

EUPATORIUM FENDLERI. *Brickellia Fendleri*, Gray, Pl. Fendl. 63, Pl. Wright, ii. 73. This proves to be an *Eupatorium*, with 5-angled but not rarely 6-nerved akenes, or sometimes one or two of the nerves at the angles are double. It has recently been collected in Arizona as well as New Mexico, by *Greene, Lemmon, and Rusby*.

EUPATORIUM (PHANEROSTYLIS: styli rami sursum incrassati petaloido-ampliata, corolla sursum ampliata 5-lobo) COAHUILLENSE. Humilis, e basi perenni multicaulis, diffusum, viscido-puberulum; foliis plerisque oppositis ovatis obtusis parce dentatis longe petiolatis; pedunculis terminalibus elongatis monocephalis; capitulo semipollicari plurifloro; involucrio imbricato pauciseriali, bracteis linearibus, extimis laxis herbaceis, interioribus paucistriatis; achenio lineari; pappo e setis circiter 24 sat validis albidis barbellulatis; corolla eum styli inferioribus longe exsertis aut albis aut carneis.—Northern Mexico, in the Sierra Madre, south of Saltillo, Coahuila, *Palmer*, no. 453.

BARROETEA SUBULIGERA, Gray, Proc. Am. Acad. xv. 29. *Bulbostylis subuligera*, S. Schauer in Linn. xix. 718. No. 452 of *Palmer's* North Mexican collection, 1880, abundantly gathered at Soledad, "a section of low mountains with a few oaks, 25 miles southwest from Monclova in Coahuila." The heads well accord with one from an original specimen. But the plant of *Aschenborn* is said to be "fruticulus pedalis," with rameal leaves 9 lines long and a petiole of 2 lines, the upper still smaller. *Palmer's* specimens are taller than this, and

still herbaceous, but want the base, which is probably lignescent; are widely and freely branching; and the leaves, even the largest (about an inch and a half long), have a petiole of two lines at most, commonly shorter. The akenes are well flattened, sharp-edged, one face slightly convex and the other concave, the latter with a midnerve, the pericarp very thin. The heads in this, as also in *B. setosa*, are all erect. But in the herbarium of M. Boissier is a specimen from herb. Pavon, which, so long as there is no evidence that the forms run together, must be taken as a third species of the genus, and the original character will have to be modified a little in respect to the nervation of the akenes:—

BARROETEA PAVONII. Herbacea; foliis ovatis membranaceis basi lata truncata vel subcordata arcte sessilibus argute dentatis, dentibus setigeris; capitulis laxe paniculatis in pedunculo gracili nutantibus; involucri (lin. 4 longi) bracteis fere scariosis lanceolatis mucronato-acutatis; acheniis latiusculis plano-compressis, uno latere 3- altero 1-3-nervato. — Mexico, herb. Pavon, nunc Boissier, sub nom. “*Eupatorium setiferum*” and “*E. cuspidatum*.” Char. from notes taken in herb. Bossier and two capitula. In form the involucre bracts resemble those of *B. setosa*.

BRICKELLIA ODONTOPHYLLA. Sat elata, puberula; caulibus vel ramis simplicibus; foliis alternis membranaceis petiolatis grosse crenatodentatis cordatis vel subcordatis, sinu lato aut truncato aut medio breviter cuneato-decurrente, venis haud reticulatis; capitulis racemosis secundis pendulis iis *B. secundifloræ* (forma *B. Cavanillesii*) similibus; involucri glabri bracteis omnibus acutis. — Coahuila, Mexico, in the Sierra Madre south of Saltillo, *Palmer*, no. 442. Leaves with lamina an inch or two long, thin; lower obtuse and almost as wide as long, some of them with more tapering apex.

BRICKELLIA PRINGLEI. Inter *B. cylindraceam* et *B. thyrsofloram*; caulibus herbaceis strictis bipedalibus puberulis superne hirsutulis; foliis brevi-petiolatis oblongo-lanceolatis acutis basi obtusis subserratis fere coriaceis trinervatis eximie reticulatis scabro-puberulis; thyrsis e ramis floridis brevibus oligocephalis laxo folioso; capitulis vix pedunculatis plusquam 20-floris; involucre pluriseriatim imbricato, bracteis glabris, intimis lanceolatis acutis, exterioribus ovatis rotundisque parum mucronatis in bracteolas pedicellum imbricantes transeuntibus. — S. Arizona, in cañons of the Santa Catalina Mountains, April, 1881.

BRICKELLIA LEMMONI. Foliis priori capitulis et inflorescentia *B. betonicifolia* sat affinis, cinereo-puberulis; caulibus gracilibus ultrape-

dalibus thyrsoido-floribundis; foliis submembranaceis lanceolatis basi acutis sessilibus vel in petiolo brevissimo marginato attenuatis minus reticulatis; capitulis plerisque breviuscule ac graciliter pedunculatis 10-12-floris; involucri pauciseriati bracteis sensim acutatis, intimis linearibus, extimis ovato-lanceolatis. — Rucker Valley in the Chiricahua Mountains, S. Arizona, *Lemmon*, 1881.

BRICKELLIA CYLINDRACEA, Gray & Engelm., var. LAXA. Forma caule aut simplici aut laxo ramoso; capitulis minoribus aperte paniculatis nunc brevissime nunc exserte pedunculatis; foliis ramalibus petiolatis. — Southwestern part of Texas, at Georgetown and Bluffton, *Palmer*.

BRICKELLIA GRANDIFLORA, Nutt., var. PETIOLARIS. Forma gracilis, sat elata; foliis hastato-deltoides nunc longe sensim acuminatis petiolo gracillimo (1-2 pollicari) paulo parumve longioribus. — Mountains of S. Arizona, *Lemmon*.

BRICKELLIA FRUTESCENS. Frntex humilis; ramis divaricatis capitulis subsolitariis terminatis; foliis omnibus alternis parvis (lin. 3-5 longis) spatulatis integerrimis eveniis; involucri circa 20-floro, bracteis obtusiusculis; acheniis glabellis; pappi setis minutissime crebreque serrulatis. — Tantillas Cañon, near the borders of San Diego Co., but within Lower California, *Palmer*, 1875, with heads undeveloped. Mountain Springs, San Diego Co., *G. R. Vasey*, 1880, in flower. And, according to Dr. Vasey, also collected by the late *Sutton Hayes* in the same district.

KUHNTIA SCHAFFNERI. Humilis, glaucescens, fere glabra; radice tuberosa; caulibus brevibus decumbentibus foliis sublinearibus oblongisve integerrimis parvis (lin. 3-6 longis) crebre instructis, fertilibus pedunculo adsurgente nudo scapiformi (ultra-spithamæo) monocephalo terminatis; capitulo ultra-semipollicari. — Valley of Mexico, *Schaffner*. Sent by the discoverer, without name, to Dr. Cosson of Paris.

LESSINGIA GLANDULIFERA. *L. Germanorum* sat proxima; caule erecto ramosissimo; ramis rigidis ramulisque foliis parvis crebris nunc quasi imbricatis coriaceis rigidis glabris margine pl. m. glanduliferis instructis; involucri magis turbinato. bracteis etiam sæpius glanduliferis; glandulis modo *Calycadeniæ* claviformibus. *L. Germanorum* et *L. ramulosa*, var. *tenuis*, pro parte, Gray, Bot. Calif. i. 307, etc. — *L. Germanorum*, Less., of which I have an original specimen, is whitened when young with an appressed tomentum, even up to the involucri; the bracts of which are less unequal, more foliaceous, and,

like the sparse and softer leaves, wholly destitute of the nail-headed glands which conspicuously appear on most specimens of the species now recognized, though sometimes they are few and small. The corollas are plainly yellow, more so than in dried specimens of *L. Germanorum*, which according to Chamisso are saffron-colored. The original species we have only from the neighborhood of San Francisco. *L. glandulifera* occurs from Monterey to San Diego, Owens Valley, San Bernardino, &c. Fine specimens from the latter district, collected by the Brothers Parish and Mr. Pringle, have directed my attention to the species, which I had confounded with two others.

GRINDELIA COSTATA. Elata, glabra, lævis; ramis gracilibus monocephalis; foliis fere membranaceis lanceolatis acutis serrulatis basi auriculis breviter adnato-decurrentibus semiamplexicaulibus; capitulo hemisphærico semipollicari; involucri bracteis brevibus subulatis demum squarroso-recurvis modo *G. squarrosæ*; acheniis (lineam longis) lævibus lunato-gibbosis vel incurvis circa 10—costatis, costis plerisque crassis (valleculis angustissimis) obtusis, ventrali cariniformi; areola epigyna parvula. — Northern Mexico, near Juraz, in Coahuila, 100 miles north of Monclova, *Palmer*, no. 472.

GRINDELIA SUBDECURRENS, DC., is a species which should likewise be well distinguished by the akenes: these in De Candolle's specimens are at maturity so turgid as to be globular, are without ribs and almost without angles, the slightly depressed terminal areola rather large. Specimens which have been referred to it, with immature fruit more prismatic, may probably belong to *G. squarrosa*.

GRINDELIA ARIZONICA, Gray, as yet unpublished (to which belongs *G. microcephala*, Rothrock in Wheeler Rep. 141), of which ripe fruit is still wanting, appears to include no. 467 of Palmer's North Mexican collection.

ACAMPTOPAPPUS SHOCKLEYI. Frutex humilis, ab *A. sphærocephalo* differt capitulis majoribus hemisphæricis in pedunculo gracili ramos patentis terminante solitariis *radiatis*; ligulis circiter 12 (oblongis semipollicaribus luteis); involucri minus imbricato; pappo achenio paullo longiore. — Western Nevada, near Candelaria, Esmeralda Co., *W. S. Shockley*.

BIGELOVIA INTRICATA. Suffrutescens, divergenti-ramosissima, glaberrima, parce squamoso-foliata; ramulis gracillimis monocephalis; foliis crassiusculis subulatis sæpius mucrone apiculatis, majoribus semipollicaribus, ramulinis minimis squamiformibus; capitulis (lin. 3—4 longis) 12—15-floris; involucri campanulato, bracteis sat numerosis

spiraliter 3-4-seriatim imbricatis subchartaceis (albidis nervo viridulo) acutis inappendiculatis, extimis lato-lanceolatis brevibus, intimis linearibus; corollæ lobis brevibus ovatis; styli appendicibus lineari-lanceolatis parte stigmatifera longioribus; acheniis teretibus pluristriatis hirsutulis pappo dimidio brevioribus. — S. E. California, in the Mohave desert, at Lancaster station, *Parry*. A notable species, having the very short corolla-lobes of the section *Chrysothamnopsis*, along with the involucre of the *Euthamioideæ* division of the *Aplodiscus* section.

BIGELOVIA ALBIDA, Marcus Jones in herb. *Chrysothamnus*, fruticosa, 2-3-pedalis, fastigiato-ramosa, subglaber, glutinosa; ramis ad apicem usque (sæpius fasciculatim) foliosis; foliis fere filiformibus (pollicaribus) mucronatis; capitulis cymoso-confertis semipollicaribus 5-floris; involucri bracteis lanceolatis subcoriaceis, exterioribus sursum subfoliaceis subpatentibus in acumen aristellatum productis, intimis papyraceis muticis; corolla "alba!" (ut videtur ochroleuca), lobis linearibus; antheræ appendicibus brevissimis obtusissimis; styli appendicibus lineari-filiformibus parte stigmatifera 2-3-plo longioribus; acheniis villosulis. — In alkaline soil, Wells, Nevada, *Marcus Jones*, August, 1881.

ASTER (ORTHOMERIS) STENOMERES. *Ianthe*, *A. scopulorum* (*Diplopappus alpinus*, Nutt.) proximus; caulibus gracilibus subpedalibus; foliis viridibus angusto-linearibus longioribus vix marginatis; involucre lato, bracteis parum biseriatis tenuioribus minus inæqualibus linearibus, junioribus laxè pubescentibus; ligulis ultra-semipollicaribus. — Rocky Mountains of Montana and Idaho, *Burke*, *Watson*; collected by the former many years ago, by the latter in 1881 at Battle Camp.

ASTER (ORTHOMERIS) PALMERI. *A. spinoso* aliquanto affinis, caule frutescente capitulisque *Feliciis* Capensibus similis, glaber; ramis herbaceis e caule lignoso 4-pedali paniculato-ramosissimis *Baccharidis* modo striato-angulatis; foliis integerrimis angustissime linearibus leviter uninerviis, ramulorum parvis obtusis; capitulis paniculatis sparsis lin. 3 longis; involucri campanulati bracteis imbricatis erectis oblongis obtusis rigidulis, dorso versus apicem viridulo, marginibus scariosis; receptaculo fimbriis acheniis angustis subteretibus hirsuto-sericeis dimidio brevioribus onusto; ligulis 8-10 brevibus albis; fl. disci circiter 20. — S. Texas, at Corpus Christi Bay and on the Rio Grande at Eagle Pass, September and December, 1879. *Palmer*, no. 509, 516. This militates against the West Indian genus, *Gundlachica*, of Proc. Am. Acad. xvi. 100.

ASTER IMBRICATUS, Walp. Rep. ii. 574. This is the name, by transference, of the Chilian species named by Nuttall *Tripolium imbricatum*. And it may here be noted that it is the original *Tripolium conspicuum*, Lindl. in DC. Prodr. v. 254, founded on specimens of Bridges and Bertero; a plant of rather rigid and strict habit, perhaps perennial, with comparatively large solitary heads, and a "turbinate" involucre of firm pluriserially imbricated bracts, the outermost ovate and ovate-lanceolate, the inner mostly acute. It is quite different from the common and wide-spread annual species which has been taken for it.

ERIGERON DRYOPHYLLUS. *Euerigeron*, subcinereo-pubescentis; radice perenni; caule pedali parce ramoso; ramis apice nudis monocephalis; foliis membranaceis obovatis lyrato-pinnatifidis sinuatisve in petiolum alatum attenuatis, ramealibus lanceolatis subintegris; involucri bracteis subulatis; ligulis 80-90 longe exsertis lin. 3 longis albis purpureo tinctis; acheniis parce hispidulis ad margines tantum nervatis; pappo fere simplici, setulis exterioribus paucis exiguis. — Northern Mexico, in the mountains at Guajuco, N. Leon, southeast of Monterey, *Palmer*, no. 495.

ERIGERON PRINGLEI. Cæspitosus e caudice crasso multicipiti, pygmæus, fere glaber et lævis; caulibus floridis simplicibus erectis vel patentibus gracilibus inferne foliatis monocephalis; foliis radicalibus pinnatim 3-5-fidis in petiolum longe attenuatis, lobis brevibus oblongis acutis, caulinis angusto-linearibus; involucreo glabro; ligulis 25-35-violaceis. — Crevices of rocks on the Santa Rita Mountains at the elevation of 9000 feet, S. Arizona, *Pringle*.

ERIGERON MUIRII. Affinis *E. grandifloro*, Hook., differt insigniter lana gnaphalioides mollissima longa herba tota vastiente; caulibus spithamæis monocephalis; foliis plerisque spathulatis; involucri bracteis sursum attenuatis; ligulis albis; pappo externo multi-squamellato conspicuo. — Cape Thompson, Alaska, *John Muir*, 1881. The most interesting and apparently the only new species of an extensive and truly valuable collection made by Mr. Muir in a recent searching-cruise which he accompanied, and which extended to Wrangel Island. The plant seems to have been abundant, for it occurs in the collection under three numbers. The head, style, rather scanty main pappus, &c., are very much as in *E. grandiflorus*, especially of the var. *lanatus*; but of that the pubescence is villous, except at the head, towards the base of the plant varying to hirsute: in this the whole plant is densely clothed with long and soft cottony wool,

quite in the manner of *Gnaphalium*, and the short outer pappus is very conspicuous.

BACCHARIS SAROTHIROIDES. *B. Emoryi* affinis, scoparia, microphylla; foliis linearibus integerrimis, ramulinis minimis; capitulis laxe paniculatis minoribus paucifloris; pappi fl. masc. setis apice nudis, fl. fœm. demum lin. 3 longis. — Southern borders of California, San Diego Co., near the old Mission station, the boundary monument, &c., *Sutton Hayes, Palmer*. This is one of the species with soft elongating pappus in fruit, which has been somewhat confounded with *B. Emoryi*, and also with *B. sergiloides*, which belongs to another section.*

* The North American species of *Baccharis* I now understand in this wise, arranging them in four groups.

1. Pappus of the fertile flowers very copious, pluriserial, elongated in fruiting, fine and rather soft: akenes 8–10-costate: stems somewhat simple and herbaceous above the woody base: leaves linear, 1-nerved. — To this group belong *B. juncea* of S. Brazil, of which I have not seen akenes, and *B. Seenanni*, Gray, of Mexico, only that the latter appears to have 5-nerved akenes.

B. WRIGHTII, Gray, Pl. Wright, i. 101, & ii. 83. W. Texas to S. Colorado and Arizona.

B. TEXANA, Gray, Pl. Fendl. 75, & Pl. Wright, l. c. Texas.

2. Pappus of the fertile flowers less copious, conspicuously elongating in fruit, soft and fine, mostly flaccid and bright white: akenes 10-nerved. These are branching shrubs, with numerous glomerulate or paniculate heads, the leaves sometimes incisely lobed or angulate dentate, but not serrate.

* Atlantic species.

B. HALIMIFOLIA, L. Coast of New England to Texas; also in Cuba.

B. GLOMERULIFOLIA, Pers. North Carolina to Florida near the coast; also Bermuda.

B. SALICINA, Torr. & Gray. *B. salicifolia*, Nutt. Colorado, east of the mountains, to W. Texas. I have seen few specimens that belong to this species.

Its leaves are from oblong to linear-lanceolate, rarely entire; heads or glomerules of two or three heads pedunculate; involucre of both sexes campanulate (nearly 3 lines long), of mainly ovate and acutish bracts.

B. ANGUSTIFOLIA, Michx. Brackish marshes, from S. Carolina and Florida to Texas.

** Pacific species.

B. PILULARIS, DC., including *B. consanguinea*, DC. Pacific coast from Monterey to Oregon.

B. EMORYI, Gray, Bot. Mex. Bound. 83. S. California from Los Angeles Co., and through the interior country well into Arizona and the southern part of Nevada and Utah. Originally described only from upper branches; some specimens of it have been referred to the preceding, others to *B. salicina*.

PLUCHEA (BERTHELOTIA) BOREALIS. *Tessaria borealis*, Torr. & Gray (§ Phalacrocline, Gray, Pl. Wright), &c. *Berthelotia lanceolata*, DC., being referred by Bentham to Pluchea, carries with it the present plant. The near affinity of the two, as well as the subcaudate anthers, I had noticed in Pl. Wrightianæ, i. 102, but I did not carry out the conclusion on account of the stoutness of the pappus-bristles. — *Tessaria*, Ruiz & Pav., considering that the species are exclusively South American, may be retained, and characterized by the narrow heads and the long villosity of the small receptacle.

ANTENNARIA FLAGELLARIS. Capitula *A. dimorphæ* sed minor, floribus paucioribus; caudice parvo simplici emittente flagellis scapiformibus gracillimis nudis (spithamæis) propagine mox radicante et

From the variations in the size of the heads and a difference in male involucre, this may comprise two species.

B. SAROTHIROIDES, Gray, *supra*. So far as known, this is confined to S. California along and near the Mexican frontier.

* * * Of New Mexico, Arizona, and Mexico; the branches terete and lightly striate (not striate-angled as in the preceding and in most of our species), minutely pruinose-roughened.

B. PTERONIOIDES, DC. Prodr. v. 410. *B. ramulosa*, Gray, Pl. Thurb. 301, & Bot. Mex. Bound. 84. *Aplopappus ramulosus*, DC. *Linosyris (Aplodiscus) ramulosa*, Gray, Pl. Wright. The specimen in the Candolle herbarium appears to be this rather wide-spread and peculiar Mexican species.

3. Pappus of the fertile flowers not longer than of the male, even in the fruit not surpassing the style, therefore not elongating in age, rather rigid and scanty: akenes 10-nerved, but the intermediate nerves sometimes indistinct: fertile corollas regularly and acutely 5-toothed: receptacle bearing some chaffy scales similar to involucre bracts among the outer flowers, becoming hemispherical or conical when these are numerous: branches herbaceous from a woody base; the fruitful ones bearing sparing small leaves, or naked, and paniculate small heads.

B. SERGILOIDES, Gray in Pacif. R. Rep. iv. 101, & Bot. Mex. Bound. 83, also Bot. Calif. i. 333, but there mixed with *B. sarothroides*, &c. Desert of S. E. California to Nevada and adjacent borders of Nevada and Utah.

4. Pappus of the fertile flowers not flaccid, little if at all elongated in fruit, mostly not copious: akenes only 4-5-nerved.

* Scabro-puberulent or pubescent, not glutinous: fruiting pappus manifestly surpassing the style: heads loosely paniculate: bracts of the involucre scarious with a green or greenish back or centre, acute or acuminate: stems herbaceous from a more or less woody base.

B. BRACHYPHYLLA, Gray, Pl. Wright, ii. 83. S. Arizona to the borders of California. Very minutely puberulent.

monocephalo terminatis; foliis omnibus angusto-linearibus. — *A. dimorpha*, var. *flagellaris*, Gray, in Wilkes Exped. xvii. 366. — Washington Territory and eastern part of Oregon, *Pickering* and *Brackenridge*, *Cusick*, *Howell*. A peculiar species of the marked section to which *A. dimorpha* belongs. Incomplete specimens were referred to that species, on the strength of Nuttall's description, from which it would seem that his female plant might almost be of this species. And the following proves to be a third species of this section.

ANTENNARIA STENOPIHYLLA. Stolonibus flagellisve ut videtur nullis; caulibus gracilibus 3-6-pollicaribus foliosis foliisque angusto-linearibus acutatis elongatis argenteo-lanatis; capitulis 2-4 ad apicem nudum caulis capitatum congestis; involuero utriusque sexus lin. 2-3

B. PLUMMERE, Gray, Proc. Am. Acad. xv. 48, &c. Mountain ravines back of Sta. Barbara and Sta. Monica. *Miss Plummer* (now *Mrs. Lemmon*), *Parish*.

* * Glabrous or nearly so, smooth, often glutinous: fruiting pappus slightly if at all surpassing the style.

+ Bracts of the 15-30-flowered involucre rather narrow and of firm texture, with green centre or costa: leaves rather small and rigid, serrate with rigid or spinulose teeth.

B. THESIOIDES, HBK. Includes *B. ptarmicæfolia*, DC. A common Mexican species, collected in S. Arizona by *Wright*.

B. BIGELOVII, Gray, Bot. Mex. Bound. 84. First collected in Arizona and New Mexico by *Bigelow*, *Wright*, and *Thurber*, recently by *Lemmon* and *Rusby*.

+ + Bracts of the many-flowered involucre rather narrow, thin and pale but with greenish centre: heads corymbosely cymose: receptacle hemispherical or broadly conical!

B. DOUGLASSII, DC., including *B. Hankei*, DC., which came from Monterey, California, not Mexico. An herbaceous species, wholly Californian.

+ + + Bracts of the many-flowered involucre broad (outer ovate), thin-chartaceous, rather dry, with narrow scarious margins (at least the inner) yellow or tawny: stems very leafy up to the corymbosely cymose inflorescence: leaves lanceolate, willow-like.

B. GLUTINOSA, Pers. A name to be adopted if this is indeed the Chilian species, as I suppose. It is certainly both *B. cærulescens* and *B. Alamani* of De Candolle, and probably has other names. It is a tall species, herbaceous from a more or less woody base, common from S. California to S. W. Texas and through Mexico.

B. VIMINEA, DC. A Californian species, which extends from Monterey to San Bernardino Co., is a true shrub, 6 to 12 feet high, with shorter and more entire leaves than the foregoing, bearing smaller clusters of larger heads, terminating short lateral branchlets. According to Messrs. Parish Brothers it blossoms at the end of winter or in early spring; while the foregoing blossoms in autumn.

longo, bracteis omnibus ovatis oblongisve obtusiusculis brunneis vel masculis internis apice albo; setis pappi fl. masc. sursum parum barbellulatis haud clavellatis.— *A. alpina?* var. *stenophylla*, Gray, in Wilkes Exped. l. c.—Spipen River, Washington Terr., *Pickering* and *Brackenridge*. Union Co., Oregon, on high hills, *Cusick*.

GNAPHALIUM WRIGHTII. *G. microcephalo* peraffine; ramis diffusioribus; foliis latioribus plerisque spathulatis basi nunquam adnato-productis; involucri bracteis griseo-albis obtusis, interioribus apiculato-acutatis.— *G. microcephalum*, Gray, Pl. Wright, i. & ii., non Nutt.— Common from S. Arkansas and W. Texas to New Mexico. Also no. 419 of Parry and Palmer's collection from San Luis Potosi, Mexico, which has been referred to *G. canescens*, DC.; but, from the character, that species is better represented by no. 433½ of the same collection.

ADENOCAULON. To the remarks in Proc. Am. Acad. viii. 653, the following correction and addition should be made. An attentive examination of all the species shows that the basal auricles of the sagittate anthers are manifestly produced into a slender acumination or small tail, the adjacent ones connate. And the genus is so thoroughly congruous with *Carpesium*, which is anomalous in the *Fuinuleæ*, that the two may well be associated in the Inuloid subtribe *Adenocaulæ*.

MICROPUS AMPHIBOLUS. *M. Californico* proximus, differt floribus fœmineis 9–10 in receptaculo oblongo subimbricatis, bracteis fructiferis tenuioribus (maturis chartaceis) parum latioribus, appendice ovata hyalina majore primum arcte inflexa demum porrecta; floribus sterilibus pappo paucisetoso instructis.— California, no. 416 of *Kellogg*, *Harford's* distribution; and Walnut Creek near Martinez, *Brewer*, 1860–62.— I wish to call attention in California to this plant, which has been confounded with *Micropus Californicus* and with some other *Filagineæ*. Its characters are such as really to give some color to the merging of *Stylocline* in *Micropus*, the female flowers, about ten in number, being spirally inserted on a somewhat elevated though hardly columnar receptacle, the scarious hyaline apical appendage to the bract (which all the species possess) being larger in proportion to the bract, indeed almost of its length in anthesis, and then inflexed, afterwards horizontal, and the almost mature fructiferous bracts comparatively thin and soft, so that it approaches *Psilocarphus*. Moreover the few staminate flowers are subtended by linear deciduous paleæ, and provided with a few pappus bristles. The organic apex of the ovary, though lateral, is close to the summit. Transitional though it be, I

cannot refer the plant to *Stylocline*, nor suppress that genus without also suppressing *Psilocarphus*.

PLUMMERA, Nov. Gen. *Compositarum*.

Capitula heterogama, pauciflora; floribus radii fœmineis ligulatis 2-5, disci masculis 6-8. Involucrum obpyramidalatum, cupuliforme, cartilagineo-coriaceum, duplex; exterius e bracteis 4 ovatis oblongisve obtusis dorso carinatis ultra medium usque sæpius coalitis; interius e bracteis totidem alternantibus vix brevioribus liberis obovato-cuneatis apice lato rotundato subscariosis. Receptaculum planum nudum. Corollæ radii lato-cuneatæ, trilobæ, sensim in tubo brevem angustatæ; disci tubuloso-infundibuliformes, breviter obtuseque 5-dentatæ, extus crebre glanduloso-pubescentes, tubo proprio brevi crassiore. Antheræ basi obtusæ. Stylus fl. disci apice brevissime bifidus, ramis haud stigmatiferis, apice depresso-dilatato semi-peltato: ovarium inanimatum gracile. Achenium fl. radii turgidum, obovatum, ecostatum, sursum pilis tenuissimis villosum, areola epigynæ parva parum depressa: pappus nullus.

PLUMMERA FLORIBUNDA. Herba ut videtur biennis, bipedalis, superne corymboso-ramosissima, foliosa, subglabra, odore et sapore amaro-aromatica; foliis omnibus tenuiter 1-3-ternatim partitis, modo *Helenii* et *Actinellæ* impresso-punctatis; capitulis parvis perplurimis fastigiato-cymosis plerisque pedunculatis; floribus aureis. — Apache Pass, S. Arizona, *Mr. & Mrs. Lemmon*. Dedicated to the latter, under the name which she until recently bore; the partner of her husband in the severe labors and privations of Arizona exploration, and in the honor of this and of many other interesting discoveries. The natural affinity of this plant may rather be with *Actinella* in the *Helenioideæ*; but the essential characters are wholly those of the *Helianthoideæ-Milleriæ*.

DUGESIA, Nov. Gen. *Comp.-Melampodiæarum*.

Capitula heterogama, radiata; fl. radii 8-12 fœmineis, disci plurimis hermaphrodito-sterilibus. Involucrum latum, duplex; exterius foliaceum, e bracteis 6-8 obovatis oblongisve patentibus; interius e bracteis numerosioribus oblongis membranaceis erectis. Receptaculum planum; paleis angusto-linearibus scariosis planis apice dilatato subherbaceis flores steriles subtendentibus, exterioribus ab acheniis et bracteis involucri subtendentibus omnino liberum. Corollæ radii ligula plana cuneato-oblonga apice 2-3-fida e tubo brevi; disci fere

Silphii, stylus sterilis *Silphii*, vel summo apice bifida: ovarium inane. Achenia obovata, crassa, obcompresso-turgida, dorso subconvexo uninnervia, ventre subangulata, costa prominente superne in dentem crasso-subulatum rigidum porrectum desinente, marginibus dentato-alatis (nempe ala sinuato-incisa nunc pluripartita, lobis summis cartilagineis auriculiformibus forte ad pappum referentibus), basi nec bractea sua involucri nec paleis internis adnata.

DUGESIA MEXICANA. Herba humilis e radice perenni, facie *Chrysogoni*, foliis pinnatifidis hispidulis *Engelmanniæ* (sed plerisque oppositis), achenio dente interno instructo *Lindheimeræ*, sed *Silphio* potius affinis, achenio crasso (maturo tuberculato-scabro) schizoptera insignis. — *Lindheimera Mexicana*, Gray, Proc. Am. Acad. xv. 34; Hemsl. Bot. Centr. Am. ii. 141. San Luis Potosi, *Parry & Palmer*; but collected much earlier by *Dr. Schaffner*. This might seem to be referable to the obscure genus *Schizoptera* of Turczaninow; but the involucre and slender tube to the short ligules attributed to that genus indicate something different, perhaps more like *Guardiola*.* — This genus is named in honor of Professor *Alfred Dugès*, of Guanajuato, Mexico, a zealous zoologist, from whom we have recently received a collection of the plants of that part of the country.

PARTHENIUM CONFERTUM. Herbaceum, pube adpressa substrigosa canescens et hirsutum; radice ignota forte perenni; caulibus 1-2-pedibus sat validis subsimplicibus usque ad apicem foliosis; foliis circumscriptione obovato-oblongis bipinnatifidis, segmentis lobisque brevibus crebris obtusis, vel pinnatilobatis lobis paucies crenato-incisis; capitulis perplurimis corymboso-cymosis confertis; involuero canescenti-pubente; pappi paleis parvulis oblongis. — Plains of Coahuila, Mexico, near Parras, *Gregg*, 1847-9, *Palmer* (no. 648), 1880. Belongs to the section formed for *P. Hysterophorus* (but probably the root perennial), which species indeed approaches it in a canescent and simpler-leaved variety (var. *lyratum*), of the same region, no. 316, *Wright*, no. 647, *Palmer*, &c. The present species, now confirmed by *Palmer's* specimens, was long ago collected by the late *Dr. Gregg*.

* CHRYSOGONUM VIRGINIANUM, L. It still appears that this is the only species of the genus, although a rather variable one. The akenes at maturity fall away from the receptacle, carrying the involucre bract behind and the bracts of two or sometimes three sterile flowers in front: so the genus belongs to the Parthenioid group, along with *Berlandiera*, *Engelmannia*, &c., and not with *Silphium*, where *Bentham* placed it, having combined it with *Moonia*, *Arn*, and taking the character in these respects from that truly distinct Indo-Australian genus.

AMBROSIA PUMILA, the *Franseria pumila*, Nutt., and of Torr. & Gray, Fl. ii. 293, of which "we had not seen the fruit," nor had Nuttall, is a good *Ambrosia*, with mucous fruiting involucre. Occasionally two of these are connate at base, on which character Delphinio founded his genus *Hemiambrosia*. The species is very closely related to *A. CANESCENS*, namely *A. fruticosa*, var. *canescens*, Benth. Pl. Hartw. 17, of Mexico. But that is taller, more silvery-canescens, with narrower lobes to the leaves, slender-pedicelled sterile heads, and some small spines to the fruiting involucre; the latter character probably unreliable.

RUDBECKIA MONTANA. E grege *R. occidentalis*, procera, lævis, fere glabra; foliis pinnatifidis, summis pauci-laciniatis, lobis paucijugis lanceolatis, terminali majore nunc oblongo-ovato; ligulis nullis; disco primum ovoideo, fructifero cylindraco 1-3-pollicari; acheniis cum pappo longius cupulato lin. 3-4-longo. — Rocky Mountains of Colorado; *E. Hall*, spec. cult. Elk Mountains, Colorado, *Brandegge*.

RUDBECKIA MOHRII. *R. atrorubenti*, Nutt., per-affinis, ramosior, glaberrima; foliis minus rigidis angusto-linearibus viridibus; disco atro-fusco subgloboso; ligulis luteis; paleis receptaculi parum mucronatis; acheniis longioribus subcurvatis areola obliquo insertis; pappo profunde cupulato. — Margin of ditches and ponds near the Dead Lakes, not far from Iola, W. Florida, June 22, 1880, *Charles Mohr*. This has some affinity on the one hand with *R. nitida*, but is a much nearer relative of *R. atrorubens*, which is quite of this genus, and no *Echinacea*. Dr. Mohr collected these two peculiar species in the same district.

GYMNOLOMIA TRILOBA. Subglabra, ramosa; radice ignota; foliis alternis lato-ovatis trilobis basi truncata vel subcordata; involucri bracteis linearibus disco hemisphærico demum ovoideo brevioribus; receptaculo conico; acheniis glaberrimis subcompressis calvis. — On peaks of the Chirrichui Mountains, south of Rucker's Valley, Arizona, *Lemmon*.

SYNEDRELLA VIALIS. *Calyptrocarpus vialis*, Less. Syn. 221, & Linnæa, ix. 269. *Oligogyne Tampicana*, DC. Prodr. v. 629; Deless. Ic. Sel. iv. t. 38; Gray, Pl. Wright, i. 111. *Blainvillea Tampicana*, Hemsl. Biol. Centr.-Am. ii. 169. In Pl. Wright, above cited, I had noted the near relationship of this plant to *Synedrella* as well as to *Blainvillea*, and concluded that the wingless akenes mainly distinguished it from the latter genus. I had then seen no winged or margined akenes, and did not know that upon this plant was founded the

Calyptrocarpus of Lessing, which is characterized as having "achænium plano-obcompressum . . . interrupte et anguste alatum." A tuberculate winged margin of this sort is manifest in some of the outer akenes of Texan and Mexican specimens. *S. peduncularis* of Bentham appears to be the connecting link between this species and *S. nodiflora*. The author would doubtless have added this third species, if he had noticed that the akenes of the disk as well as the ray are obcompressed and dorsally subtended by narrow flat chaff. And so De Candolle's *Oligogyne* is described. *Blainvillea* is quite different in these respects. But to *Blainvillea*, and certainly not to this species, belongs *B. biristata*, DC. (the *Galophthalmum Brasiliense* of Nees and Martius), of Brazil.

VIGUIERA LANATA. Tomento denso pannoso candidissima, humilis e basi ut videtur lignescens; foliis plerisque subradicalibus crassis rotundatis fere integerrimis trinervatis basi nunc subcordatis petiolatis, caulis floridi alternis, superioribus nunc omnibus ad bracteas parvas spatulatis linearibusque reductis; involucri imbricati (semipoll. alti) bracteis linearibus tomentosis; ligulis plurimis ultra-semipollicaribus; acheniis undique sericeo-villosissimis; pappi paleis intermediis truncatis fimbriato-laciniatis aristis subulatis dimidio brevioribus. *Bahiopsis lanata*, Kellogg, Proc. Calif. Acad. ii. 35. — Cerros Island, Lower California, Veatch, Street, Belding. — Through the kind attention of Dr. Parry, we possess an original specimen of Dr. Kellogg's *Bahiopsis*, which is here characterized. It is quite different from the plant doubtfully named *Viguiera nivea*, Benth.? in the Botany of California, which, falling back to its earliest specific name, now becomes *V. tephrodes*. Nor is it the *Encelia nivea*, of Benth. Bot. Sulph. 27, which is still ambiguous. The original at Kew appeared to me destitute of pappus, and Bentham's note, in Gen. Pl. ii. 376, leaves it to be inferred that he saw none. There is a plant collected in Lower California by Lieutenant Belding which accords with Bentham's description, except that the leaves are alternate, and there is a very caducous pappus of two aristiform paleae, but no intermediate squamellæ. The akenes, when known, will probably refer it to *Encelia* rather than to *Helianthus*. But it is to be noted that *Encelia nivea*, Benth., is said to come from San Quentin. Now the only San Quentin we know is on the Bay of San Francisco. But the plant at Kew was not recognized on inspection.

LEPTOSYNE (COREOCARPUS) ARIZONICA. Suffruticosa, ramosa; ramis floridis elongatis herbaceis gracilibus foliatis; foliis omnibus

oppositis 3-5-partitis, segmentis linearibus plerumque integerrimis; capitulis laxe corymboso-cymosis breviuscule pedunculatis; involuero externo indistincto e bracteis 1-3 parvis, interno seu proprio e bracteis 6-8 ovatis biseriatis; annulo corollæ tubi barbato; ramis styli fl. herm. appendice subulato superatis; acheniis oblongis marginibus serie tuberculorum quasi alatis aut calvis aut aristis 1-2 tenuibus instructis (faciebus aut levibus aut hirtello-muriculatis), intimis minus perfectis angustioribus immarginatis. — Near Fort Lowell, Arizona, along streams, *Lemmon*, 1880. Santa Catalina Mountains, *Pringle* 1881. — The delicate short awns of the akenes are either naked or sparingly denticulate, the denticulations spreading or some of them recurved. The minute cupule at the summit of the ovary and akene is within the base of the corolla, therefore an epigynous disk. — It is becoming evident that *Leptosyne*, DC., *Pugiopappus*, Gray (*Agarista*, DC.), and *Coreocarpus* with *Acoma*, Benth., must be combined into one genus, which is the counterpart on the western side of North America of *Coreopsis* on the eastern, and from which it is distinguished by its fertile ray-flowers and by the annulus of the disk-corolla. The latter is a peculiarity of the genus. *Leptosyne maritima*, as we have it in cultivation, occasionally develops a short paleaceous awn to each margin of the summit of the akene. *Pugiopappus* (of three described species) and *Coreocarpus* form good sections, and the latter approaches *Bidens*.

MADIA YOSEMITANA, Parry in litt. Inter sect. *Anisocarpum* et *Harpæcarpum*, pusilla, spithamæa; foliis linearibus integerrimis, summis alternis; capitulis solitariis longiuscule pedunculatis; floribus radii 5, ligulis brevibus, involucri bracteis apice brevissimo erecto, achenio semi-obovato parum falcato apice coronula parva setulis ciliolata instructo; disci 3 sterilibus intra cupulam 4-dentatam, pappo instructis e setis paucis parce barbellatis corollam æquantibus. — California, in damp moss at the foot of the Upper Yosemite Fall, *Parry*, June 1881.

LAGOPHYLLA GLANDULOSA. *L. ramosissimæ* proxima; indumento parco brevi; ramulis foliis præsertim superioribus bracteisque glandulis claviformibus obsitis; acheniis minus obcompressis. areola terminali minore. — California, in the Sierra Nevada from Auburn to near the Yosemite, *Lemmon*, *Mrs. Bidwell*, *G. R. Vasey*.

ACTINELLA VASEYI. E grege *A. Richardsonii*; radice ut videtur perenni; caule stricto pedali ramisque floridis fastigiatis foliosis; lobis foliorum angusto-linearibus; involuero campanulato (lin. 3½ alto), exteriore 8-9-lobato, nempe e bracteis ovato-oblongis ultra medium

connatis; ligulis majusculis (lin. 4 longis); receptaculo convexo; pappi paleis oblongis sæpius obtusis enerviis corolla disci vix dimidio brevioribus. — New Mexico, in the Organ Mountains, *G. R. Vasey*, August, 1881.

ARTEMISIA PARISHII. *Scriphidium*, frutescens, 3–4-pedalis, tomento minutissimo undique caesescens; foliis (plerisque sesquipollicaribus) aut linearibus integerrimis (lineam latis) aut inferioribus apice dilatato tridentatis; panicula ampla laxa, ramis gracilibus polycephalis; capitulis (lin. 2 longis) 6–7-floris; involuero campanulato; acheniis utriculatis glandulosis et pilis arachnoideis parce villosis. — Newhall, Los Angeles Co., and in Cajon Pass, California, Oct. 1881, coll. *S. B. & W. F. Parish*. It has the habit and ample paniculate inflorescence of *A. Palmeri*.

SENECIO LEMMONI. Frutescens, parum succulentus, ramosissimus, tomento arachnoideo parco mox delapso glaberrimus; foliis lanceolatis argute dentatis vel denticulatis (summis linearibus integerrimis), imis in petiolum marginatum attenuatis, superioribus basi auriculato-dilatatis amplexicaulibus, auriculis spinuloso-dentatis; ramis floridis apice nudis; capitulis pauciusculis longius pedunculatis; involuero parum bracteolato; ligulis circ. 12. — Near Camp Lowell and Sta. Catalina Mountains, S. Arizona, *Lemmon*, 1880 & 1881. Not much like any other North American species.

CNICUS ROTHROCKII. *C. Arizonicæ* similis, ramosior; caule foliisque glaberrimis lævibus, vel ramis nunc pilis crispulis parce pubescentibus; involucri bracteis primum laxè lanulosis. *C. Arizonicus*, var., Rothrock in Wheeler Rep. vi. 179. — Central and Southern Arizona, *Rothrock*, 1874, *Lemmon*, 1881.

HECASTOCLEIS, Nov. Gen. *Comp. - Mutisiacearum.*

Capitula uniflora: flos hermaphroditus. Involucrum cylindraceum, e bracteis pauciseriatis imbricatis angusto-lanceolatis subherbaceis rigidis cuspidatis. Receptaculum parvum nudum. Corolla fere coriacea, tubulosa, angusta, regularis, limbo haud ampliato in laciniis 5 æquales lineares mox recurvo-patentes fisso. Antheræ lineares, subcoriaceæ, basi in caudas sat longas nudas productæ. Stylus integer, apice stigmatico truncato parum emarginato. Achenium immaturum cylindraceum, glabrum. Pappus coroniformis, laciniato-dentatus, corneus. — Frutex ramosus, glaber; ramis rigidis foliosis; foliis alternis et in axillis fasciculatis coriaceis, caulium linearilanceolatis plerumque cus-

pidato-mucronatis margine hinc inde spinuliferis sessilibus, floralibus ampliatis lato-ovatis iliciformibus venulosis margine spinulis gracilibus armatis capitula sessilia pl. m. glomerata fulcrantibus paululum superantibus; corolla albid.

HECASTOCLEIS SHOCKLEYI. — Very arid district, at Candelaria, Esmeralda Co., Nevada, *W. S. Shockley*. A remarkable addition to the few known North American *Mutisiaceæ*, to stand near *Ainsliæa*, but altogether *sui generis* and of peculiar habit. The generic name alludes to the separate enclosure of each flower in its involucre.

CREPIS PLEUROCARPA. Inter *C. occidentalem* et *C. acuminatum* quasi media, pube minuta cinerea demum decidua; caulibus subaphyllis; foliis runcinato-dentatis incisive; cyma paniculiformi laxa; capitulis angustis paucifloris; acheniis oblongis sursum haud attenuatis eximie alato-10-costatis pappo paulo brevioribus. — Head-waters of the Sacramento, above Strawberry Valley, on wet slopes of the mountains, at the altitude of about 7,500 feet, 1881, *Pringle*. The short and thick akenes, with at least ten narrow and very salient ribs, almost wings, separated by broad grooves, distinguish this species.

LOBELIA GATTINGERI. *L. appendiculatæ* sat similis; floribus minoribus (lin. 3 longis); calycis lobis haud ciliatis attenuato-subulatis fere inappendiculatis basi utrinque callo minimo instructis, fructiferis capsula brevioribus; pedicellis quandoque bracteolatis. — Middle Tennessee, in springy places of calcareous bluffs and in cedar barrens. *Dr. Gattinger*. No. 1637 of the distribution of A. H. Curtiss, under the name of *L. leptostachys*. Flowering May and August, from a monocarpic root.

GITHOPSIS DIFFUSA. Demum effuse ramosissima; ramis gracilibus; foliis parvis; calycis lobis lanceolatis (basi latoribus) corollam subæquantibus ovario præsertim capsula fere lineari arcte sessili subdimidio brevioribus; seminibus turgide oblongis. — On Cucamonga Mountain, S. California, June, 1881, *S. B. & W. F. Parish*. The capsule opens apically, as in the original species.* The blue corolla is only 2 lines in length.

ANDROSACE ARIZONICA. E grege *A. occidentalis*, tenella; scapis debilibus decumbentibus radiisque umbellæ paucifloræ capillaribus elongatis; foliis phyllisque involucri consimilibus brevibus; calycis lobis foliaceis, fructiferis accrescentibus ovatis radiato-patentibus tubo

* Baillon's statement to the contrary is founded on a misapprehension, he evidently having taken a Texan *Specularia* for *Githopsis*. See Bull. Soc. Linn. Par. 304.

brevi lato capsula semiclaudente longioribus; corolla minima; seminibus paucis (5-6) sat magnis. — Santa Catalina Mountains, S. Arizona, *Pringle*. Mostly in fruit, April 19, 1881; earlier specimens may have a less inconspicuous corolla. *A. occidentalis* has been collected in the same mountains.

GOMPHOCARPUS HYPOLEUCUS. *Asclepiadi lanuginosæ* (Mexicana) haud dissimilis; caule valido bipedali puberulo; foliis omnibus oppositis ovalibus brevi-petiolatis supra glabratis viridibus infra albotomentosis; pedunculis umbella multiflora longioribus; corolla viridula, segmentis ovali-oblongis (lin. 4 longis); cucullis atropurpureis carosis erectis (antheris duplo longioribus) oblongo-ligulatis et basi hastatis sed lobis seu appendicibus triangulatis acutis arcte inflexis, facie interna laud fissa. — Santa Rita Mountains, Arizona, *Pringle*.*

* The following *Gentianeæ* are contributed by Dr. Engelmann: —

ERYTHRÆA NUDICAULIS, Engelm. Biennis, *E. Douglasii* proxima; caule humiliore erecto sursum laxè brachiato-ramoso; foliis infimis ovatis basi breviter contractis rosulatis, caulinis paucis lineari-lanceolatis; floribus paucis longè pedunculatis; calyce tubum corollæ vix æquante; lobis corollæ oblongis obtusis planis tubo paullo brevioribus; antheris lineari-oblongis; stylo ovario multoties breviorè; seminibus subglobosis reticulatis. — Base of Santa Catalina Mountains, Arizona; fl. April, *C. G. Pringle*. This is distinguished from all the North American species by its rosulate leaves (4 to 6 or 8 lines long) and almost naked stem, 2 to 6 or 8 inches high, with small and narrow distant leaves, and few (rarely more than 4 to 6) very long-peduncled flowers; these are scarcely more than 5 lines long, rose-purple with yellow throat; anthers (soaked) from half to nearly a full line long; stigmas broadly fan-shaped. From the nearly allied *E. Douglasii* it is distinguished by its radical leaves and whole growth, by a much shorter flower-tube in proportion to the lobes, and rather smaller seeds.

GENTIANA MICROCALYX, Lemmon in litt. Annuæ, erecta, pedalis seu sesquipedalis, fastigiato-ramosa; foliis sessilibus e basi subcordata ovato-lanceolatis margine sub lente scabrellis; floribus inferioribus longè pedicellatis in apice ramulorum cymoso-aggregatis (fere 5 lin. longis albidis denum pallide violaceis); calyce profunde inæqualiter 5-lobo tubo corollæ ter quaterve breviorè; lobis corollæ patentibus lanceolatis acutiusculis basi nudis tubo subcylindrico brevioribus; ovario subsessili in stylum brevissimum attenuato; seminibus globosis leviusculis. — Arizona, *Mr. & Mrs. Lemmon*. — Leaves thin, and, with the exception of the middle ones, almost without nerves, from an inch to an inch and a half long. Flower 5 lines, calyx 1 line long. Allied to *G. Wislizeni* of the same region, but distinguished by the smaller proportions, thinner leaves, and especially the shape of the calyx and the absence of any fringe in the throat of the corolla, whereby it stands next to the much larger and coarser *G. quinqueflora*.

G. ENGLEMANN.

Mr. Lemmon has published a description and a woodcut of this new *Gentian* in the Pacific Rural Press, of Feb. 25, 1882. It was collected on the summit of the Chirrichua Mountains, in the southern part of Arizona, Sept. 30, 1881.

GILIA (NAVARETIA) PROSTRATA. *G. leucocephalæ* proxima, sed humifusa capitulo primario radicali, ramisque inferne nudis apice capitulum foliis involucreto gerentibus quasi prolifera; calycis tubo parce hirsuto; ovulis seminibusque in quoque loculo 4. — Near Los Angeles, California, on the margin of desiccated ponds, *Rev. J. C. Nevin*, 1879, 1881, *Dr. Parry*, 1881.*

PHACELIA PRINGLEI. *Euphacelia*, *P. namatoidei* proxima, gracilior, glanduloso-pubescent, aperte ramosa; foliis linearibus basi attenuatis, inferioribus oppositis, omnibus pseudo-racemis gracilibus brevioribus; sepalis linearibus corolla fere rotata cærulea dimidio brevioribus. — Mountains about the head-waters of the Sacramento River, N. California, at 7,500 feet, *Pringle*, 1881. This is interesting as connecting the anomalous *P. namatoides* with the ordinary Phacelias. Only one or two pairs of leaves are opposite; the inflorescence is as free from circination as in that species.

PHACELIA PLATYLOBA. *Euphacelia* inter species pl. m. glandulosas nec setosas, gracilis, pube brevi molli subviscosa; foliis parvulis pinnato-5-partitis, segmentis oblongis crenato-incisis, terminali majore subpinnatifido; floribus in spica angusta breviter pedicellatis subconfertis; calycis lobis e basi angusta valde dilatatis foliaceis (1 vel 2 subito in laminam oblato-ovatum, cæteris minoribus obovato-spathula-

* It has at length become evident that the unequal insertion of the stamens (so characteristic of *Phlox*) will no longer serve to distinguish *Collomia* from *Gilia*. Transitions occur in the same species from very unequal to equal insertion, or nearer to equality than in some other *Gilias* besides those of the Navaretia section. The character of solitary ovules having also failed, nothing remains but to remand Nuttall's genus *Collomia* to the already large and much diversified genus *Gilia*. Fortunately not many new names will be required: For the

C. Cavanillesiana, Don, is *Gilia glomeriflora*, Benth.

C. Cavanillesiana, Gray, as to the United States plant, is *G. multiflora*, Nutt., from which one or two other species or forms are still to be extricated.

C. Thurberi, Gray, has to be *G. Thurberi*.

C. longiflora, Gray, is *G. longiflora*, Don.

C. aggregata, T. C. Porter, is *G. aggregata*, Spreng.

C. leptalea, Gray, is *G. capillaris*, Kellogg.

C. heterophylla, Hook., is *G. Sessei*, Don.

C. giloides, Benth., with *C. glutinosa*, is *G. divaricata*, Nutt.

C. gracilis, Dougl., is *G. gracilis*, Hook.

C. tenella, Gray, may be named *G. leptotes*.

C. linearis, Nutt., can retain the specific name of *G. linearis*, and

C. grandiflora, Dougl., that of *G. grandiflora*, the homonym of Steudel being *G. densiflora*.

tis); corolla subrotata cærulescente, appendicibus brevibus obtusissimis; capsula in exemplo abortu monosperma oblonga acutiuscula (lineam longa) calycem haud superante; semine subrugoso.—California, in Fresno Co., 1881, *Parry*. The species of this group are not very clearly defined; but no one has a foliaceous calyx of this fashion. The expanded corolla is barely 4 lines in diameter. The fruiting calyx does not exceed 2 lines in length; and the one or two quasi-petiolate lobes are a line in breadth.

ERIODICTYON ANGUSTIFOLIUM, Nutt., var. *PUBENS*. Foliis sæpe latiuscule lanceolatis haud lucidis supra puberulis subtus tomentulosi; ramulis pube brevi et calycibus villo denso indutis. — San Bernardino Co., California, 1881, *S. B. & W. F. Parish, Parry*. With the foliage of *E. glutinosum* as to shape, and a pubescence which makes some approach to that of *E. tomentosum*, this has the short and nearly campanulate corolla of *E. angustifolium*, to which it is accordingly referred.*

* *Revision of the Racemose Basi-bracteate Species of ECHINOSPERMUM, in Correction of the Syn. Flora of N. America, ii. p. 189.*

1. Very loosely and small-flowered biennials, or perhaps sometimes annuals: corolla and nutlets not over 2 lines broad or long; leaves thin and green.

E. VIRGINICUM, Lehm. Nutlets of the globose fruit equally short-glochidiate over the whole back.

E. PINETORUM, E. L. Greene, in herb. Cauline leaves small, narrowly oblong, mostly obtuse: racemes erect and simple: nutlets only marginally glochidiate with flattened prickles, but the flat or concave ovate dorsal disk glochidiate muriculate. — New Mexico, on the Pinos Altos Mountains, July & Sept. 1880, *E. L. Greene*.

E. DEFLEXUM, Lehm. Nutlets only marginally glochidiate, with the dorsal disk minutely scabrous: in var. *AMERICANUM* (which makes some approach to *E. Virginicum*) the somewhat more granulate dorsal disk not rarely bears two or three small glochidiate prickles on an obscure midnerve!

2. More or less larger- and less loosely-flowered: racemes usually paniculate: tube of the corolla not at all or only slightly surpassing the calyx: glochidiate prickles either wanting on the back of the nutlets or shorter and smaller than those of the margin.

* Biennials: dorsal disk of the nutlets wholly unarmed, granulate-scabrous.

E. URSINUM, E. L. Greene, in herb. Hispidulous or hispid on the stem and leaves, stout: nutlets small (2 lines long), with broadly ovate dorsal disk plane or nearly so, the subulate flattened marginal prickles short. — New Mexico, on gravel beds of Bear Cañon in the Bear Mountains, New Mexico, 1880, *E. L. Greene*. To this, in flower only, evidently belongs no. 633, *Fendler*, N. Mexican Coll., which had been referred to the next species.

E. FLORIBUNDUM, Lehm. Pubescent, rather strict: nutlets larger, with

ERITRICHIIUM INTERMEDIUM. *E. Krynitzkia*, *E. muriculato* affine, admodum varians; nuculis ovato-lanceolatis (ex ovata sursum sensim

ovate-deltoid dorsal disk more or less carinately one-nerved, margined by a series of long flat subulate prickles. — The syn. "*E. subdecurvens*, Parry, &c," to be excluded, as it belongs, along with many of the specimens referred here, to the next species. Corolla commonly 3 lines in diameter.

** Perennials, larger-flowered (corolla usually 5 lines in diameter): dorsal disk of the nutlets sparsely armed with much shorter and smaller glochidiate prickles than the flattened and basally dilated marginal ones.

E. DIFFUSUM, Lehm. Pubescent and often canescent with soft hairs or with leaves hispidulous, branched from the base: pedicels usually slender: nutlets with broadly ovate dorsal disk; the ventral face roughish and dull; the marginal prickles as in *E. floribundum*: but mature fruit not seen.— Lehm. Pug. ii. 23; Hook, Fl. Bor.-Am. ii. 83, not Gray, Syn. Fl., in which this species is mixed with *E. floribundum*. *Rochelia patens*, Nutt. Jour. Acad. Philad. vii. 41. *Echinosperrnum subdecumbens*, Parry in Proc. Davenport Acad. i. 48. Douglas's plant, on which the species was founded by Lehmann, is a low and leafy form, quite cinereous, with altogether immature fruit. When well known it may give characters specifically to distinguish the following:

Var. *HISPIDUM*. Stem and leaves truly hispid: nutlets broadly ovate (3 lines long), with marginal prickles completely confluent for more than half their length into a wing, the ventral face very smooth and lucid.— Eastern Oregon, on rocky hills and gravelly banks, *Cusick*, 1880 and 1881; and near Boise City, Idaho, *Dr. T. E. Wilcox*, 1881.

*** Perennial, with simple stems from a multicapital caudex, comparatively large-flowered (limb of the nearly rotate corolla half an inch in diameter), linear-leaved, sericeous: fruit wholly unknown; probably of this genus.

E. CILIATUM. *Cynoglossum ciliatum*, Dougl. in herb. Hook.; Lehm. Pug. & Hook. Fl. l. c. 85.— Douglas's station noted in herb. Hook. is "On the gravelly banks of mountain streams near the head-springs of the Columbia; in herb. Benth. Kettle Falls and Spokane River, 1826." The fruit is a great desideratum. *Cynoglossum Howardi*, with which it was rightly associated in the Syn. Flora, p. 188, is evidently only a dwarf and probably alpine variety of the same species, in which the sericeous hirsute pubescence is all still appressed. In the plant of Douglas spreading and more bristly hairs fringe the margins of the leaves with a kind of ciliation, and there are similar spreading or reflexed bristles on the lower part of the stem. This is a foot or so in height.

3. Comparatively large-flowered, perennial, with tube of the corolla surpassing the calyx and about the length of the lobes: nutlets of the globose fruit equably armed over the whole surface and margins with long and slender but flattish minutely glochidiate prickles.

E. CALIFORNICUM. *E. diffusum*, Gray, Syn. Fl. l. c. (excluding small-flowered specimens which belong to the true *E. diffusum*, and excl. syn. Kellogg?) not of Lehm.— Sierra Nevada, California, from Mount Shasta southward. This was

ad apicem attenuatis nunc valde papilloso-muricatis; ab *E. barbigero* differt calyce sæpius dimidio minore haud villoso; nuculis sæpius 4 fertilibus. — Southern part of California (from Los Angeles, *Nevin*, &c.) to adjacent Arizona. Not uncommon in collections, has been confounded at times with both of the two species mentioned: if it should pass into *E. muriculatum*, the character of that species would require much extension. It has been collected by *Parry*, *Lemmon*, *Parish*, *Cleveland*, &c.

ERITRICHIMUM RACEMOSUM, Watson in herb. *Krynitzkia*, *Pseudo-Myosotis*, e basi lignescente perenne, ramosissimum, setis rigidis subsparsis hispidum; foliis linearibus parvulis; floribus racemoso-paniculatis sparsis, nonnullis folioso-bracteatis; pedicellis flori subæquilongis; calyce setis rectis patentissimis rigidis instructo, segmentis lanceolatis acutis tubo corollæ albæ breviter hypocateriformis brevioribus; nucula fertili sæpius unica (fere lineam longa) e basi lata sursum angustata dorso parce muriculata intus sulco sursum angustato tota longitudine gynobasi subulata in stylum sat gracilem producta adnato. — Mesquite Cañon, San Bernardino Co., California, March, 1881, *S. B. & W. F. Parish*. The calyx and pedicel appear to be persistent.*

taken for Lehmann's *E. diffusum*, because of his description of the corolla ("Corolla alba? magna, tubus calyce paullo longior sensim ampliatus"); and Californian specimens of the real *E. diffusum* were mixed with it. The original specimens of the latter do not have the exerted tube of the corolla which marks the present species when in blossom, as does the fruit at maturity. It is the *E. nervosum* of Kellogg; but neither the leaves nor the sepals are perceptibly nervose (the former not "3-5-nerved" nor the latter "3-nerved"), so that the name would be a false one.

. *E. Mexicanum*, Hemsl. (*Cynoglossum Mexicanum*, Schlecht, in *Linnaea*, & DC. Prodr. x. 156), is an apparently biennial species with slender prickles covering the whole surface of the fruit, but with corolla-tube not exceeding the calyx.

* ERITRICHIMUM, § PLAGIOBOTHRYIS.

Good specimens and careful notes, kindly communicated by the Rev. J. C. Nevin of Los Angeles, and a consequent re-examination, enable me to distinguish the species of the first subdivision in the Syn. Fl. N. Amer. (p. 192) more clearly than is done in that work. It will be seen that one of them requires a change of name.

E. FULVUM, A. DC., the *Myosotis fulva*, Hook. & Arn. Bot. Beechey, p. 38, and I suppose *Plagiobothrys rufescens*, Fischer & Meyer, as appears from the habitat, were all founded on the Chilian plant. My specimens of this, from Bertero's

LITHOSPERMUM (RHYTISPERMUM) GLABRUM. Humile, e radice annua ramosum, læve, præter pube parca adpressa minuta glaberrimum; foliis spathulato-linearibus; bracteis inflorescentiæ spiciformis densifloræ demum elongatæ nullis; floribus fere sessilibus; calycis segmentis subspathulato-linearibus foliaceis corollæ albæ æquilongis, fructiferis costa inferne valde incrassata indurata; nuculis oblongo-ovatis subtriquetris fere lævibus opacis, areola basilari haud magna. — Apache Pass, S. Arizona, *Lemmon*, 1881. A singular species of Old-World type, somewhat like *L. incrassatum* of Gussone; the base of the calyx and its exceedingly short pedicel similarly thickened and indurated after flowering; but the flowers are not accompanied by bracts, the nutlets are narrower, slightly contracted at base and with less dilated areola of insertion, and quite inclosed in the indurated base of the calyx.

JACQUEMONTIA PRINGLEI. *J. abutiloidei* affinis, facie *Abutili*, erecto-diffusa e basi frutescente, haud volubilis; foliis cordatis breviter acuteque acuminatis integerrimis utrinque cum ramis canescenti-

and from C. Gay's collection, although destitute of good fruit, plainly differ from the North American species. The calyx is 5-parted all but to the base into linear lobes. There is no evidence that it connives over the fruit, and it seems that it cannot be circumscissile.

E. NOTROFULVUM, of California and Oregon, the *Myosotis fulva*, Hook. Bot. Beechey, Suppl. p. 369 (that of Hook. Fl. Bor.-Am. is probably *E. tenellum*, Gray), *E. fulvum*, A. DC. as to Calif. plant; Gray, Proc. Am. Acad. x. 57, &c. Erect from a rosulate tuft of thinnish radical leaves; the slender comparatively simple stems reaching a foot or two in height: spikes ebracteate except sometimes at base: calyx 5-cleft barely to the middle into oblong-lanceolate and hardly at all accrescent lobes, closely connivent over the fruit, promptly circumscissile above the base. The pubescence of the calyx, although generally rufous, is often whitish.

E. CANESCENS, Gray, l. c. Diffusely spreading or depressed, or sometimes ascending, more canescently hirsute, but the tips of the calyx at first not rarely rufous: leaves of firmer texture: spikes bracteate below and sometimes throughout: calyx 5-parted (fully two thirds to the base); the lobes broadly triangular-lanceolate or broader, accrescent, open in fruit, tardily when at all circumscissile close to the base.

Var. ARIZONICUM, Greener, more hirsute or hispid, with somewhat the aspect but not the fruit of *E. Torreyi*: corolla smaller, sometimes with a tinge of rose-color: calyx less accrescent: rugæ of the nutlets rather sharper and towards the sides rising sometimes into elevated points or tubercles. — Arizona, *Greene*, *Pringle* S. Utah, *Marcus Jones*. An intermediate form, collected on the Mesas near San Bernardino by the *Brothers Parish*, has soft-hirsute pubescence, softer leaves, the upper ones forming conspicuous bracts to the loose spikes, and very accrescent mostly wide-open calyx.

tomentosis; pedunculis folio longioribus 2-3-floris; floribus pedicellatis; sepalis acutis vel parum acuminatis, 3 exterioribus ovatis, interioribus subovatis tenuioribus dimidio minoribus; corolla ut videtur alba, limbo pollicem lato. — S. Arizona, in the Santa Catalina Mountains, *Pringle*, May, 1881.

EVOLVULUS LÆTUS. *E. Arizonico* affinis, sed pilis longis patentibus villosus atque indumento sericeo undique argentato-sericeus, multicaulis e basi perenni suffrutescente; caulibus erectis foliosis; foliis lanceolatis sessilibus (majoribus ultra-semipollicaribus, summis lin. 2-3 longis); pedunculis 1-3-floris folia pl. m. superantibus; corolla cærulea semipollicem diametro. — Mesas and foot-hills of the Santa Rita Mountains, S. Arizona, *Pringle*.

BREWERIA MINIMA. Pusilla, e radice annua diffusa, pubescens; foliis lanceolatis basi attenuatis, imis spathulatis; pedunculis unifloris folio brevioribus versus apicem bibracteatis; flore lin. 2-3 longo; corolla violaceo e calyce parum exserta, lobis subovatis; stylo bipartito. — Northern part of Lower California, April, 1882, *Marcus Jones, Parry, Pringle*. This has the aspect of an *Evolvulus* and of the *Stylisma* section of *Breweria*.*

PENTSTEMON PARISIUM. *P. spectabili* et *P. Clevelandi* affinis, pariter glaberrimus, glaucescens; caule 2-3-pedali; foliis integerrimis vel tenuissime denticulatis, caulinis præsertim superioribus oblongo- seu ovato-lanceolatis e basi subcordata semiamplexicauli haud connatis; panicula ampla effusa, pedicellis gracilibus; corolla (pollicari) angustoinfundibuliformi roseo-rubra mox violascente, limbo parvo subæquali, lobis lin. 2 longis; filamento sterili glaberrimo. — S. E. California, in

* It may here be noted that an inspection of the originals in the Sherardian herbarium enables me to eliminate two false species of *Convolvulaceæ* introduced by Pursh, which have given trouble, viz. : —

Convolvulus Sherardi, Pursh, Fl. ii. 730. This is founded on a poor fruiting specimen of *Convolvulus micranthus*, R. & S., which was collected in the West Indies, not in "Carolina."

Calystegia paradoxa, Pursh, l. c. 729. The specimens belong to *Convolvulus hirsutus*, Bieb. (*C. sagittatus*, Sibthorp), and were doubtless collected by Sibthorp in Greece. There are two tickets with the specimen: one with the phrase "Convolvulus hirsutus anguloso folio, fl. albo;" the other, which is there through some misplacement, is the one which Pursh has copied, and which led him wrongly to conclude that the plant came from Virginia.

Calystegia Catesbeiana, Pursh, l. c., is founded on a specimen from Catesby in the same cover as the above (no. 343); I had already rightly referred it to the *Convolvulus septium*, var. *repens*, but it is one of the forms which may almost as well be referred to *C. spithameus*.

the Cucamonga Mountains and elsewhere, *Wallace* (panicles only, referred in *Syn. Fl.* 265, to *P. Clevelandi*), *S. B. & W. F. Parish*. *P. Clevelandi*, of which the best specimens have now been received from the Brothers Parish (who are most zealously and admirably developing the botany of the region) appears to hold to the bearded sterile filament, has decidedly smaller and narrower corolla, of more crimson color; the leaves are rigid, very acutely and rigidly dentate, and the upper pairs almost always connate into an oblong or oval disk. With *P. spectabilis* this equally showy species accords only the character of the panicle and the glabrous filament, the corolla being less ampliate above, &c. I am glad to dedicate the species to the botanists who alone have collected it (except for the imperfect and misunderstood specimens of the late Mr. Wallace) and have enabled me to make it known.

PENTSTEMON BREVILABRIS. Glaber, glaucescens, e basi lignescens ramosus, ultra-spathamæus; foliis coriaceis integerrimis oblongo-lanceolatis imisve spathulatis; thyrso angusto elongato, pedunculis paucifloris brevissimis; calycis segmentis lanceolatis prorsus herbaceis; corolla vix semipollicari (albida?) sursum ventricosa parum bilabiata, lobis subconformibus brevissimis; filamentis sterilibus antheriferis fere conformi nudo. — Cerros Island, Lower California, *S. Belding*, 1881.

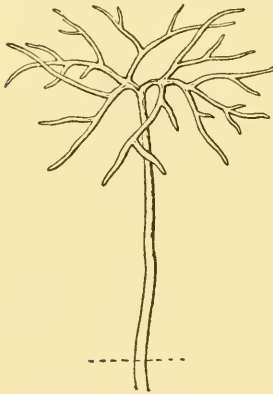
ORTHOCARPUS PARISHII. *Triphysaria* antheris omnibus bilocularibus, ultra-spathamæa, ramosa; foliis 3-5-fidis ramisque fere glabris, lobis lineari-filiformibus; bracteis 5-partitis foliis consimilibus summisve purpureo tinctis cum calyce tenuiter pubentibus flore brevioribus; lobis calycis lanceolatis obtusis tubo dimidio brevioribus; corolla purpurascens labio sæpius pallido, saccis tam latis quam longis, fauce parum pubescente, galea lanceolata obtusiuscula extus puberula. — San Jacinto Mountain, San Diego Co., California, *S. B. & W. F. Parish*, July, 1880.

CORDYLANTHUS (ADENOSTEGIA) NEVINII. Paniculato-ramosus, subvillosus; foliis tripartitis integrisque angusto-linearibus haud calloso-apiculatis; floribus secus ramulos graciles sparsis nudiusculis; corolla flavido-purpurascens; staminibus 4 consimilibus; filamentis villosis; antheris unilocularibus, loculo altero rudimentario vel sæpe nullo; seminibus lævibus scarioso-apiculatis. (To stand next to *C. tenuis*, and the subsection in *Syn. Fl.* to be widened on account of the essentially one-celled anthers.) — California, in the San Bernardino Mountains, at about 5,000 feet, *Rev. J. C. Nevin*, 1880, *S. B. & W. F. Parish*, 1881.

MONARDELLA TENUIFLORA, S. Watson in herb. Soror *M. macrantha*, Gray, fruticuloso-cæspitans, spithamæa, tomentuloso-ciurea; foliis parvis (lamina lin. 3-4 longa) ovalibus ovatisve; capitulis multifloris; bracteis oblongis; corolla albida, tubo filiformi longe exserto (ultra-semipollicari) lobis oblongo-lanceolatis multoties longiore. — S. California, at San Jacinto, in San Diego Co., July, 1880, *S. B. & W. F. Parish*.

APPENDIX.

BURSERA MICROPHYLLA, Gray, Proc. Am. Acad. v. 155. This shrub was collected by Xantus at Cape San Lucas, Lower California, in fruit, and soon after by Schott, in Sonora, with a few flowers. It appears to have all the characters of *Bursera*, except that, according to Torrey's notes, the ovules are solitary in the cells. In the original description is the phrase, "Cotyledones contortuplicatissima." Recently Dr. Parry and the Messrs. Parish have collected it in Arizona, near Maricopa, in fruit, and have raised seedlings. When sending some seeds, the Brothers Parish called my attention to the singularly dissected cotyledons.



They are here represented from a drawing of a seedling raised in the Botanic Garden of Harvard University, the figure a little larger than life. Bentham and Hooker state that the cotyledons of *Bursera* are "interdum trifida." In this species they are biternately dissected into narrow linear lobes. The leaves of the next pair are simpler, the secondary lobes being fewer and short; the succeeding are pinnately parted into seven leaflets, passing toward the adult leaves, which are pinnate with numerous very small leaflets on an interruptedly margined rachis.

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