turbance, such as great faults, and where there are mountains or other disturbing causes, the stations must be nearer together. The design is to collect sufficient data to draw the isobaric curves, along each of which the force of gravity, after correction for elevation and latitude, is constant. These curves will afford the means of ascertaining the precise figure of the geoid (i. e., the level surface of the sea continued under the continents), and this in its turn will have an important bearing upon geological theories, upon geodetical determinations, etc. Thus far the work has been retarded by the necessity of completely reforming the methods used in Europe for measuring the force of gravity, in which very grave errors have been detected. Mr. Peirce announced that he had discovered a new and considerable source of error in the flexure of the pendulums themselves which have been used for the determinations. The new pendulums now getting constructed for the United States Survey are not open to this correction. Gravity has already been determined at twenty-eight stations, the results for eight have been published, and the remainder will appear within a year. When the necessary apparatus has been received and found satisfactory, with yearly appropriations of four thousand dollars above the yearly expense of transportation, eight or nine stations will be occupied each year, and the work soon brought to completion.

Professor C. S. Peirce read a paper "On the Algebra of Logic." This memoir, which is highly mathematical, is part of an investigation into the methods of reasoning used in different branches of mathematics. Mr. Peirce remarked that no progress was made with the theory of numbers until Fermat discovered a peculiar form of reasoning, by the use of which the branch of mathematics in question was rapidly developed. In the same way, the theory of linkages and parallel motion had been kept back by ignorance of the proper form of reasoning. All mathematical reasoning requires the use of signs or symbols of three distinct kinds. The first are general signs such as compose the body of speech, and the symbols of differentiation, integration, etc., in algebra. The second are signs directing the attention to their objects, and distinguishing them, without describing the distinctions, by virtue of some real connection with them. Such are all natural signs and symptoms; also pronouns, the letters of a geometrical diagram, the subscript numbers in algebra, etc. The third are signs which represent their objects by virtue of presenting some similarity or analogy to them. Such are the diagrams of geometry, the arrangements of algebraical formulae, etc. These signs, called *icons* by Prof. Peirce, are shown to be absolutely essential to all reasoning. In fact, all mathematical deduction consists in observing something to be true with regard to such an *icon*, and consequently true likewise of the object or reasoning. The most rudimentary *icon* is a syllogistic form, where the arrangement of the letters presents an analogy with the relations of the terms of reasoning. A method for investigating *icons* is given, together with a list of some twenty of them, used in different parts of mathematics, and representing essentially different forms of relationship irreducible to one another. The class of problems for which each of these is indispensable is also specified; and examples of the application of the theory to the resolution of several intractable problems are given. The paper will be published in the forthcoming volume of the *Memoirs of the Academy*.

Mr. Peirce read a paper by himself and Mr. Joseph Jastrow upon least perceptible differences of sensation. The German physiological psychologists assume that there can be two different intensities of nerve-excitation of so nearly the same value that the sensations they produce shall be absolutely indistinguishable. On the other hand the astronomers and physicists employ the method of least squares, according to which there is no difference of excitation so slight that a sufficient number of observations will not detect it. Probably neither party would insist dogmatically upon the accuracy of its assumption, and the researches of Messrs. Peirce and Jastrow are the first that have been undertaken in order to decide which is right. The psychologists have assumed that when we feel quite uncertain as to which of two weights, for instance, is the heavier, the sensations they excite are identical. To find whether this is so, two weights differing by a small amount have been brought (with a variety of precautions, fully described in the paper) successively upon the finger of an observer, who has stated which he thought was the heavier, and also stated (by the use of an arbitrary numerical scale) the degree of his confidence in his judgments. The differences of the weights were so small that the observer had not the slightest consciousness of feeling anything, so that it seemed to him nonsensical to attempt to say which was the heavier. Nevertheless he gave what he thought a random answer, and it was found in each case he answered more often right than wrong. Moreover, upon calculating by least squares his "probable error," that is to say, the ratio of weights which he would be able to discriminate rightly seventy-five times out of a hundred, the value so calculated was found to agree with direct observation, or, what comes to the same thing, a "probable error" could be assigned from which, by means of the theory of least squares, the proportions of erroneous judgments for different ratios of weights could be calculated with approximate accuracy. The following tables show this:

SUBJECT: MR. PEIRCE.							
Ratios of weights.	1100	1080	1060	1050	1040	1030	1015
No. of sets of 50 obs'ns.	1	1	7	1	1	6	5
Observed average No. errors per set.	2	4	10.4	13	15	19.3	21.6
Calculated No. for Prob. error = 0.051	4.6	7.2	10.7	12.7	14.9	17.2	21.0

[The observations of Mr. Jastrow are divided into four groups, because the accuracy of his sensibility underwent gradual change.]

First Group.							
Ratios of weights.	1100	1080	1060	1050	1040	1030	1015
No. of sets of 50 obs'ns.	1	1	7	1	1	6	5
Observed average No. errors per set.	5	9	11.0	19	15	13.8	20.8
Calculated number for Prob. error = 0.05	4.4	7.0	10.4	12.5	14.7	17.1	21.0

Second Group.			
Ratios of weights.	1060	1030	1015
No. of sets of 50 obs'ns.	5	5	5
Observed average No. errors per set.	2.2	9.4	17.0
Calculated number for Prob. error = 0.023.	2.1	9.6	16.6

Third Group.			
Ratios of weights.	1020	1010	1005
No. of sets of 50 obs'ns.	6	6	4
Observed average No. errors per 50	12.8	17.7	20.7
Calculated number for Prob. error = 0.02.	12.5	18.3	21.6

Fourth Group.						
Ratios of weights.	1060	1030	1020	1015	1010	1005
No. of sets of 50 obs'ns.	1	1	6	1	6	6
Observed average No. errors.	0	5	10.0	14	16.0	20.2
Calculated number for Prob. error = 0.0155	0.8	4.8	9.6	12.8	16.5	20.6

It was found that whenever the difference between the weights was less than half the probable error, the degree of confidence was always marked zero, implying that the judgment seemed a purely random guess, or was very rarely marked 1, implying a slight suspicion of consciousness of a difference. Hence it appears that the assumption of least squares is correct, and that an *Unterschiedschielle* does not exist.

Dr. Gibbs read a paper on Atomic Volumes, in which he endeavored to show that the received views upon this subject are radically incorrect, inasmuch as no account is taken of the distinction which must be drawn between molecular and intermolecular, or interstitial, space. He showed that since the space occupied by the molecules of hydrogen in a cubic meter of that gas at the normal temperature and pressure is 0.0007 of the whole space, or 700 cubic centimeters, and since the weight of a cubic meter is 89.6 grammes, the absolute specific gravity of the molecules of hydrogen is 0.128, water at 4° C. being taken as unit; and that since the atomic weight of hydrogen is unity, the relative atomic volume of hydrogen is 1 : 0.128, or 7.81. The determination of the molecular volume of hydrogen in a cubic meter of the gas depends upon the assumption that the molecules exert no sensible action upon each other, and is therefore subject to correction. He showed that the molecular volumes of gases could be determined in certain cases, but that at present we have no means of arriving at those of solids or liquids.

The following notice of Grant's Difference Engine was made by Mr. Fairman Rogers:

The Difference Engine, for the purpose of calculating any tables which can be made by the method of differences, was first exhibited at the Centennial Exhibition in 1876. It was theoretically satisfactory, but its mechanical construction was found defective in practice. The machine has been entirely redesigned and the old one destroyed, and the new one, which is nearly completed, promises to be free from the old defects. It is much smaller, simpler in construction, and with no parts that are liable to get out of order. As the engine not only calculates the terms of the tables, but prepares a wax mould, from which the electrotype for printing can be taken, the results will at least be free from errors introduced by copyists or printers.

Mr. Fairman Rogers made the following remarks in reference to the experiments of Muybridge on the motions of animals by instantaneous photography. After the considerable time elapsed since the first experiments, Mr. Muybridge has resumed them this summer in Philadelphia, under the auspices of the University of Pennsylvania. No especially new system is used, but the apparatus has been perfected in many details, and dry plates are used, so that superior results may be looked for. While many instantaneous photographs of animals in motion existed before those made by Muybridge, they were mere isolated attitudes of motion, giving very little information, while his, being consecutive, and taken at equal intervals of space or time, give all the information regarding the different phases of the motion.

It is perfectly possible to apply this method to the study of all kinds of motion, and it must come into use for that purpose. It would be useful, for instance, to study in this way the propelling action of the tails of fishes, with a view of determining the proper form for screw propellers, which will not only give good results in economic propulsion, but will avoid the vibrations accompanying high speeds. It is with a view of attracting the attention of the members of the Academy to the value of this method of investigation that the subject is again referred to before it.

SOME RESULTS OF THE EXPLORATION OF THE DEEP SEA BENEATH THE GULF STREAM BY THE U. S. FISH COMMISSION STEAMER ALBATROSS DURING THE PAST SUMMER.*

By A. E. Verrill.

The exploration of the Gulf Stream region was continued this season, under nearly the same conditions as in 1883, by the steamer Albatross, Lieutenant Z. L. Tanner commander. During the four trips, between July 20 and September 13, sixty-nine dredgings were made (stations 2,170 to 2,288). In most of these a large beam-trawl was used very successfully, even at great depths.

Of these dredgings, 5 were in depths between 2,000 and 2,600 fathoms (4 successful); 20 were between 1,000 and 2,000 fathoms; 24 between 500 and 1,000 fathoms; 8 between 300 and 500 fathoms; 12 between 75 and 300 fathoms. Another trip has since been made to explore more extensively the zone between 40 and 100 fathoms. On this trip about 24 additional dredgings were made, but the results are not yet worked out. The first trip was made while the steamer was on her way north from Norfolk, Va., and some of these stations were off the coast of Maryland, the most southern being in N. lat. 37° 57', but most of the others have been made in the region

south and southeast of Martha's Vineyard, though some of them were a long way off the coast. The five stations in depths below 2,000 fathoms were more than half way to Bermuda, and nearly east of the coast of Virginia, between N. lat. 36° 5' 30" and 37° 48' 30", and between W. long. 68° 21' and 71° 55'.

The results are highly satisfactory, both in the way of physical observations and zoological discoveries. Large numbers of additions have been made to the fauna, including representatives of nearly all classes of deep-sea animals. Many pelagic species were also secured in the surface nets, and especially in the trawl-wings, among which there are some new forms and many that have not previously been observed so far north in the Gulf Stream.

CHARACTER OF THE DEEP-SEA DEPOSITS.

Some very interesting and important discoveries were made in regard to the nature of the materials composing the sea-bottom under the Gulf Stream at great depths. These observations are of great interest from a geological point of view, and some of them are contrary to the experience of other expeditions, and not in accordance with the generally accepted theories of the nature of the deposits far from land. The bottom between 600 and 2,000 fathoms, in other regions, has generally been found to consist mainly of "globigerina ooze," or, as in some parts of the West Indian seas, of a mixture of globigerina and pteropod ooze. Off our northern coasts, however, although there is a more or less impure globigerina ooze at such depths, at most localities beneath the Gulf Stream this is by no means always the case. The ooze is always mixed with some mud and sand, and frequently with much clay-mud. In a number of instances the bottom at depths below 1,000 fathoms has been found to consist of tough and compact clay, so thoroughly hardened that many large angular masses, sometimes weighing more than fifty pounds, have been brought up in the trawl, and have not been washed away appreciably, notwithstanding the rapidity with which they have been drawn up through about two miles of water. In fact these masses of hard clay resemble large angular blocks of stone, but when cut with a knife they have a consistency somewhat like hard Castile soap, and in sections are mottled with lighter and darker tints of dull green, olive, and bluish gray. When dried they develop cracks, and break up into angular fragments. This material is genuine clay, mixed with more or less sand, showing under the microscope grains of quartz and feldspar, with some scales of mica. More or less of the shells of *globigerina* and other foraminifera are contained in the clay, but they make up a very small percentage of the material.

The following are some of the special localities where these clay masses were taken:

Station 2,192, in 1,060 fathoms, N. lat. 39° 46' 30", W. long. 70° 14' 45". Large blocks of sandy clay, some weighing about 100 pounds. It was estimated that about a ton was brought up.

Station 2,230, in 1,168 fathoms, N. lat. 38° 27', W. long. 73° 2'. Large quantity of masses of hard but sticky greenish blue clay, some masses varying to yellowish and buff colors.

Station 2,171, in 444 fathoms, N. lat. 37° 59' 30", W. long. 73° 48' 40". Large lumps of bluish gray sandy mud.

In other localities, below 1,000 fathoms, the bottom is covered with, or largely composed of, hard, very irregular, flattened, crust-like concretions of clay and iron oxide, with more or less manganese-oxide in the crevices and worm-burrows with which they are filled. At some localities a barrelful, or more, of such masses was brought up, varying in size from a few ounces up to 20 pounds or more in weight, and from an inch to six inches in thickness.

The following are some of the localities where such materials occurred:

Station 2,208, in 1,178 fathoms, N. lat. 39° 33', W. long. 71° 16' 15". Large quantities of hard, crusty, ferruginous clay. Also a rounded granite boulder, weighing over 20 pounds.

Station 2,228, in 1,582 fathoms, N. lat. 37° 25', W. long. 73° 6'. Large quantities of irregular crusty and cavernous concretions and masses of ferruginous clay, with considerable black manganese oxide lining the holes and cracks. The lower side of many of the masses consisted of sticky bluish clay. It was estimated that about a ton of this material came up. There were some corals, gorgonians, hydroids, bryozoa, and the brachiopods *Discina Atlantica* and *Waldheimia cranium* adhering in considerable numbers to these hard masses.

Rounded boulders and pebbles of granite, gneiss, and other crystalline rocks occurred at a number of stations. One boulder, from station 2,208, is referred to above.

The following are other localities:

Station 2,195, in 1,058 fathoms, N. lat. 39° 44', W. long. 70° 3'. A rounded granitic boulder, about four inches in diameter. Its surface was covered with adherent species of foraminifera and some annelid tubes.

Station 2,226, in 2,021 fathoms, N. lat. 37° 0'; W. long. 71° 54'. A large number of pebbles and small, rounded boulders of granite, porphyry, etc., and some coal-cinders. The pebbles were more or less covered with adherent foraminifera, bryozoa, etc.

Scattered boulders and pebbles have also occurred at many other localities along the inner edge of the Gulf Stream. These have probably all been carried out there by ice from the adjacent coasts, in spring.

A curious case, quite unique in our experience, of the occurrence of abundant relics of human handiwork was observed this year at station 2,221, in 1,525 fathoms, N. lat. 39° 5' 30", W. long. 70° 44' 30", beneath the Gulf Stream, a large quantity of common bricks, with mortar and soot still adhering to them, was brought up in the trawl. Some were nearly entire, but most were in fragments. Annelid tubes, brachiopods, and other forms of deep sea life were attached to them in small quantities, showing that they had not been on the bottom very long. These may have come from some wreck, or they may have formed the deck-furnace of some whaling vessel, and have been thrown overboard on the homeward trip. At any rate, the accident of hitting upon the precise locality of such relics is very curious. Otherwise than this instance we have rarely found in deep water any human traces except coal-cinders from steamers.

In all our ten localities between 2,000 and 3,000 fathoms, the bottom has been "globigerina ooze." We have never met with the "red clay" which ought to occur at such depths, according to the observations made on the cruise of the Challenger.

The temperatures observed with the improved thermometers now used on the Albatross were between 36° 4' and 37° 0' F. in 2,000 to 2,600 fathoms. But temperatures essentially the same as these were also taken in 1,000 to 1,500 fathoms, and even in 965 fathoms one observation gave 36° 8'

F. It follows from these observations that nearly the minimum temperature is reached at about 1,000 fathoms, in this region.

The Zoological results this year are of great interest. Many additions to the fauna of great depths were made, and a large proportion of them are undescribed forms. Some of the fishes were of great interest. Huge spiny spider-crabs (*Lithodes Agassizii*) over three feet across were taken in 1,000 to 1,230 fathoms, and another very large crab (*Geryon*) occurred in great abundance in 500 to 1,000 fathoms, while in 2,574 fathoms a large and strong crab-like creature (*Munidopsis*) was taken. Many curious shrimp, some of them of large size and brightly colored, and often with perfect eyes, occurred in most of the deepest dredgings. Several very interesting new forms of star-fishes, ophiurans, and holothurians were dredged, some of them in large quantities, even in the deepest localities. Several interesting new forms of corals, gorgonians, sea-pens, and allied forms also occurred. Numerous specimens of huge sea-urchins with flexible shells (*Phormosoma uranus*) were obtained from several different stations, in 600 to 1,100 fathoms. Some of these are about ten inches broad. One sea-urchin (*Aspidodiadema*), not before observed north of the West Indies, was taken in 991 fathoms. Most of the deep-sea star-fishes belong to the *Archaster*, and other closely related genera. Some of these, like *A. Agassizii* and *A. grandis*, were taken in large numbers, several hundreds in a single haul. And the same often happens with several of the ophiurans and sea-urchins. One interesting stalked crinoid (*Rhizocrinus*) was obtained in 2,021 fathoms.

Many additions were made to the mollusca. In July, the writer published a general list of all the deep-water mollusca taken in the Gulf Stream region off this coast, up to the end of 1883. That list included 338 deep-water species and 42 that inhabit the surface waters. This year about twenty-five deep sea species and about eight from the surface were added to the list, making the total number over 400 species. Among the new forms discovered this year are four or five species of cephalopods, some of them very remarkable, and representing new genera. There were some very interesting new shells, some of them of good size and well developed, from below 2,000 fathoms. Most of the larger and finer ones from the very deep waters belong to the *Pleurotoma* group, but some large species are allied to *Sipho* (or *Fusus*) and to *Dolium*. Numerous specimens of three rare species of brachiopods were also dredged from below 1,000 fathoms. These are *Discina Atlantica*, *Waldheimia cranium*, and *Atrina gnomon*. The latter has not been known before from this side of the Atlantic.

[THE GARDEN.]

THE CATALPAS.

THERE are about half a dozen species belonging to the genus *Catalpa*, four of which are highly ornamental trees. These hail from North America, China, and Japan, and, in the south of England at any rate, can fairly claim to be classed among hardy subjects. The others, from the West Indies, are tropical plants, and therefore would be out of place here. *C. bignonioides* (the *Catalpa*, or Indian Bean) is by far the best known and most widely grown. Its panicles of large handsome flowers and the large light-green leaves give it a totally distinct aspect—one widely different from that of any other outdoor tree. Moreover, it flourishes even in the smoke laden atmosphere of towns, retaining its leaves after those of a good many other deciduous trees have fallen or become discolored. It is also a fast growing tree, and in its native country furnishes remarkably durable and valuable timber. The catalpas are readily raised from seeds or root cuttings.

*C. Bignonioides** has heart shaped leaves, pointed, downy

FOLIAGE OF THE CATALPA.

beneath, and the flowers are borne in open compound panicles. Its slender, nearly cylindrical seed pods are not unfrequently produced in the neighborhood of London. These measure about a foot in length, and remain hanging on the tree until the following spring. The bell shaped, two lipped corollas have an irregular five lobed spreading border; the color is white more or less tinged with violet and speckled with purple and yellow in the throat. It was first discovered by Catesby in South Carolina, and was introduced to this country in 1726. In a wild state, according to Professor C. S. Sargent's "Catalogue of the Forest Trees of North America," it occurs in Western Georgia, Florida, and perhaps west to Louisiana.

Its very light, close grained, remarkably durable wood is valuable for fence posts and cabinet work; its specific gravity when perfectly dry is 0.405. Under cultivation in this country it rarely attains more than 30 feet or 40 feet in height, but the *Syon* specimen figured by Loudon measured 52 feet in height and the trunk 3 feet in diameter, the spread of the branches being 50 feet. A noble tree in the garden of Mr. Denne Denne, of Canterbury, was figured in the *Gardener's Chronicle* in 1876; this was only 32 feet high, but the branches had a spread of 60 feet. When in flower this tree resembled "a mass of snow, enlivened with rich yellow and brown mottlings." It would be very interesting to know how many of the catalpa trees mentioned by Loudon in his "Arboretum" are now in existence, and details of present measurements would be of great interest and value. This species no doubt attains a maximum size in rich, deep, some-

what moist soil, but it forms a very handsome tree, and flowers and grows freely in dry, sandy gravel. At Kew in very poor dry, gravelly soil specimens are now in full flower, and the large handsome leaves show no trace of the effects of the heat and drought which are only too evident in the case of several other deciduous trees.

Var. Aurea is one of the best golden leaved trees or shrubs in British gardens, as it retains its golden yellow hue throughout the season.

Var. Erubescens (Carriere, *Revue Horticole*, 1869, 460) is a form—probably a seedling from the common Indian Bean (*C. bignonioides*)—with a more compact inflorescence, larger, more highly colored corolla, with a less deeply divided limb.

C. Speciosa (Engelmann, in Coulter's *Botanical Gazette*, January 1, 1880).—This is a recent addition to British arboreta, and probably has not yet flowered in this country. It is, however, likely to prove valuable, and the following extracts from the late Dr. Engelmann's paper seem worth reproducing here: "This tree has quite an interesting and in-

eastern species. The wood of both is extremely durable, perhaps as much so as that of our red cedar, and has the advantage over it of a more rapid growth and of possessing only a very thin layer (two or three annual rings) of destructible sapwood. But of these qualities and of its adaptability to many important uses others, and especially Mr. Barney in a recent pamphlet, have given a full account. It is already extensively planted in our Western prairie States, and especially along railroads, for which purpose it is expected to furnish the much-needed timber in a comparatively short time."

Professor C. S. Sargent, in correcting an error which had arisen in the *Gardener's Chronicle* with respect to *Catalpa speciosa*, writes: "I take this occasion to call the attention of European planters to this species. It is in every way a far finer and more rapid growing tree than *Catalpa bignonioides*, and should it succeed in Europe, as from its geographical range in this country I am led to believe that it will, it will prove a most valuable addition to the list of ornamental and

FLOWERING SHOOT OF CATALPA BIGNONIOIDES.

structive history. It was already known to Michaux and to many botanists and settlers of those regions. Even the aboriginal Shawnees appreciated it, and the French settlers along the Wabash named it for them the Shawnee wood (*Bois Chavanon*), and prized the indestructible quality of its timber; but the botanists, even the subtle Rafinesque, who roamed over these very regions seem to have taken it for granted that it was not distinct from the southeastern *Catalpa bignonioides*. To me the fact that these trees, then not really cultivated in St. Louis, produced their larger and more showy flowers some ten or fifteen days earlier than the eastern or common kind was well known as early as 1842, and their blossoming has since been annually recorded in my

timber producing trees. Its distribution in a wild state is given by the same authority as Southern Indiana and Illinois, Western Kentucky and Tennessee, Southeastern Missouri, and possibly southward through Louisiana. Its wood is rather heavier than that of the last species, its specific gravity being 0.462; it is valuable for cabinet work, and almost imperishable when placed in contact with the soil; it is largely employed for railway ties, fence posts, etc. A large tree in rich bottom-lands, often 80 feet in height, with a trunk 4 feet in diameter; one of the most valuable trees of the American forests."

*C. Kämpferi** is a native of Japan, where it was discovered by Kämpfer in 1693, and introduced by seed into Belgium

A FULL GROWN CATALPA BIGNONIOIDES.

notes on the advance of vegetation, but I had not the sagacity or curiosity to further investigate the tree. It was reserved to Dr. J. A. Warder, of Cincinnati, to draw public attention to it."

"*Catalpa speciosa* replaces *C. bignonioides* entirely in the Mississippi Valley. It is readily distinguished from it by its taller and straighter growth, its darker, thicker (half an inch to 1 inch), rougher, and scarcely exfoliating bark (in the older species it is light gray, constantly peeling off, and therefore not more than 2 lines or 3 lines thick); its softly downy, slenderly acuminate, and inodorous leaves (those of *C. bignonioides* have a disagreeable, almost foetid odor when touched), marked with similar glands in the axils of the principal veins of the underside; by its much less crowded panicle, and by its much larger flower, fruit, and seed."

"Our tree is larger, of straighter growth, and being a native of a more northern latitude, is hardier than the south-

in 1849. It is a close ally of the American species already mentioned, and is one of the most striking of the many instances of that intimate relationship, due to common origin, of the plants of the Atlantic United States, and Eastern Asia, which is not shared by the plants of the Pacific Coast States. The leaves are smaller, cordate at the base, six inches long and broad, bright pale green; the round petioles measure from two to five inches in length. The panicle is erect as the leaves; the flowers are smaller than those of the American species, of a pale yellow color sprinkled with minute red spots. Probably this species hardly attains more than 12 feet in height.

* *C. Kämpferi*. Siebold and Zuccarini. "Flora Japonica," sect. alt., p. 18; *Illustration Horticole*, 1862, p. 319. Koch, "Dendrologie," zweiter theil, erste abtheilung, p. 303; *Botanical Magazine*, t. 6611. C. ovalis, G. Don, "History of Dieblamydeous Plants," iv., 230. C. Bungei of gardens, not of C. A. Meyer. C. himalayensis of gardens.

* *C. bignonioides*, Walter, "Flora Caroliniana," p. 64 (1788; Gray, "Manual of the Botany of the Northern United States," p. 331; Koch, "Dendrologie," zweiter theil, erster abtheilung, p. 302. C. syriacifolia, Sims. *Botanical Magazine*, t. 1094; London, "Arboretum et Fructicum Britannicum," vol. iii., p. 1261; "Encyclopædia of Trees and Shrubs," p. 669.