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ENTOMOLOGICAL BRANCH, DEPARTMENT OF AGRICULTURE,
OTTAWA.

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THE OTTAWA NATURALIST

VOL. XXIX.

JUNE-JULY, 1915

Nos. 3 and 4

ON THE VALIDITY OF THE GENUS *PLETHOPELTIS*,
(Raymond).

BY RICHARD M. FIELD.

While studying some fossils collected by Dr. Percy E. Raymond from the Hoyt Quarry, Saratoga, the writer became interested in the relationship of the two forms which have been described by Walcott as *Agraulos saratogensis*. In his recent description (7) of the Hoyt fauna Dr. Walcott has figured a form with strongly outlined glabella, bearing glabellar furrows, while in his first description of the fauna he illustrated under this name a specimen with smooth glabella and very faint circumglabellar furrow. This latter, or "smooth-glabella" variety, is found to predominate in the collection. A still closer inspection of the material seemed to show that although both forms may belong to the same species, it is extremely doubtful if they are to be placed under the genus *Agraulos*. The writer believes that the following evidence shows that Raymond was justified in erecting his new genus *Plethopeltis* for trilobites such as *Agraulos saratogensis* Walcott.

To determine the validity of the genus *Plethopeltis* it is necessary to discuss the following facts. Raymond, in the "Revision of the Bathyruridæ" (8) designated *Agraulos saratogensis* instead of *Bathyrurus armatus* Billings, as the type of the new genus *Plethopeltis*. It is understood that he did this because only a single cranidium of *P. armatus* was known and no pygidium, while numbers of pygidia were found associated with *P. saratogensis*. Some doubt has recently been expressed as to whether after all the species *saratogensis* should be removed from the genus *Agraulos*. If the latter be the case, then the genus *Plethopeltis* automatically drops out of the nomenclature. Raymond's generic diagnosis of *Plethopeltis* is as follows:—

"Cephalon strongly convex, wider than long, without concave border or marginal rim. Glabella faintly defined, without glabellar furrows. Eyes small, situated well forward. Free

cheeks rather wide, smooth, with short spines at the genal angles. Pygidium small, with few traces of segmentation; convex; no border."

The writer finds from the investigation of the material lately collected by Dr. Raymond that the characteristics given by him as "glabella faintly defined, without glabellar furrows" is neither a generic nor a specific characteristic. The present collection fortunately allows a close comparison of the variety first figured and described by Walcott (5), his holotype, and the plesiotype later figured by him in his description of the Hoyt fauna. Here we have the two varieties closely associated, having lived and died under the same physical conditions. Judging from the few well preserved specimens examined by the writer, not more than nineteen in all, it would seem that the form with the smooth glabella predominated. Further and more careful collecting is necessary, however, before this assertion can be proved. It should be noted that Walcott in his first description already noted (p. 276) noticed "two pairs of slightly indented glabellar furrows that curve inward with a slight backward obliquity; on the casts of the interior of the larger specimens the furrows are scarcely to be seen——." But he shows no trace of these furrows in his figure. At any rate the presence or absence of glabellar furrows has in this case at least, nothing to do with the generic classification. We shall have more to say regarding the development of glabellar furrows later.

Walcott (7) in his second paper gives the following description of *Agraulos saratogensis*:

"Head convex, slightly semi-elliptical in outline and terminating in round, short, postero-lateral spines; glabella moderately convex, truncate conical, sides converging slightly towards the broadly rounded front, about $\frac{1}{2}$ longer than wide; marked by two pairs of slightly indented glabellar furrows that extend inward with a slight backward obliquity; on the casts of the interior of the larger specimens the furrows are scarcely to be seen; occipital furrow well defined and arched forward at the centre; occipital segment rising to a short blunt spine at the centre and narrowing toward the sides; dorsal furrow well defined about the glabella. Fixed cheeks narrow; anteriorly they merge into the broad, rounded, frontal limb and posteriorly into the short posterior lateral limbs; palpebral lobes small and situated a little in front of the transverse centre of the head. The frontal limb about $\frac{1}{2}$ the length of the head and curved down to the margin without an intervening furrow. Free cheeks convex and somewhat tumid, irregularly triangular in outline and without a marginal border. The associated pygi-

dium is convex, strongly lobed and without a distinct marginal furrow. Axial lobe intermarginal, convex and divided into four annulations and an interior double by four distinct transverse furrows; lateral lobes crossed by three main furrows and two shorter ones, corresponding to the furrow on the lateral lobe of the thoracic segments, thus outlining the anchylosed segments in the pygidium; a fourth segment and the terminal portion are also outlined by a faint ridge. Thorax unknown. This is a very distinctly marked species allied to *Bathyrurus armatus* Billings." (4).

Corda (1) was the author of the genus and the first to figure *Agraulos* (in 1847) but his drawing is so inaccurate that one can hardly recognize any similarity between it and the original type described by him as *A. delphinocephalus*. Later, Barrande (2) gave an excellent description of the same species under the name *Arionellus ceticephalus*, declining to use Corda's generic name. Barrande's figures are so accurate that the indices worked out from these compare favorably, indeed very closely, with those worked out on the actual specimens. Barrande does not appear to have noticed the presence of eye-lines, a primitive aspect of this species and of many other Cambrian trilobites. One has but to compare the indices (38-64) to appreciate how widely Corda's figure differs from those of Barrande. A drawing from an actual specimen found in the type locality of Skrey, Bohemia, is shown on the plate, Fig. 3. The first mention of *A. saratogensis* was by Walcott (3) in 1879 when he listed it as *Ptychoparia (A.) saratogensis*. In his next paper (5) he referred the species definitely to the genus *Agraulos*. A copy of his figure is shown on the accompanying plate in Fig. 2. Walcott, (7) in 1912, figures another specimen of the same species showing a strong circumglabellar furrow; glabellar furrows and ridge, as shown in Fig. 1. Both of the varieties above described occur at the same horizon at the Hoyt Quarry. Raymond, (8) in his "Revision of the Species which have been referred to the genus *Bathyrurus*," took *Agraulos saratogensis* as his type of the new genus *Phethopeltis*, as has been previously stated.

The writer made a critical and comparative examination of the features of the four types referred to above and has recorded a summary of his observations in the accompanying plate, which is to a large extent self-explanatory. Figures 1 and 2, representing the two variations of *P. (A.) saratogensis* are drawn from specimens from the Hoyt Quarry. Figure 3 is drawn from a specimen of *Agraulos ceticephalus* Barrande. Figure 4 represents *Phethopeltis armatus* (Billings). On the right of the figures are arranged in order the chief characteristics

of the cephalons. On the left are placed the generic characteristics which connect *P. saratogensis* and *P. armatus*. In working out of the indices, the length of the cephalon was measured from the middle of the neck furrow to the anterior extremity, the length of the glabella being measured from the middle of the neck furrow to the anterior edge. The index in each case was derived by dividing the smaller by the larger measurement and multiplying the resultant by 1,000 to make it a whole number. It was hoped that by making careful measurements (within 0.25 of a mm.) that the indices would afford valuable criteria for the classification, but unfortunately the results do not appear to be decisive, probably because of the lack of sufficient working material. Nineteen specimens representing the total available material of *P. saratogensis*, were measured and their indices calculated. The average index proved to be 70 but a careful inspection of the individual indices showed this figure to be too low. Fourteen of the indices range between 75 and 80; only two fall below 70, while two others are as high as 85. The figures seem to show that further collecting would raise the average considerably. It is also important to note that measurements taken on *P. saratogensis* figured by Weller (6) as representative specimens from New Jersey show an index of 80. The writer has therefore made a conservative estimate of 75 as the index for *P. saratogensis*. So far as can be determined at present the index does not vary between the forms with smooth and those with furrowed glabella. Eleven specimens of *A. ceticephalus* were measured and their average index proves to be 63. This average was shown to be practically identical with that calculated from measurements made on Barrande's figures. The writer was forced to calculate the index for *P. armatus* from the original drawing by Billings. So far only one cranidium of this species is known, and its high index (88) may not be entirely indicative of the average for the species. All the evidence seems to show that the indices of *P. armatus* and *P. saratogensis* are very similar and dissimilar from that of *A. ceticephalus*. In addition, *P. saratogensis* and *P. armatus* have the following characteristics in common, which in turn are dissimilar from those of *A. ceticephalus*:

1. Greater convexity of the cephalon.
2. Eyes close to the glabella.
3. Cephalon never upturned at the anterior margin.
4. Facial sutures carried well forward.
5. Opposite portions of the circum-glabellar furrow nearly parallel and converging only slightly forward.

The writer therefore believes in the validity of Raymond's new genus.

Plethopeltis
saratogensis



Index; 75.
Convexity; great.
Eyes; close to glabella.
Cephalon; unvariable, wider than long, never upturned at anterior margin. Posterior development into nucal spine.
Glabella; circum-glabellar furrow faint to strong, 2 pairs of faint glabellar furrows and median ridge.

Plethopeltis
saratogensis



Index; 75.
Convexity; great.
Eyes; close to glabella.
Cephalon; unvariable, wider than long, never upturned at anterior margin. Posterior development into nucal spine.
Glabella; circum-glabellar furrow faint to strong, no glabellar furrows, no ridge.

Agraulos
ceticephalus



Index; 63.
Convexity; low.
Eyes; farther apart than in preceding.
Cephalon; variable, from wider than long to longer than wide, anterior margin slightly upturned in some specimens. No nucal spine.
Glabella; no circum-glabellar furrow, 4 pairs of glabellar furrows, ridge, eye lines.

Plethopeltis
armatus



Index; 88?
Convexity; great.
Eyes; close to glabella.
Cephalon; only one known. No signs of upturning of anterior margin. Nucal spine better developed than in 1 and 2.
Glabella; circum-glabellar furrow faint and dying out anteriorly. No glabellar furrows. No ridge.

Characteristics common to 1, 2 and 4.

1. Great convexity.
2. Eyes close to glabella.
3. Cephalon never upturned at anterior margin.
4. Facial sutures more nearly similar.
5. Circum-glabellar furrows similar in outline and roughly parallel.

DEVELOPMENT AND DISTRIBUTION.

The writer does not propose here to discuss the genus *Plethopeltis* but there are one or two points which are of interest regarding the morphological development and migration of the species, *P. saratogensis*. By glancing at the diagrams it will be seen that both 1 and 2 are referred to the same species, although certain morphological features are shown to be more strongly developed in one than in the other. As has been mentioned previously, the "smooth-glabella" forms predominate in the present collection and it is reasonable to suppose that this form is also the more stable, exhibiting more specialized development. Why the type possessing glabellar furrows and ridge should have persisted may be attributed to some inhibitor which is difficult to explain at present. At first the writer was led to believe that the differences of glabellar furrows and circum-glabellar furrow was one mainly of preservation, but a more careful inspection of the material has led to the conclusion that this is not the case and that we have in the specimens collected from the Hoyt Quarries two distinct types, showing stages of gradation from the smooth to the furrowed form. In the development of the species the glabellar furrows and ridges are the first to disappear while the circum-glabellar furrow often persists into the more specialized individual.

Cushing and Rudemann (9) describe the rocks in which the species occur as follows:

"——— the Hoyt is a local phase of the upper Theresa, probably an off-shore phase———. The waters were clearer, less subject to incursions of sand, *Cryptozoon* reefs flourished as they did not in the normal Theresa, and trilobites and gastropods lived on the surface of the reefs, where we find their fossil remains to-day."

When we consider the specimens of *A. saratogensis* described by Weller (6) from New Jersey we notice here that only the "smooth glabella" forms are represented. Weller stated that: "——— glabellar furrows——— are wholly absent from the New Jersey specimens." The pygidia associated with the New Jersey specimens do not entirely agree with the description of that portion of the animal as it occurs at Saratoga, the transverse furrows being much less conspicuous. Notwithstanding these differences the specific identity of the specimens from these two localities can hardly be questioned. Most of the specimens observed are smaller than the one illustrated, some of them being less than 5 m/m. in length. The writer also found a large number of small individuals amongst the specimens from the Hoyt Quarry, but these were not measured for obvious

reasons. It would seem as if Saratoga were the centre of distribution for this species and that only the fixed type was able to migrate.

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DEPARTMENT OF GEOLOGY,
HARVARD UNIVERSITY.

CORRESPONDENCE.

THE EDITOR, THE OTTAWA NATURALIST.

Mr. P. A. Taverner's "Suggestions for Ornithological Work in Canada," strike the right note. At present we Canadian bird lovers are more in touch with Washington, D.C., than with our own Ottawa. Only a few of us even know each other. By the formation of an Audubon Society in Winnipeg recently an attempt has been made to bring bird observers together. Hardly anyone in the West outside a limited circle is aware of the splendid original work of Norman Criddle and his brother Stuart. Probably none of your readers have the least idea that in A. G. Lawrence, of Winnipeg, and H. E. Pittman, of Wauchope, Sask., there are some rising lights in nature lore, especially in ornithology. I could name a few others, old and young, who might be linked together for the purposes suggested by Mr. Taverner. As a writer of sorts and as a lecturer on our birds I am impressed by the unused material lurking in Manitoba alone.

H. M. SPEECHLY, PILOT MOUND, MAN.

A CHEAP CASE FOR SMALL MUSEUMS.

BY HARLAN I. SMITH.

Geological Survey, Ottawa.

(Continued from page 36).

One form and size of this case is practically a simple box, three feet wide over all with a window sash screwed on as a cover. The sides of the case may be 7 feet high. The top and bottom of $1\frac{1}{8}$ inch material, 1 foot wide, is set in about $2\frac{1}{8}$ inches, more or less, from the ends of the sides. These four boards constitute the box frame without front or back. A piece $2\frac{1}{2}$ inches wide and as thick as the window sash, usually $1\frac{3}{8}$, or, better, $1\frac{1}{4}$ is nailed across from side to side at the top and bottom of both front and back to strengthen the frame and to cover the space above and below the top and bottom of the case; the lower one also serves as a support upon which the lower edge of the glass front and glass or wooden back frames may rest. This $2\frac{1}{2}$ -inch strip only partly covers the edge of the top and bottom, so that the screws holding the front and back may be inserted into the top and bottom, but also so that there may be no crack or space from the front or back into the space left at the outside of the top and bottom of the case. A kicking moulding may then be put across from side to side at the bottom of the case, both front and back, but it should not project beyond the sides of the case, as this would prevent several cases being placed close together, side by side. In short, the sides of the case should be flush. A board is next put over the top of the case to keep dust, etc., from gathering in the space outside of the case top, and to give the case finish. This board should project an inch or two in front and behind, but as in the case of the kickboard should not extend beyond the sides of the case except where a case is to stand alone. A moulding may be placed below this top in the corner between it and the $2\frac{1}{2}$ -inch strip across the top of the front of the case according to taste. The general label of the entire case may then be fastened on this moulding on the $2\frac{1}{2}$ inch strip or from the cover of the case to the $2\frac{1}{2}$ inch strip, by means of round headed screws through the middle of the end of the label board. In fact one purpose for having the case extend above the top of the exhibition space, that is above the top of the glass sash, is to provide this space for a case label. On the other hand a case label may be painted directly on the $2\frac{1}{2}$ inch strip, or the sash.

The front of the case is made of a simple window sash, such as may be obtained in any town where a sash and door factory exists, or for that matter any place where houses are built. It is fastened with round headed screws engaging the edge of the sides and top of the case, the frame resting upon the $2\frac{1}{2}$ inch strip across the lower part of the case. By screwing the frame on, it is not necessary to go to the expense of hinges and locks. The screw holes may be soaped, waxed, or metal screw sockets may be used if it seems desirable to go to that expense. A screwdriver serves as a key. Moreover, by drawing the screws tight, the case may be made as near dust-proof as is necessary in a small museum. In fact much more fuss is made about dust-proof cases and about getting fine cases than about using them, after fine dust-proof cases are obtained; that is, the curator's energy seems to be used up in getting building, cases, and specimens; then he rests on his oars as a rule, leaving the exhibits without understandable labels, and practically useless. A little attention given to wiping out cases, cleaning specimens and looking to the upkeep of the specimens in most cases would be cheaper and quicker than giving so much attention to dust and insect proof cases. Moreover, going over the specimens say once a year for such a purpose, the curator could hardly fail to note the lack of order and labels, and many things which he would then want to do to improve the usefulness of his exhibit. However, cotton tape or wicking set in a planed groove may be added to exclude dust if desired.

The frame should be cut down on the outer sides and ends as much as is consistent with sufficient strength to hold the glass, but of course it cannot be cut down to less than the $\frac{3}{8}$ of an inch necessary to cover the edges of the sides and top of the exhibition case, to which it is screwed. The glass should be in the largest pieces obtainable, up to the full size of the frame, and where more than one piece of glass is required preference should be given to running the mullions horizontally so that they may the more often fall opposite a horizontal shelf edge instead of vertically across the line of vision. It is hardly necessary to say that the glass should be of the best quality which the museum can afford, and certainly should be free from blebs and other blemishes. If it is sufficiently heavy, there will be no need of disfiguring signs requesting visitors not to lean on the glass.

Shelves may be cut about $\frac{1}{8}$ of an inch shorter than the top and bottom of the case, so that they may be moved easily and may rest upon round headed screws, or, still better, on screw eyes turned horizontally in the sides of the case, one at each corner of the shelf. When it is necessary to raise or lower the

shelf these screws are easily changed and the holes may be puttied up and touched with color, although if left they will no more disfigure the case than the ordinary ratchets used for holding shelves at various heights. The case may be stained or painted with a dull finish, certainly not a very glossy varnish, perhaps preferably with a thin wash, to give it a somewhat neutral color in harmony with that of the walls of the building in which it is to stand.

The back of the case, it seems, should certainly be put on in the same way as the front, so that if it is ever desirable to turn the case at right angles and have glass upon both front and back, the back may be removed and a glass frame similar to the one in front may be put on as easily as one would open and shut the case to put in or take out a specimen. If the back is to be solid woodwork, which is perhaps desirable where heavy things are to be hung from it, care should be taken that it is built so that the expansion and contraction due to changes in the weather or the heating of the building may not strain the rest of the case, and the boards should run up and down or crosswise rather than either diagonally or possibly even in panels, so that they may not be optically disagreeable in connection with the exhibit. Perhaps as good a way as any would be to let the back of the case be a frame with compo board instead of glass, as the compo board could be replaced at any time glass was desired, and meanwhile would serve very well as a background to exhibits or upon which to hang exhibits that were not too heavy. A diaphragm set back against the rear frame would serve for heavy objects and be desirably smooth or could be covered with burlap, paint, paper, or what not, as desired.

When the case has glass front and back, that is, when the exhibit is to be viewed from two sides, or when it is not desirable to use the full depth of the case for the exhibit on hand, a diaphragm about $\frac{1}{4}$ of an inch shorter and narrower than the inside of the case may be inserted at any distance from the front of the case, and held in place either with round headed screws through the sides of the case or with small angle irons or $\frac{3}{8}$ -inch cove, in front and behind the diaphragm at the corners, or oftener according to taste and the amount of strength desired. This method of fastening the diaphragm allows it to be adjusted or removed in a very few minutes with practically no waste and no unsightly scars which could not be retouched with putty and colored, or which if not retouched would be no more unsightly than the complicated and expensive diaphragm holders usually used.

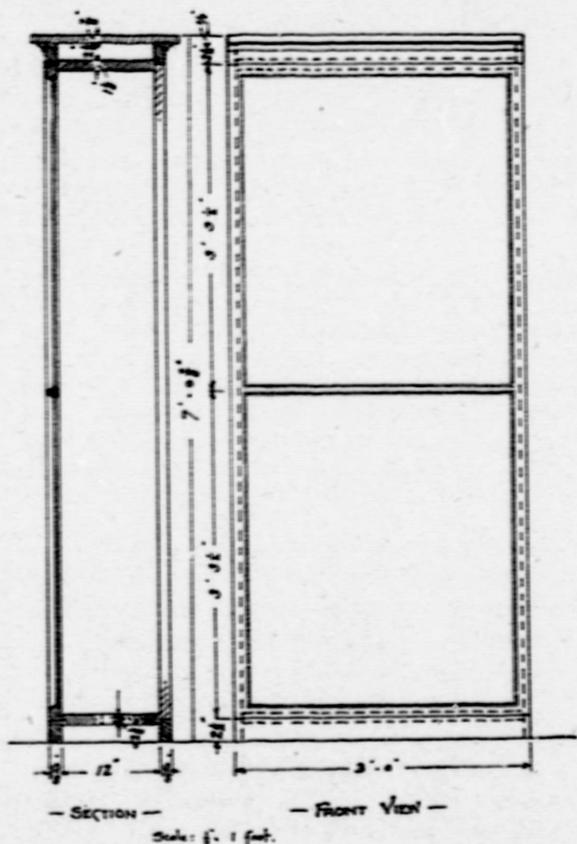
The cases should be made in uniform sizes or multiple sizes like sectional book cases, so that they may be moved about and

reassembled, for instance, by placing two 3-foot cases side by side to harmonize with a 6-foot case, and so on, or by placing two cases 6 inches deep back to back, to approximately harmonize with a case 1 foot deep. Cases should never be fastened to the walls of the room in such a way that when they are moved the room is disfigured, requiring replastering, repainting of the replastered part, and then, as so often happens, repainting of the entire room because it is discovered that the patch of new painting does not match the whole because of its freshness. A little forethought along these lines will save a large portion of the funds of museums which might be used for other purposes, instead of being thrown on the junk heap.

If it is desirable to let light in one or both sides of the case they may be made like the front and back, but then care must be taken that the frame is large enough to hold the screws necessary

for supporting any shelves used. If a diaphragm is used, the screws to hold the rear corners of the shelves may be inserted in the diaphragm.

These general plans may be varied, the cases may be made of various heights, various widths, and various depths. They may be built with higher or lower bases and tops; or again shorter cases may be built and placed upon tables or pedestals; cases may be super-imposed or hung upon a wall. Very large cases might



be made on this same principle, by substituting frames with glass in place of the wooden sides of the cases, it being only necessary in such cases to carry the sides up and down from the top and bottom of the frame in the same manner that the front and back is carried up and down. If the case is so large, as for habitat groups, that it is necessary to have more than one frame, a mullion to which to screw the frames may be inserted between the top and bottom of the case where necessary, but this should not project sidewise beyond the wooden frame. By this means the amount of wood exposed to view is kept at a minimum, whereas in many cases such as we often see, the mullion is exposed to view and the frames are on each side of it, making three thicknesses of wood to obscure the exhibit instead of only two. If desired, a moulding can be screwed over the crack where the frames meet, and if fastened to one of the frames that frame may be taken off first in opening and closing the case, which will save the trouble of unscrewing the moulding.

In the simple cases the front and back sashes may all be made the same size; where the cases are not very deep and sashes are used in the sides, it will of course be necessary to have a smaller size of sash for the sides; but if the cases are very large this will not be necessary, although it will make any attempt at a square case as much longer than it is wide as twice the thickness of the sash, unless the frame at each corner laps the same direction.

One of the simple forms of these cases three feet wide by one foot by seven feet, was made, with the exception of the frame and glass, by two carpenters, during the time which they could take from other work in a single day while assisting in reorganizing the Rocky Mountains Park Museum. It was thought that the frame and glass could be put on later. The case was wanted immediately and an exhibit was installed in it as soon as it had been given a coat of stain. This seemed a fair test of the cheapness, ease and speed with which such cases could be made available.

The specifications which have been made by Mr. P. A. Taverner to accompany this description are for a somewhat more complicated and slightly more expensive case, and consequently a number of the dimensions and methods of construction are slightly different.

SPECIFICATIONS.—BY P. A. TAVERNER.

MATERIAL—LUMBER.

All material in case to be of clear, white pine, whitewood or other material most readily obtainable in locality, in clear lengths free from large or unsound knots or shakes.

All exposed work may be in oak or other wood to match fittings already installed.

SASH.

To be $1\frac{3}{8}$ inch thick of common stock pattern—rails and styles 2 inch wide from glass to jamb, and of sizes as shown.

TOP AND SIDES.

May be of $\frac{3}{8}$ stuff with $\frac{3}{8}$ inch by $1\frac{3}{8}$ rebate along sash jamb or may be built up of two thicknesses of $\frac{1}{2}$ inch stuff. The inner lining being of matched stuff well cramped together and blind nailed.

DIAPHRAGM TO BE SUPPLIED ONLY WHERE DESIRED.

To be of $\frac{3}{8}$ inch stuff fastened together with flush end styles well nailed to prevent warping. All should be covered, both sides with burlap or other covering material, or paneled according to decoration or other scheme of museum. Diaphragm to be held upright and in place by 1 inch by 1 inch by $\frac{1}{2}$ inch iron angles screwed to top and bottom of case on either side of diaphragm. For three-foot cases there should be two pairs of such angles, top and bottom, and for six-foot cases there should be three such pairs. Diaphragms may be moved to any situation in case by changing position of angles.

SHELVES.

Shelves for light specimens may be supported by screw eyes inserted in ends and diaphragm or mullions as indicated on drawings, turning them flatways and allowing them to project enough to engage shelves. For heavy specimens, iron brackets—stock sizes, or Shrosbree specimen hangers may be used whenever needed. If a coarse burlap is used over diaphragm, screws may be put in and removed as many times as necessary without causing disfiguring scars on the surface.

BASE OR MOPBOARD.

To be stock 6 inch base of whatever design may be desired and may be readily obtained at local lumber yard or mill.

SIDES.

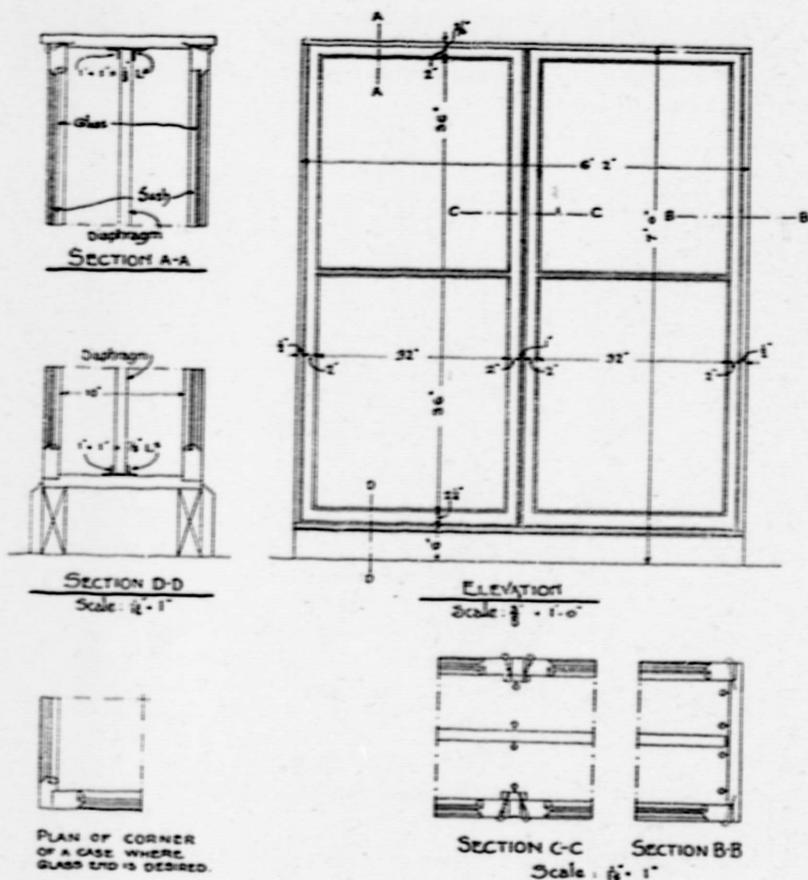
All sides of cases to present perfectly flush surface, so that two or more cases may be butted together to appear as one case without unsightly or dust catching spaces between.

Cases may be made in units of either 1 or 2 sash. A 1 sash case will then be just half the length of the 2 sash cases and will line up with them in series. The sashes are to be fastened in place by $2\frac{1}{2}$ inch brass, round headed screws, driven through the sash into the frame behind. With this method

neither locks or hinges are necessary, and all can be constructed by an ordinary carpenter without special joinery skill.

GLASS.

To be the sizes shown and of as good quality as procurable under the circumstances. The principal faults to be looked for being color, waves, bubbles or flaws.



A CHEAP CASE FOR MUSEUMS

DESIGNED BY HARLAN I. SMITH

WITH

PLAN AND SPECIFICATION BY P. A. TAVERNER

GEOLOGICAL SURVEY, CANADA

CONCHOLOGICAL NOTES.

But few mussels have been recorded from the Hudson Bay drainage area of Ontario, though many must occur.

Mr. J. B. Tyrrell, who explored the District of Patricia in 1913, found *Unio (Lampsilis) luteolus* in the Fawn and Severn about lat. 54° N. The species doubtless extends down to Hudson Bay as it does down the Mackenzie. The shells are smaller and lighter in color than these of the same species from the Rideau river and the Rideau canal. In the latter between Bank and Concession Streets, Ottawa, they are ordinarily of large size, green in color, and beautifully rayed. The Patricia shells resemble closely the *L. luteola* found in Lake Nipissing at North Bay, and in Lake Talon, near Rutherglen, but are not as yellow on the same species from Lake Gauvreau in the Gatineau hills.

No mussel peculiar to America has a wider range than this. It is found from the Brazos of Texas to the Arctic Circle and from the Rocky Mountains to the St. Lawrence and the Hudson drainage areas. Throughout this vast extent, under conditions varying from crystal lakes and streams to muddy sloughs and pools, in polar cold and torrid heat, it preserves unvaried the peculiar undulations of the beaks which distinguish it from allied species. It thus affords a striking proof of the proposition of Quatrefages, that specific characteristics—properly so-called—are not permanently affected by environment.

An *Anodonta* found by Mr. Tyrrell in the Fawn river has the beaks so eroded that it cannot be identified. It is not probably *A. kennicottii* Lea, which was described from Lake Winnipeg and Great Slave lake.

Another lot of mussels from Northern Ontario was collected in 1914 by Mr. J. K. Latchford in the Missinaibi, where on its way to Hudson Bay it flows under the National Transcontinental Railway, about twenty miles east of Hearst. They are mainly *L. luteola*, but include two *Anodontæ* which may be undescribed. Throughout Ontario, especially northward, the *Anodontæ*, or paper-shell mussels, abound. It is seldom, however, that any but mature specimens are collected. The beaks of old shells are nearly so always eroded that positive identification is extremely difficult, except in the case of a few species with prominent characteristics. The result outside of narrow limits is absolute confusion. It is safe to say the only thin-shelled mussels found near Ottawa which can be identified with any certainty are *A. (Strophitus) edentula* Say *A. cataracta* Say (= *fluviatilis* Dillw. of our lists) and *A. subcylindracea* Lea. Many

others undoubtedly occur. In the Rideau canal for instance, while it is impossible to distinguish two species among the large Anodontæ found there, a series of young shells, such as may easily be obtained in the little bay on the left side of the canal immediately above Hartwell's Locks, demonstrates the presence of two species—one certainly *cataracta* Say, and the other probably *implicata* Say. I used the word "probably" because I do not know what the young of *implicata* are like, and I know of no satisfactory description. Stimpson in his Descriptive Catalogue of the Naiades (Detroit, 1914) says "their sculpture consists of straight bars running parallel with the linge line, or they may be slightly curved and sometimes a little corrugated,"—which seems to me a confounding of two species. The beak sculpture of the Unionidæ is—I have observed—for any species invariable. *A. cataracta* in every stage of growth has been collected by the writer in at least fifty localities in Quebec and Ontario—from the lakes in the Laurentides to Toronto Bay, where it occurs with *A. grandis* Say—and the undulations of the beaks, when they could be made out, were in every case the same.

In addition to the three species named, many others occur in the Ottawa valley, but, until large series of shells are procured in every stage of growth, they cannot be determined, or, if new, described. It is really not more difficult to collect the young of mussels than to collect other small bivalves; that they cannot be seen should not prevent a search for them—nor the fact that they are often far less numerous than adults. A wire bowl strainer with a suitable handle will often produce the most astonishing returns from places that appear quite barren of molluscan life.

Till the Missinaibi is visited by an experienced collector, the Anodontæ from it can be regarded as only *probably* new.

Among the Missinaibi shells are two medium sized examples of *Unio pressus* Lea, now designated *Symphonota compressa* Lea. In addition of the localities mentioned in previous notes—the Rideau at Strathcona Park and Paquette's Rapids, near Pembroke and Moore's Creek on the Aylmer Road, and a brook crossing the Opeongo Road, near Foymount, in the County of Renfrew, afford this attractive little mussel. It has been recorded from as far north as the Montreal river near Sault Ste. Marie (Stimpson, Des. Cat. 483) but has not hitherto been known to exist in the Hudson Bay drainage.

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