XI. *On the Fossil Mammals of Australia.*—Part VII. *Genus* Phascolomys: *species exceeding the existing ones in size.* *By Professor* Owen, *F.R.S. &c.*

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In a former communication* I applied the cranial, mandibular, and dental characters of the existing species of Wombat to the determination of the fossil species resembling them in size; in the present are given the results of an easier task, viz. the determination of extinct Wombats of markedly superior size to any now living; and I shall describe the fossils as the species they represent progressively predominate in bulk.

§ 1. *Phascolomys medius*, Ow.—This species is represented by a lower jaw, fractured at both ends, presented by Sir Charles Nicholson, Bart., to the Geological Society of London; also by the fore part of the upper jaw of two individuals and by the right ramus, fractured at both ends, of the lower jaw, obtained by Edward S. Hill, Esq., from freshwater deposits exposed in the bed of a tributary of the Condamine River, at Eton Vale, Queensland: the latter were submitted to me in 1865, and have been liberally presented, with other Queensland fossils, to the British Museum by Sir Daniel Cooper, Bart. All these fossils are in the usual heavy, petrified, rolled, and more or less mutilated condition of such remains from the above formation and locality.

The first to be described (Plate XXXII. figs. 2–7) consists of so much of the premaxillary ($_{22}$) and maxillary ($_{21}$) bones as includes the sockets of the incisors (*i*) and of the first three molars (d_3, d_4, m_1, fig. 2), with part of that of the fourth, m_2. The incisors are broken off at the level of their alveolar outlets (fig. 6, *i*); the first and second molars, left side, show their natural grinding-surface; part of that of the following tooth is broken; the rest of the molars are more or less mutilated or wanting.

The superiority in size of the present extinct species to the two largest of the existing Wombats will be seen by comparing the above-cited figures, especially fig. 2, Plate XXXII., with the corresponding parts of the skull of *Phascolomys latifrons* (ib. fig. 1) and of *Phascolomys platyrhinus* (Plate XXXIII. fig. 1); it needs not to introduce the smaller Tasmanian Wombat into the comparison.

The following admeasurements give the degree, or value, of the character from the size of teeth and extent of diastema of the species above cited:—

	P. medius.		*P. platyrhinus.*		*P. latifrons.*	
	inches.	lines.	inch.	lines.	inch.	lines.
Antero-posterior extent of grinding-surfaces of d_3, d_4, m_1	1	6	1	2	1	0
Antero-posterior extent of diastema (*l* to *i*) . .	2	6	1	7	1	9

* Philosophical Transactions, 1872, p. 173.

In the relative length of the interval between the socket of the incisor (Plate XXXII. fig. 2, *i*) and that of the anterior molar (*d* 3), the present fossil resembles the latifront species (ib. fig. 1, *l*, 22′, *i*). The same relationship is shown in the form of the intermolar part of the bony palate, which is less contracted anteriorly in the fossil than in the bare-nosed Wombats (*Phascolomys platyrhinus*, Plate XXXIII. fig. 1*). The entire bony palate is more concave transversely in the hairy-nosed Wombat than in the other recent kinds; and this character is more strongly marked in the fossil, especially in the depth of the diastemal palatal tract into which open the "incisive" or premaxillo-maxillary palatal foramina (Plate XXXII. fig. 2, *a*, *a*). This deeply arched form of the bony roof of the mouth will be again noted in larger extinct species of Wombat.

The present appears to have been one half larger than the largest individuals of *Phascolomys platyrhinus*. In a specimen of this existing species, the length of the diastema equals three fifteenths of that of the entire skull, which is 7 inches 5 lines (Plate XXXIII. fig. 1, 21′, 22′). If the diastema bore the same proportion in *Phascolomys medius*, the length of its skull may be set down at 1 foot 6 inches.

The first molar (Plate XXXII. fig. 2, *d* 3), with the usual curvature, concave outward, and with the exposed part inclined obliquely backward, has a grinding-surface, or transverse section, of an oval form, with the small end forwards. The long diameter is 5 lines, and is in the direction of the molar series; the greatest transverse diameter is 4 lines. The enamel does not extend from the inner surface so far outward upon either the front or back parts of the tooth as in the recent Wombats; it shows no trace of the antero-internal fold which is feebly marked in *Phascolomys latifrons*, and strongly marked in *Phascolomys platyrhinus* and *Phasc. vombatus*. The coat of cement covering the outer side of the tooth is continued in a thinner layer over part of the enamel, and where absent has been probably accidentally removed from that partial deposit of the hardest dental tissue.

The second molar (ib. *d* 4) is divided by the usual deep inner groove and shallow outer one into two lobes, the hinder one being broader both transversely and from before backward. The antero-posterior extent of the grinding-surface is $7\frac{1}{2}$ lines, the transverse extent of the front lobe is 4 lines, of the hind lobe $4\frac{1}{2}$ lines; the inner end of this lobe is less obtusely rounded than that of the front lobe. From the unequal depth of the outer and inner alveolar walls, only a small part (about a line) of the unenamelled outer part of the tooth projects from the socket, while an extent of four lines of the inner enamelled part of the tooth projects beyond the lower inner alveolar wall (Plate XXXII. fig. 7, *d* 4). The enamel-coat is thinner at the bottom of the inner inflection or groove, and terminates near the rounded external angles of the tooth: portions of the thin cement covering the enamel are preserved.

The third molar (ib. fig. 2, *m* 1) resembles *d* 4 in size and shape; the anterior lobe does not extend so far inward as the contiguous lobe of the antecedent molar. The portion of the anterior lobe preserved of the fourth molar (*m* 2) shows the same relative

* See also Trans. Zool. Soc. vol. ii. plate lxxi. fig. 6 (*Phascolomys vombatus*).

position to the hind lobe of m 1. The enamel in all the molars is longitudinally striate, the striæ being feebly marked and subrugose.

Completing the upper molar series according to the analogy of *Phascolomys latifrons*, its antero-posterior extent would be about 2 inches 8 lines; and this is the extent shown in a photograph (Plate XXXV. fig. 7), nat. size, of a portion of the upper jaw of *Phascolomys medius*, with the entire molar series of the right side, from the breccia-cave of Wellington Valley, New South Wales, in the Australian Museum, Sydney, for which I am indebted to the Trustees of that Museum and their able Curator, Mr. KREFFT.

The margin of the diastemal part of the upper jaw (Plate XXXII. fig. 2, l) is sharp to near the incisive outlets (i), where it broadens and becomes obtuse. The cross section of the incisor (ib. fig. 6) is a transverse oval, 6 lines in long diameter, $4\frac{1}{2}$ lines in short diameter; the small end of the oval is obtuse and turned outward. The enamel bends from above a very short way down upon the inner side or large end of the oval; it arches down over the small end. The enamelled surface of the tooth is more convex than the hind or lower cement-clad surface; but this is more convex, or less flattened, than in *Phascolomys latifrons*. The long and short diameters of the transverse section of the incisor in the other two living species are in opposite directions to those in the present fossil and the Latifront Wombat.

In *Phascolomys medius* the malar process of the maxillary (Plate XXXII. fig. 3, 21*) rises thirteen lines above the alveolus of the third molar: the intervening wall of the maxillary is moderately concave vertically; in the smaller living Wombats it is convex; but in the character of height of origin of the process we again have an evidence of affinity to the latifront species. The photograph (Plate XXXV. fig. 7) shows a close correspondence with the fossil in this character.

The prezygomatic ridge (Plate XXXII. fig. 3, m) is low and broad, but in course and length resembles that in *Phascolomys latifrons*; in *Phasc. platyrhinus* this ridge is shorter, relatively thicker, and more prominent. Anterior to the ridge and the socket of d 3 the maxillary part of the skull of *Phasc. medius* contracts transversely, seemingly more suddenly than in existing Wombats, to form the diastemal part of the upper jaw. The maxillo-premaxillary suture runs vertically, with a sinuous and strongly denticulate course, about 5 lines in advance of the socket of d 3. The front walls of the incisive sockets (Plate XXXII. figs. 3, 4, & 5, 22, 22) are relatively higher or deeper than in *Phascolomys latifrons*, in which they are relatively higher than in the bare-nosed Wombats. The contour of this part of the premaxillary is rather concave in the fossil.

The photograph above referred to (Plate XXXV. fig. 7) of the cave fossil shows the same depth and shape of the bony palate, and the same somewhat abrupt contraction of the diastemal part of the maxillary, as in the fossil (Plate XXXII. fig. 2) from Eton Vale.

These evidences of specific distinction, superadded to the marked superiority of size of *Phascolomys medius*, are acceptable; although the degree of constancy of size and shape of teeth in the three species of living Wombats would have justified an inference, from

the teeth alone of the present fossil, that a still larger Wombat than the platyrhine continental species had formerly existed in both Queensland and New South Wales.

As so much, however, depends on ascertained constancy of characters in the comparative work preliminary to determination of extinct species, I believe it will be acceptable to palæontologists to have a description and figures of a fossil of *Phascolomys medius* somewhat larger than the subject of Plate XXXII. figs. 2–7.

The fore-and-aft extent of the first three molars in fig. 2, Plate XXXIII., is 1 inch 11 lines; in fig. 2, Plate XXXII., the same dimension yields 1 inch 8 lines. The closer agreement, as to size, in all other parts of the two fossils leads me to regard the above dental difference as coming within the limits of age- or sex-variation. The present fossil has been more crushed than the former; the socket of d_3 may have been pressed forward a little way from that of d_4, and so have contributed somewhat to the above difference. It is singular how the post mortem or posthumous violence has operated so as to detach almost the same parts and proportion of the fore part of the skull from the remainder in both representatives of *Phascolomys medius*. Some transversely acting force has nipped in the maxillaries in advance of the sockets of d_3, breaking the diastemal from the alveolar part of the left maxillary and crushing it inwards; this, in the present fossil, has somewhat approximated the right and left anterior molars (d_3, d_4), and has converted the concavity of the palate at the hind part of the diastema into an angular cleft. But the fore part expands and conforms in character with that in the last-described fossil. The length of the diastema and the characters of its borders are the same. The differences mentioned are obviously accidental. Rather more of the anterior pier of the zygomatic arch is preserved on the left side of the present fossil (Plate XXXIII. fig. 3, $_{21*}$).

The first molar (d_3) and the incisors have the same shape as in Plate XXXII. Nearly the whole of the implanted part of the left incisor (*i*) is exposed in the subject of fig. 3, Plate XXXIII. The incisors slightly converge as they curve downward and forward to the outlets of their long sockets. The enamel shows the same longitudinal rugous striation as in the other fossil. In both the median ridge is shown along so much of the floor of the nasal passages as is exposed (ib. fig. 4, *n*). In fig. 6 is given an inside view of so much as is preserved of the molars of the left side, upper jaw, corresponding with that from the preceding fossil given at fig. 7, Plate XXXII.

With the two foregoing fossils I received from Queensland, through the same liberal and enlightened contributors of materials for the history of Australian marsupial fossils, the portion of mandible, with the entire molar series, figured in Plate XXXIV. figs. 1 & 2.

This fossil, from the size of the teeth and of the jaw supporting them, I refer to the same species as the upper jaw (Plates XXXII. & XXXIII.). It includes an extent of 5 inches of the right ramus, wanting both extremities, but with a symphysial portion of the left ramus (Plate XXXIV. fig. 2, *v*, *i*) adherent by matrix, though slightly displaced, showing that the joint (*s*) had not been obliterated.

The general curve of the lower contour resembles that of the mandible of *Phascolomys*

latifrons (Philosophical Transactions, 1872, Plate XXII. fig. 3). The anterior part of the origin of the coronoid (Plate XXXIV. fig. 1, *q*) bears the same relation to the penultimate molar, and is more advanced than in *Phascolomys platyrhinus*. The ectalveolar groove (ib. fig. 3, *u*) between this process and the last two alveoli is relatively narrower than in any of the living species. The fore part of the ectocrotaphyte depression (*f*), bounded below by the prominent outstanding ridge (*h'*, *h*, fig. 1), is less deep than in the bare-nosed Wombats, and is more gradually excavated, as in the hairy-nosed species.

The ramus maintains its depth (1 inch 10 lines) to the socket of the first molar (Plate XXXIV. d_3, figs. 1 & 2). The hind part of the symphysis (ib. fig. 3, *s*) is on the vertical parallel of the hind part of the second molar (d_4), being rather more advanced than in *Phascolomys latifrons* (Philosophical Transactions, 1872, Plate XXI. fig. 3, *s*), and much more so than in *Phasc. platyrhinus* (ib. fig. 2, *s*) or *Phasc. vombatus* (ib. fig. 1, *s*). The upper surface of the symphysis (Plate XXXIV. fig. 3, *l*) repeats the character of the opposed palatal part of the upper jaw (Plate XXXII. & XXXIII. $21', 22'$) in its degree of transverse concavity; and this, at the diastemal tract, is bounded by lateral ridges, sharper than those above; they indicate a slightly curved course as they advance, concave outward, so far as they extend in the fossil. These characters of the upper surface of the symphysis are most nearly repeated by *Phascolomys Krefftii* (Philosophical Transactions, 1872, Plate XX. fig. 2, *l*, *s*) amongst the smaller Wombats; but in that extinct species the symphysis extends back as far as it does in *Phasc. platyrhinus* or *Phasc. vombatus* (Philosophical Transactions, 1872, Plate XIX. figs. 1 & 2). In *Phasc. latifrons* the symphysis is shorter, more concave and more definitely bounded above than in the bare-nosed Wombats, but is not so much so as in *Phascolomys Krefftii*. The lower contour of the symphysis in *Phascolomys medius* rises at a less open angle with the axis of the ramus than in *Phasc. latifrons*, and still less so than in the bare-nosed species. The lower surface shows the pair of vascular outlets, of small size, 15 lines in advance of the hind border. The anterior outlet of the dental canal (Plate XXXIV. fig. 1, *v*) is relatively rather nearer the socket of d_3 than in the smaller fossil and recent Wombats. The vertical convexity of the outer wall of the ramus and comparative flatness of the postsymphysial inner wall are according to the generic type, and relate to the direction of convexity of the long, bent, deeply implanted, ever-growing molars.

The first molar (d_2, ib. figs. 1, 2, 3) has the usual generic small size and simple form, representing, as it were, like its homotype above, one half of the succeeding molars. The grinding-surface resembles that of the upper jaw in being suboval, with the long axis lengthwise. In this it differs from *Phascolomys latifrons*, *Phasc. Mitchelli*, and *Phasc. Krefftii*, in which that surface is subquadrate, and it resembles, rather, *Phascolomys platyrhinus*; but the larger end of the oval is at the fore part of the tooth in *Phasc. medius*, not at the hind part, as is usually seen in *Phasc. platyrhinus*. The fore part of d_3 in *Phasc. medius* shows a feeble longitudinal groove, as in *Phasc. latifrons*. The enamel, as usual, coats the outer and fore part of the tooth, but is not extended so far from the fore part upon the inner side as in *Phasc. latifrons*. There

seems to be a slight interruption in the course of the enamel at the middle of the fore part of the tooth, which I have noticed in some of the smaller Wombats. The enamel was coated by cement in the fossil.

The succeeding molars slightly decrease in breadth of grinding-surface from the third (m 1), the decrease being most marked in the hind lobe of the last molar. This character is more marked in *Phascolomys latifrons* than in *Phasc. platyrhinus*. The longitudinal extent of the series of five teeth in *Phascolomys medius* is 2 inches 6 lines, as against 2 inches 1 line in *Phasc. platyrhinus*, and 1 inch 8 lines in *Phasc. latifrons*.

The lower incisors of *Phascolomys medius* resemble in relative size those in *Phascolomys latifrons*, in which they are smaller than in the bare-nosed Wombats; but the shape of the transverse section in *Phasc. medius* is different (Plate XXXIV. fig. 4, *i*); it gives a full ellipse, $4\frac{1}{2}$ by $3\frac{1}{2}$ lines, with the long axis almost vertical, but obliquely inclined from above downward and rather inward. The enamel is thin, and limited to the lower half of the long procumbent tooth. They are smaller, especially narrower transversely, than the upper pair, and in this respect resemble the lower incisors of the hairy-nosed, not the bare-nosed, Wombats.

From the proportions which the extent of the molar series bears to the length of the entire mandible in existing Wombats, I estimate that the lower jaw in the present extinct species must have been between 6 and 7 inches in length.

§ 2. *Phascolomys magnus*, Ow.—This species is founded on two portions of the upper jaw, one containing the entire molar series of both sides (Plate XXXV. figs. 1–4), the other retaining the second, third, and fourth molars of the right side. Both are from the freshwater deposits of Queensland. The less fragmentary specimen includes rather more than an inch of the diastema in advance of the molars, so much of the outer wall of both maxillaries as includes the malar process, and a small portion of the premaxillaries.

The extent of each molar series is 3 inches 6 lines; they run almost parallel with a slight curve convex outward: the least interspace between the right and left series, viz. at the fore part of the second molar (d 4), is 1 inch; the greatest, viz. at the hind part of the last molar (m 3), is 1 inch 6 lines; the interspace between the right and left anterior teeth (d 3) is 1 inch $2\frac{1}{2}$ lines.

Thus, as in *Phascolomys medius*, the disposition of the upper molars and general form of the intervening palate is after the type of the existing hairy-nosed Wombat; but the concavity, transversely, of the palate is even greater than in *Phascolomys medius*, and becomes still more marked at the diastemal region.

The malar process of the maxillary (Plate XXXV. fig. 2, 21*) rises at the same elevation above the socket of the third molar as in *Phascolomys medius*, showing a variety amongst the larger extinct Wombats which has been noted in the smaller existing species†.

The prezygomatic ridge (ib. *m*) resembles, in its curved course, length, and narrowness, that in *Phascolomys latifrons*. The maxillary anterior thereto advances and bends

† Philosophical Transactions, 1872, p. 179, figs. 5 & 6.

in with a convexity lengthwise: in the latifront and other living species the bone is here concave in the direction of the skull's axis. As the maxillary in *Phascolomys magnus* proceeds to join the premaxillary, the convexity changes to a concavity, in which remains of the maxillo-premaxillary suture may be traced.

The diastemal border (ib. fig. 2, 21′) rises as it advances from the molar alveoli at a less open angle than in *Phascolomys medius*, in which, as in the recent species, it extends forward nearly on the same parallel with the line of the alveolar outlets.

A shallow channel marks the inner surface of the commencement of the diastemal border (ib. fig. 1, 21′), its course being from above obliquely forward; there is a feeble rising of the surface anterior thereto. The palate between the ridges is regularly arched, the span being 1 inch 6 lines, the depth or height of the arch 1 inch. The extent preserved just reaches the place of entry of the prepalatal or "incisive" foramina, showing from the nasal cavity the hind wall of those canals and the increased vertical extent of the free inner surface of the premaxillary, making the sudden deepening of this part of the palate when viewed from below in such specimens as have that part entire, such as the subjects of fig. 2, Plate XXXII., & fig. 2, Plate XXXIII. *a*, from the smaller extinct species, *Phascolomys medius*.

The fractured surface of the premaxillaries (Plate XXXV. fig. 5) exposes the incisors near the apical end of the long pulp-cavity, about 1 inch 3 lines above the diastemal ridge: the premaxillary increases in thickness as it rises to form the alveolus. The upper fractured surface of the present fossil (Plate XXXV. fig. 4) exposes part of the floor of the nasal passages, gradually descending as they retrograde toward the place of the post-palatine apertures. Most of the intermolar floor of these passages and roof of the mouth has been broken away.

On each side of the nasal passages appear the hollow implanted ends of the molar teeth. That of d_3 (fig. 4) projects above the prezygomatic ridge, that of d_4 between this and the front pier of the zygoma (21*); and the relative position of the rest conforms with the generic type of these singular elongate, outwardly curved, ever-growing teeth.

The total length of the first and smallest, following the curve, is 2 inches 9 lines. The long diameter of the oval or subtriangular grinding-surface is 6 lines; the breadth near the base, which is backward, is 5 lines. The inner enamelled side extends forward, with a very slight outward bend, from the axial line of the skull to the apex, which is narrow and obtuse, and round this the enamel bends for a short way along the outer side of the tooth; this is the longest side, and curves from behind forward and inward to the apex more strongly than does the inner side. The enamel can be traced from the inner side over the greater part of the hind surface of the tooth. The coat of cement covering the outer side of the tooth can be traced over parts of the enamel, the whole of which it seems originally to have covered.

The grinding-surface of the second molar (d_4) gives 9 lines in fore-and-aft diameter, 6 lines across the hinder lobe; that of the third molar (m_1) has the same longitudinal

with rather less transverse extent; and the two succeeding teeth diminish, chiefly in transverse thickness. The grinding-surface of the last molar (m 3) has a fore-and-aft extent of $6\frac{1}{2}$ lines, with a transverse diameter at the hind lobe of but 3 lines. In shape, implantation, and structure, showing interruption of the enamel coating at the outer side, these upper molars closely adhere to the generic character of *Phascolomys*. The exposed implanted ends show the widely open persistent pulp-cavities. The section of the base of the right incisor has a transverse diameter of 6 lines, a vertical one of $5\frac{1}{2}$ lines. The upper, which would become the front surface, is transversely convex; the under surface is transversely concave, but irregularly so, from the greater production downward of the inner angle. The upper incisor appears, from the present remnant of it, to differ in shape as well as size from that of *Phascolomys medius*. The inner interspace between the pair at the place of fracture (Plate XXXV. fig. 5) is 7 lines; they no doubt converged as they descended to come into contact at their exposed and working ends.

The above-described fossil is from a full-grown and seemingly old individual.

I am glad, however, to have another example of the size of teeth which typifies *Phascolomys magnus*. It is afforded by a fragment of the right maxillary, with the second, third, and fourth molars *in situ*, and portions of the sockets of the first and fifth.

The antero-posterior extent of the grinding-surfaces of the three teeth in place is 2 inches 4 lines, according in all dimensions and in relative size with those in the subject of figs. 1–4, Plate XXXV. The outer surface of the bone shows the same relative position of the malar process of the maxillary, the same shape and course of the prezygomatic ridge, so far as it is preserved. Part of the malar bone contributing to the fore part of the orbit is also here preserved; but the fragment has been much rolled and worn, and is incrusted with the petrified lacustrine deposit.

In both specimens the enamel has a finely reticulate surface, with a tendency to longitudinal striation. This surface aids the attachment of the cement.

Amongst the detached teeth worked out of the portions of breccia from the Wellington-Valley bone-caves transmitted to the British Museum was one entire molar tooth and the halves of two others (Plate XXXV. fig. 6), of the size of those of *Phascolomys magnus*. The entire molar corresponds closely with the third, upper jaw, left side, in the specimen last described from Darling Downs (ib. fig. 1, m 1). We thus get evidence of the former range of *Phascolomys magnus* over some hundreds of miles of the Australian continent.

§ 3. *Phascolomys gigas*, Ow.*—Of the lower jaws of Wombats exceeding in size that of *Phascolomys medius* (Plate XXXIV.), I have seen none with a molar series having the same relative size to the upper one in *Phascolomys magnus* (Plate XXXV.) which the teeth of the lower jaw bear to those of the upper one in existing Wombats, and in all the extinct species of which I possess means of comparing those teeth.

A series of lower molars with an extent of grinding-surface of 4 inches 3 lines (Plate

* Art. "Palæontology," Encyclopædia Britannica, 1858, vol. xvii. p. 175. fig. 114.

XXXVI. fig. 3) cannot have worked, in the same head, upon an upper series of only 3 inches 6 lines (Plate XXXV. figs. 1 & 3). The anterior molar of the lower or movable jaw in *Phascolomys medius* (Plate XXXIV. fig. 2, d_3) has a somewhat smaller extent of grinding-surface, as in all existing Wombats, than the corresponding tooth of the upper or fixed jaw (Plate XXXII. fig. 2, d_3, and Plate XXXIII. fig. 2, d_3). The smallest example of d_3 in the remains of large Wombats yet to be described gives 9 lines and $4\frac{1}{2}$ lines as the two diameters of its almost elliptical grinding-surface (Plates XXXVI. & XXXVII. d_3). Such a tooth cannot have belonged to the same species as the one which has an upper anterior molar with the dimensions above given as characteristic of *Phascolomys magnus* (Plate XXXV. d_3).

Of this species the lower jaw and teeth have not yet come under my observation. All the examples of the large extinct Wombats now before me for description belong to the species *Phascolomys gigas*, of which the grinding-surface of a lower molar is figured in the "Article" quoted above, and in my 'Palæontology' (p. 431, fig. 172, 2nd ed. 1861); the former existence of which Wombat I noticed, some years before, in my second memoir "On the Osteology of the Marsupialia"*.

Satisfactory evidence of this species has since reached me, of which I propose, first, to describe a considerable proportion of the mandible, obtained by Edward S. Hill, Esq., from a freshwater deposit at Eton Vale, Darling Downs, in 1863, and presented by Sir Daniel Cooper, Bart., to the British Museum.

It consists of the right ramus (Plate XXXVI. fig. 1) with the fore part broken off near the socket of the first molar (d_3), and with some mutilation of the outstanding parts of the ascending ramus; also of the fore part of the left ramus (ib. fig. 2), with the hind part broken off at the socket of the penultimate molar (m_2). They are both parts of the same mandible, and I have therefore supplied, in the subjects of Plate XXXVI. fig. 2, Plate XXXVII. fig. 1, and Plate XXXVIII. fig. 1, from one ramus what was wanting in the other.

Reference to Plate xxii. Phil. Trans. 1872, where the side view is given of the mandible in the three known living species of *Phascolomys*, will make at once appreciable the character of the present extinct Wombat, in the minor relative antero-posterior extent of the ascending ramus, and its greater relative height before dividing into the condylar (*b*) and coronoid (*c*) processes. The intervening notch sinks nearly to the level of the grinding-surface of the molars in the recent and smaller extinct Wombats; whereas in *Phascolomys gigas* the common plate (*f*, *g*) rises much higher before dividing into *b* and *c* (Plate XXXVI. figs. 1 & 2). The fore-and-aft extent of the rising branch at the neck of the condyle equals in extent that of the last four molars in *Phascolomys platyrhinus*,

* Trans. Zool. Soc. vol. iii. p. 306, 1845:—"I have recently obtained evidence from the postpliocene deposits of the district of Melbourne, through the kindness of my friend Dr. Hobson, of an extinct Wombat, or true *Phascolomys*, at least four times as large as either of the known existing species." These were *Phascolomys vombatus* and *Phascolomys latifrons*; the somewhat larger continental Wombat (*Phascolomys platyrhinus*) had not then been determined.

and rather more in *Phascolomys latifrons*; in *Phascolomys gigas* the same dimension equals only the last two molars and half of the antepenultimate one.

The ectocrotaphyte ridge (Plate XXXVI. fig. 1, *h*, *h*) is relatively more prominent and the depression (*f*) which it circumscribes below is relatively deeper in *Phascolomys gigas* than in either the Platyrhine or Tasmanian Wombats, and the intercommunicating vacuity is relatively wider in the gigantic Wombat, in which its long diameter is 9 lines. The neck of the condyle at its origin (*b*) is but 9 lines across; it expands to a breadth of more than an inch where the condyle has been broken off. The base of the coronoid process (*c*) has an antero-posterior extent of 1 inch 3 lines; the anterior margin continued into that of the rising ramus subsides upon the outer surface of the jaw (*q*) below the socket of the penultimate molar (m_2).

The lower contour of the mandible (Plate XXXVI. figs. 1 & 2) describes a strong convex uninterrupted curve to the fractured diastemal part, herein resembling rather the latifront, or hairy-nosed, than the bare-nosed Wombats.

The inflected angle (Plate XXXVIII. fig. 1, *a*) begins, posteriorly, at a lower level than the ectocrotaphyte plate (ib. *h*), as in existing Wombats, but it has a minor relative extent; that of its base, as defined anteriorly by the "mylo-hyoid groove" (Plate XXXVI. fig. 2, *w*), does not exceed 2 inches; consequently the superangular cavity (*e*) is relatively small. The dental canal (Plate XXXVII. fig. 4, *o*) begins as a wide transverse fissure, internal to which is the large vacuity above mentioned leading to the ectocrotaphyte fossa. The postalveolar ridge (ib. *t*) forms a low angle as it bends to the superangular fossa. The ectalveolar groove (ib. *u*) is relatively narrow.

The depth of the horizontal ramus augments more rapidly to the back part of the symphysis (Plate XXXVI. fig. 2, *s*) than in recent or smaller extinct Wombats; from being 2 inches behind the last alveolus it grows to 3 inches 3 lines below the interval between the penultimate and antepenultimate alveoli. The smooth thick lower border shows prominences indicative of the matrices of the hinder molars, the bone being here reduced to extreme thinness. The symphysis begins behind at a vertical line dropped from the interspace between m_1 and m_2; it has been partially obliterated, the separation of the rami here being attended with fracture of the confluent portion. This indicates an aged animal. The hinder and upper border of the symphysis is divided into two curves by the encroachment of the smooth inner surface of the ramus a little below the swelling (*i**) indicative of the closed and formative end of the socket of the incisor. The interlocking rough narrow ridges of the joint show the usual tendency to radiate from above downward. There are two anterior outlets of the dental canal (in the subject of Plate XXXVI. fig. 1, *v*) on the same vertical line, about half an inch in advance of the alveolus of d_3 and near the diastemal margin.

The length of the "ascending ramus" before dividing into the condylar and coronoid processes shows a resemblance in the gigantic Wombat to the large herbivorous Nototherе and Diprotodon, which is not seen in the smaller species of *Phascolomys*. The bold curve of the lower contour of the "horizontal ramus" in *Phascolomys gigas* recalls

that feature of the mandible of the Megathere, and it has a like relation to the lodgement of the formative matrices of long, ever-growing molars *.

The first molar (ib. figs. 1 & 3, d_3) is subbilobed, through opposite longitudinal shallow grooves equally dividing the tooth. The tendency to a gain of grinding-surface in the direction of the jaw's axis seen in the same tooth of *Phascolomys medius* is in the larger species carried further, so as to substitute for the representative of one half or lobe of the succeeding molars in the anterior one of smaller Wombats a more simplified condition of the normal bilobed phascolomydian type of molar. The enamel of d_3 in *Phascolomys gigas* is continued from the outer over the front side, and along nearly the whole of the hind side of the tooth. A coat of cement of similar thickness covers the inner side, and is continued more thinly upon the enamel. The surface of the enamel is longitudinally rugoso-striate.

All the succeeding molars have a partial coat of enamel, extending from the outer side upon the fore part to where this comes into contact with the antecedent tooth, and continued, perhaps, a little further upon the hind surface. The rest of the dentine has the coating of cement. The proportions of the several teeth are shown in the figures above cited.

As before remarked, the smaller size of the last molar indicates the Latifront Wombat to be nearer akin to the extinct giant than are the bare-nosed living species. The same affinity is shown by the small size of the lower incisors in *Phascolomys gigas* (Plate XL. figs. 1, *i*, 2, 3, 4). They are smaller, especially narrower, in *Phascolomys latifrons* than in *Phasc. platyrhinus* and *Phasc. vombatus*, and are, relatively, still smaller in *Phasc. gigas*, with a distinctive shape. But the characters of the lower pair of incisors are better shown in another mandibular specimen of the present large species.

The section or transverse fracture of the hollow base of the right incisor is shown in Plate XXXVII. fig. 2, *i*; the length and curvature of the implanted part of the second molar (d_4) are seen in the same figure, in which *e e* indicates the anterior terminal line of the outer enamel. The hinder fracture of the left ramus of the same jaw (ib. fig. 3) shows the length and curve of the penultimate molar (m_2), and the posterior terminal line of its partial covering of enamel (*e*).

Of the above-described instructive specimen of *Phascolomys gigas* little more than an inch of the diastemal part of the jaw is preserved (Plate XXXVI. figs. 1 & 2, *l*). Fortunately, the first specimen which made known to me the fact of so large a Wombat having formerly existed in Australia included 2 inches 8 lines of the diastemal part of the jaw, which contracts rapidly to the terminal outlets of the incisive alveoli (Plate XXXIX. figs. 1 & 2); whence I conclude that but little had been broken away from that end of the mandible.

* Should any successor deem the differential characters of the giant Wombat of generic or subgeneric value, as the minor differences of *Phascolomys latifrons* have been by Dr. Murie (Proc. Zool. Soc. 1867, p. 815), they may, perhaps, accept the name '*Phascolonus*,' having reference to the size of this species, which equalled that of the Wild Ass.

The subject of Plate XXXIX. figs. 1, 2, 3 was obtained from "a salt-lake, nearly 100 miles west of Melbourne," and was transmitted to me by Dr. Hobson*. It is the symphysial end of the mandible, with $4\frac{1}{2}$ inches of the joint (s, s'), the obliteration of which indicates the age of the individual; it includes the implanted parts of the incisors (i'), and of the three anterior molars of each ramus (fig. 1). The under part of the symphysis (fig. 2, Plate XXXIX.) shows the pair of subsymphysial foramina (r) in the same relative position as in the existing Wombats (ib. fig. 4, r). The prolongation of the attenuated anterior end of the mandible shows a nearer resemblance in *Phascolomys gigas* to *Phascolomys latifrons* (Phil. Trans. 1872, Plate xxiii. fig. 3) and *Phascolomys Krefftii* (ib. Plate xx. fig. 2) than to *Phascolomys platyrhinus* (ib. Plate xix. fig. 2) or to *Phascolomys vombatus* (ib. fig. 1). The upper surface of the specimen (Plate XXXIX. fig. 1) shows the same concavity between the right and left anterior molars as in the more perfect specimen of *Phascolomys gigas* (Plate XXXVII.). The hollow implanted ends of the incisors (Plate XXXIX. figs. 1 & 3, i'), exposed by fracture of the fossil, hold the same relative position to the third molars (m 1) as in the more complete mandible. The anterior outlets (ib. fig. 1, v, v) of the dental canal are in the same position.

The subject of fig. 5, Plate XL., shows a slight inferiority in the size of the molar teeth as compared with that of figs. 1, 2, & 3, Plate XXXVI. The present fossil is a portion of the left ramus with the last four molars in place. The longitudinal extent of their grinding-surfaces is 3 inches 5 lines (Plate XL. fig. 5), as against 3 inches 6 lines (Plate XXXVI. fig. 3); that of the first three molars is the same in both specimens, and the difference is due to a smaller size of the last molar in the present (Plate XL. fig. 5, m 3), the hind lobe of which also shows a longitudinal indent. I am unwilling to regard this as signifying more than a variety of *Phascolomys gigas*. The features of the mandible, such as the anterior origin of the ectocrotaphyte ridge (ib. fig. 6, h), and of the ascending ramus (ib. fig. 6, q), as also the ectalveolar groove (ib. fig. 5, u) and postalveolar ridge (ib. ib. t), so far as they are preserved, closely resemble those of the more complete specimen of mandible of the present large species.

The fourth example of *Phascolomys gigas* I know through a cast and photograph of the original, now in the Australian Museum, Sydney, New South Wales. The cast was prepared by direction of the Trustees of that Museum, and was transmitted as a donation to the British Museum. A photograph of the natural size, showing the grinding-surface of the molar teeth, was forwarded to me through the same liberality. The specimen is a portion of the right ramus, including the series of five molars and the entire incisor (Plate XL. figs. 1–4), of which tooth a separate cast was prepared and transmitted. The molars show a slight superiority of size over those in the subject of Plate XXXVI., as may be seen by comparison of figs. 3 & 4 in that Plate; but this I take to be within the limits of individual or sexual range of size. The configuration of the ramus, so far as the comparison can be made, closely resembles that of the more complete mandibles of the present species (Plates XXXVI., XXXVII., & XXXIX.): the portion of the

* Letter from Dr. Hobson, March 3rd, 1844.

ectocrotaphyte cavity preserved in the present cast indicates the same depth; the symphysial articular surface (Plate XL. fig. 1, *s*, *s'*) has the same shape and extent; the molar teeth (ib. fig. 1, d_3, d_4, $m_{1,2,3}$) show the same configurations and proportions of their grinding-surface (Plate XXXVI. fig. 4)—the extent of the series is 4 inches 7 lines. The length of the incisor (Plate XL. figs. 1, *i*, & 2) is 7 inches, its vertical diameter is 8 lines, its transverse diameter 6 lines. The section of the tooth (ib. fig. 4) is lozenge-shaped, with the four angles rounded. The lateral angles (*e*, *e'*) are nearer the upper (*u*) than the lower (*o*) angles, and the lower inner facet (*g*) is broader than the lower outer one (*h*); the convergence of the two broad lower facets to the obtuse lower angle makes that part of the incisor the narrowest or smallest: if the angles were rounded off, the shape of the transverse section would be an oval with the large end upward. The upper and inner angles are less rounded and more marked than the outer and lower angles. Two low narrow ridges traverse lengthwise the inner and lower facet (ib. fig. 1, *g*, *g*), dividing it into three tracts, the lowest being the narrowest; the outer and lower facet (ib. fig. 2, *h*, *h*) is slightly hollowed. A thin layer of enamel coats the lower and lateral parts of the tooth up to the lateral angles (*e*, *e'*), where it subsides abruptly after becoming thinner than it was below.

The base of the incisor in the left ramus of the first-described jaw of *Phascolomys gigas* (Plate XXXVI. figs. 1 & 2, *i*, and Plate XXXVII. fig. 2, *i*) repeats the characters above given from the cast of the entire incisor, the original of which is in the Australian Museum; the outer lateral angle is more sharply marked at the implanted part of the incisor compared.

The contrast in the shape and relative size of the incisor of the giant Wombat with that of the largest known living species (*Phascolomys platyrhinus*) is great. The section of the incisor in that species has an area double that of the section of the first molar; in *Phascolomys gigas* these proportions are almost reversed. The long diameter of such section of the incisor is transverse in *Phascolomys platyrhinus*; it is vertical in *Phascolomys gigas*. Amongst living Wombats an approach to the extinct giant is made by the *Phascolomys latifrons*, in which the vertical diameter prevails in the section of the incisor—only the large end of the oval, or base of the triangle, is below, not above as in *Phascolomys gigas*; and the area of the section in *Phasc. latifrons* rather exceeds that of the anterior molar, d_3. In the extinct *Phascolomys medius* (Plate XXXIV. fig. 4, *i*) we have a nearer approach to the characters of the lower incisors in *Phascolomys gigas*.

Another evidence of *Phascolomys gigas* is the hind part of the right mandibular ramus with a more mutilated "ascending branch" than in the subject of Plate XXXVI.; it includes the sockets of the last four molars and the base of that of the incisor. The teeth in this specimen must have presented the size of those in the subject of fig. 4 (ib.); the longitudinal extent of the last three sockets is 2 inches 10 lines. The hind fracture is at the intercommunicating canal (Plate XXXVII. fig. 4, *p*), exposing the wide beginning of the dental canal (ib. *o*), with its larger division continued along the outer side of the bases of the molar alveoli, and the smaller division (*o'*) extending along the

inner side to emerge at the anterior dental outlet (*v*); the "mylo-hyoid groove" is broader and less deep than in Plate XXXVI. fig. 2, *w*. The characters of the ectalveolar groove, of the postalveolar ridge, and of the ectocrotaphyte fossa (*f*) agree with those of the type mandible of *Phascolomys gigas*.

The present specimen was discovered by M. SATCHE ST. JEAN, at St. Jean Station, Queensland, in the bed of a tributary creek of the Condamine River.

The last specimen which I have now to notice was obtained by F. NICHOLSON, Esq., from the same freshwater deposits at Clifton Plains, Darling Downs, Queensland. I am indebted to the kindness of Professor HARKNESS, of Queen's College, Cork, for the opportunity of here describing and figuring it. It either exemplifies the largest observed variety of *Phascolomys gigas*, or indicates a still larger species, *i. e.* one in which modifications of the shape of the jaw may be associated with its superiority of size. Of this the mutilated state of the fragment does not permit me to judge, and I am disposed to refer the specimen to a large old male of *Phascolomys gigas*.

The longitudinal extent of the outlets of the last three molars of Mr. NICHOLSON's fossil (Plate XXXVIII. fig. 4, $m_{1,2,3}$) is 3 inches 1 line; they show the same kind and degree of decrease of size from the first to the third as in the smaller examples of the species. The breadth and apparent depth of the ectalveolar groove (ib. figs. 3 & 4, *u*) are as in the first-described mandible (Plates XXXVI. & XXXVII.). The fore part of the base of the coronoid or ascending ramus (ib. fig. 3, *q*) and of the ectocrotaphyte ridge (ib. *h*) show likewise the same relative positions. On the inner fractured side of this specimen the large inner division of the dental canal is seen about 9 lines above the closed ends of the last two alveoli.

§ 4. *Conclusion.*—In the case of *Phascolomys*, as of most Mammalian genera, when due time and pains are applied to the acquisition and study of the fossil evidences, the number of species which have passed away is found to exceed that of the living ones which remain.

Until comparatively lately the Wombat was known to zoologists as a solitary exceptional form of small Tasmanian marsupial, peculiar in its scalpriform dentition combined with burrowing habits*. We now know this generic form under many specific structural modifications, and with gradations of bulk rising from that of a Marmot to that of a Tapir.

The rodent type of incisors, both as to number and kind, are retained in all, certainly in the lower jaw of the gigantic species; but it would not be safe to infer that the subjects of the present Paper burrowed like the smaller living Wombats.

If we knew the Hare (*Lepus timidus*) only by fossil remains, we should err in attributing to it the habits and mode of life of the smaller species, *Lepus cuniculus*. It is probable that the larger extinct Wombats did not conceal themselves under ground.

What we know is, that of the series of forms specifically varying the generic type of *Phascolomys* the larger ones have perished. Here, as in the case of the gigantic wingless birds of New Zealand, size and bulk seem to have been a disadvantage in the

* Hence the synonym, *Phascolomys fossor*, of WAGNER.

"contest for existence"*. The small burrowing Kivis†, like the small Wombats, have survived. *Phascolomys gigas* and *Phascolomys magnus* are not likely to have escaped observation if they still lingered in any of the localities made known by the adventurous explorers of Australia; but the diminutive *Phasc. parvus* may yet be found living in some part of that continent.

Another inference, or tributary illustration of a general law, is shadowed forth less plainly, perhaps, than that bearing upon the "battle of life."

The majority of the fossils of common-sized Wombats exemplify, as in the case of *Phascolomys Mitchelli*, the more generalized structure; osteological characters, now distinguishing respectively the hairy-nosed and bare-nosed Wombats, are combined in the skull of that extinct species. At the same time divergent courses of variation had reached the stages indicated by *Phascolomys latifrons* and *Phascolomys platyrhinus* at a period when the larger species, now extinct, appear to have been living in Australia. This is less ambiguously shown, as to time, by the mandible of the continental bare-nosed Wombat from Queensland, than by that of the hairy-nosed species from the breccia of the Wellington-Valley Caverns; for, with regard to specimens obtained from caves, there are grounds of uncertainty as to contemporaneity of introduction not affecting, at least in the same degree, the fossils from stratified deposits of known geological age.

The extirpating cause of the larger Wombats, especially if they were unable to take refuge and conceal themselves under ground, was probably the hostility of man. No human remains, however, or weapons have yet been discovered in the substalagmitic breccias of the caves or in the freshwater deposits of Australia. But as the unseen planet is inferred by evidence of its force, so may the destroyer be conjectured and his discovery anticipated by the effects of his power; such, *e. g.*, as the disappearance of species which, from their easier detection, capture, or bringing to bay, and greater profit when slain, would be the first objects of chase to the primitive Aborigines.

Table of Localities of Fossils of *Phascolomys*, showing:—

Where found.	By whom.	Date.	Species.
Breccia-cavern; Wellington Valley.....	Sir Thomas L. Mitchell, C.B.	1836	*Phascolomys Mitchelli.*
Lacustrine deposits, Victoria	E. C. Hobson, M.D.	1845	*Ph. gigas.*
Lacustrine deposits, Queensland.....	Geo. Bennett, M.D., F.L.S.	1861	*Ph. Mitchelli.*
King's Creek, Darling Downs.....	Mr. Turner	1847	*Ph. parvus, Ph. medius.*
Gowrie, Darling Downs	Fred. Neville Isaac, Esq.	1861	*Ph. Mitchelli.*
Eton Vale, Darling Downs	Edward S. Hill, Esq.	1865	*Ph. platyrhinus, Ph. medius, Ph. magnus, Ph. gigas.*
St. Jean Station, Darling Downs	M. Satche St. Jean	1865	*Ph. gigas.*
Drayton, Darling Downs.....	Sir D. Cooper, Bart.	1864	*Ph. Thomsonii, Ph. medius, Ph. magnus, Ph. gigas.*
Clifton Plains, Darling Downs	F. Nicholson, Esq.	1866	*Ph. gigas.*
Breccia-cavern, Wellington Valley.....	Prof. Thomson, and Gerard Krefft, Esq. ...	1867	*Ph. Mitchelli, Ph. Krefftii, Ph. latifrons, Ph. medius.*

* Owen, "On Dinornis," Part IV., Trans. Zool. Soc. vol. iv. (1850) p. 15.

† *Apterux australis*, Shaw *Apteryx Owenii*, Gould.

Explanation of the Plates.

PLATE XXXII.

Fig. 1. Base of skull and working-surface of the teeth of the upper jaw, *Phascolomys latifrons.*
Fig. 2. Part of base of skull, with working-surface of some molar teeth, *Phascolomys medius.*
Fig. 3. Left side view of the same fossil.
Fig. 4. Right side of fore part of the same fossil.
Fig. 5. Front view of premaxillary part of the same fossil.
Fig. 6. Fractured surface of ditto, showing transverse section of the implanted part of the incisors, *i*, *i*.
Fig. 7. Inner side view of the crowns of the three anterior molars and fore lobe of the fourth molar of the same fossil.

PLATE XXXIII.

Fig. 1. Base of skull and working-surface of the teeth of the upper jaw, *Phascolomys platyrhinus.*
Fig. 2. Part of base of skull, with fractured and working-surface of some molar teeth, *Phascolomys medius.*
Fig. 3. Left side view of the same fossil.
Fig. 4. Posterior fractured end of the same fossil.
Fig. 5. Front view of premaxillaries and fractured incisors of the same fossil.
Fig. 6. Inner side view of exposed part of the three anterior molars and fore lobe of the fourth molar of the same fossil.

PLATE XXXIV.

Fig. 1. Outside view of portion of right mandibular ramus, *Phascolomys medius.*
Fig. 2. Inner side view of the same fossil.
Fig. 3. Upper view and grinding-surface of molar teeth of a mutilated mandible of *Phascolomys medius.*
Fig. 4. Front fractured end, with section of implanted part of the lower incisors of the same fossil.
Fig. 5. Hind fractured end of left ramus of the same fossil.

PLATE XXXV.

Fig. 1. Under view of part of upper jaw and molar teeth, *Phascolomys magnus*.
Fig. 2. Left side view of the same fossil.
Fig. 3. Inner side view of the right molars of the same fossil.
Fig. 4. Upper view of the same fossil.
Fig. 5. Anterior fractured surface of the same fossil, with sections of the base of the incisors, *i*, *i*.
Fig. 6. Third molar and hind half of second molar, *Phascolomys magnus*: the working-surface is shown below.
Fig. 7. Part of upper jaw, with molar teeth, *Phascolomys medius* (from a photograph).

PLATE XXXVI.

Fig. 1. Outside view of part of the right mandibular ramus and teeth, *Phascolomys* (*Phascolonus*) *gigas*.
Fig. 2. Inside view of part of left ramus and teeth of the same mandible.
Fig. 3. Working-surface of the right molars of the same mandible.
Fig. 4. Working-surface of the right mandibular ramus of a larger *Phascolomys gigas*.

PLATE XXXVII.

Fig. 1. Upper view of the lower jaw and teeth, *Phascolomys* (*Phascolonus*) *gigas*.
Fig. 2. Anterior fractured surface of right ramus of the same jaw.
Fig. 3. Posterior fractured surface of right ramus of the same jaw.
Fig. 4. Posterior fractured surface of another mandibular ramus, *Phascolomys gigas*.

PLATE XXXVIII.

Fig. 1. Hind view of mandible, *Phascolomys* (*Phascolonus*) *gigas*.
Fig. 2. Hind view of mandible, *Phascolomys latifrons*.
Fig. 3. Portion of left mandibular ramus of a large *Phascolomys gigas*.
Fig. 4. Upper surface of the same fossil.
Fig. 5. Portion of left mandibular ramus, *Phascolomys parvus*.
Fig. 6. Upper surface of the same fossil.

PLATE XXXIX.

Fig. 1. Upper surface of fore part of mandible, *Phascolomys gigas*.
Fig. 2. Under surface of the same fossil.
Fig. 3. Back view, showing roots of incisors (*i'*) and anterior molars (d_3) of the same fossil.
Fig. 4. Under surface of fore part of mandible, *Phascolomys vombatus*.

PLATE XL.

Fig. 1. Inner side view of the fore part of a right mandibular ramus and teeth, *Phascolomys gigas.*

Fig. 2. Outer side view of incisor of the same fossil.

Fig. 3. Working-surface of the same incisor.

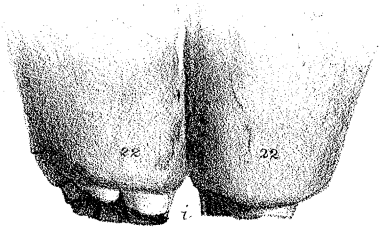
Fig. 4. Transverse section of the same incisor.

Fig. 5. Outer side view of the same fossil (without reversing).

Fig. 6. Upper view of a portion of the left mandibular ramus and last four molars of a smaller *Phascolomys gigas.*

All the figures are of the natural size: the symbols and letters of reference are explained in the text.

Fig. 5.



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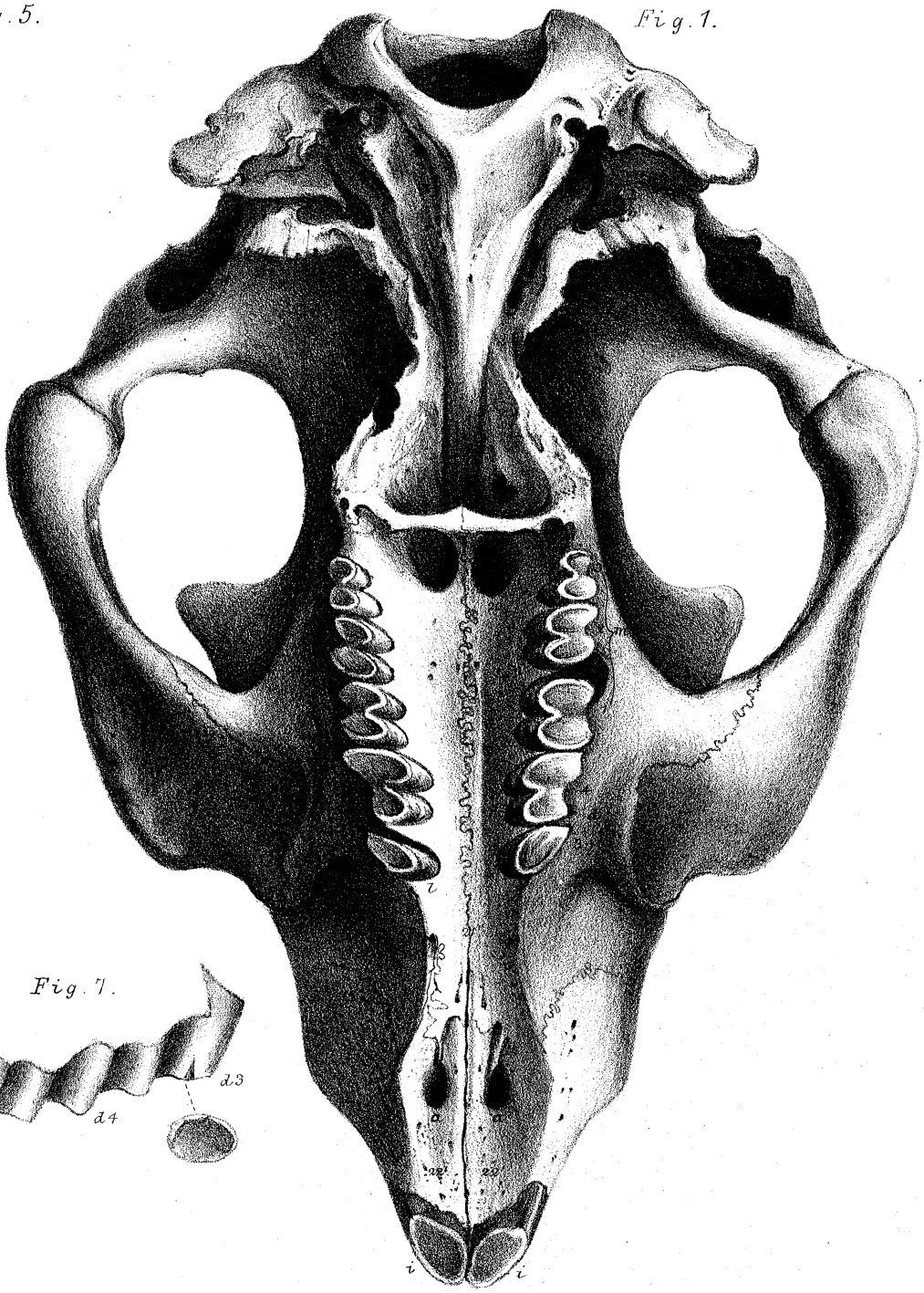

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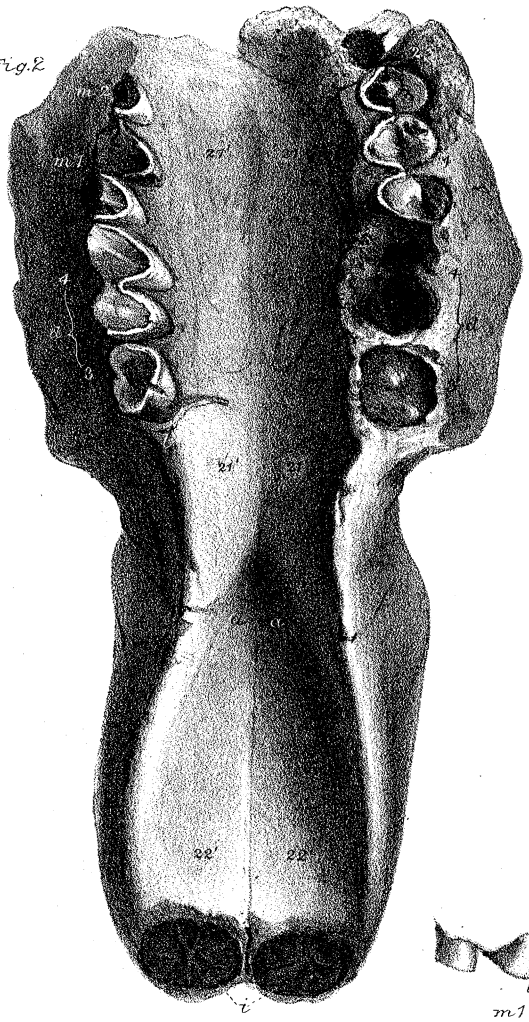
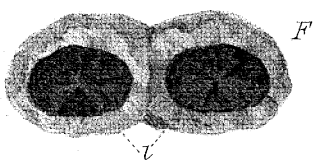


Fig. 7.

Fig. 6.



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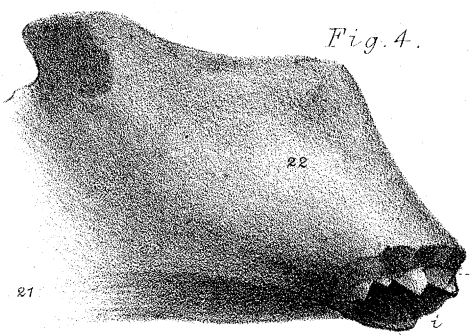

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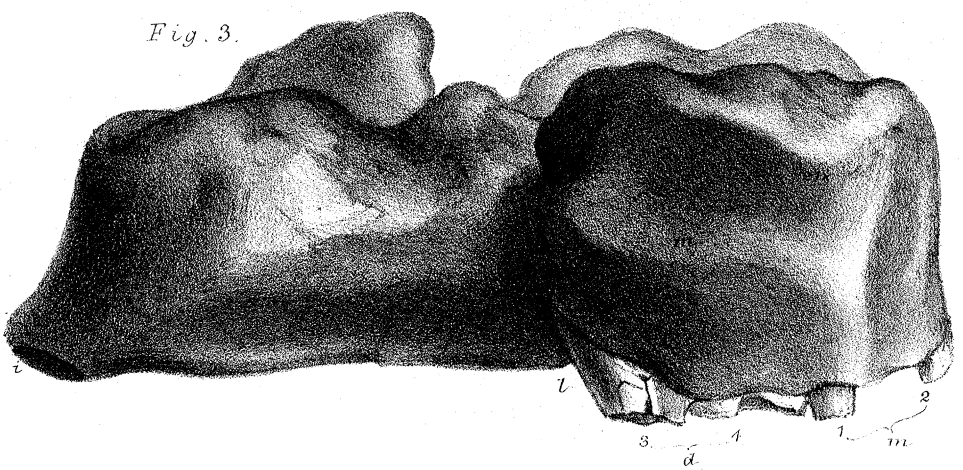


W. West & Co. lith.

Fig. 1.

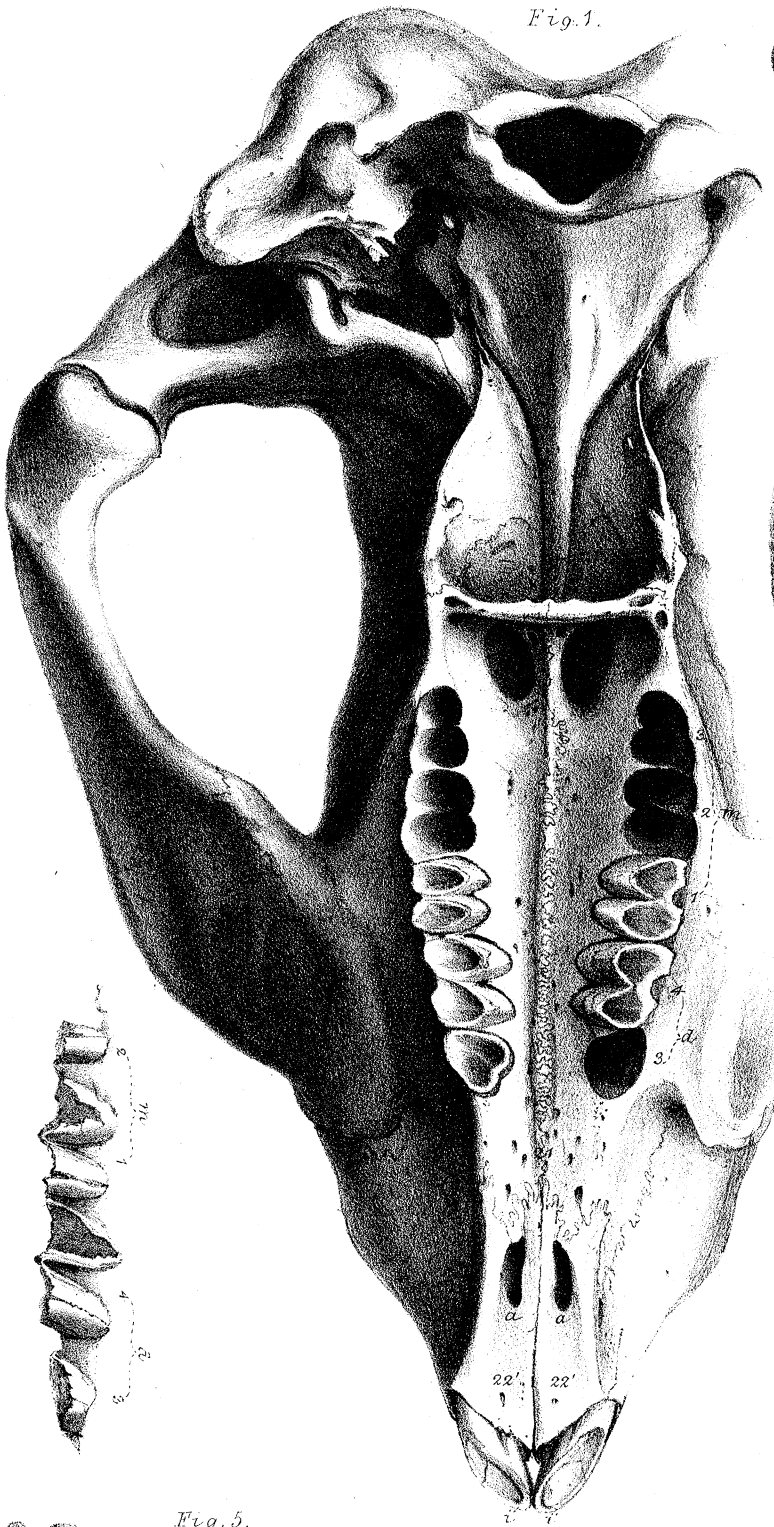
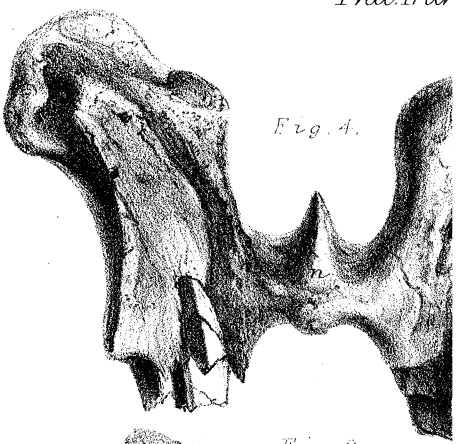


Fig. 4.



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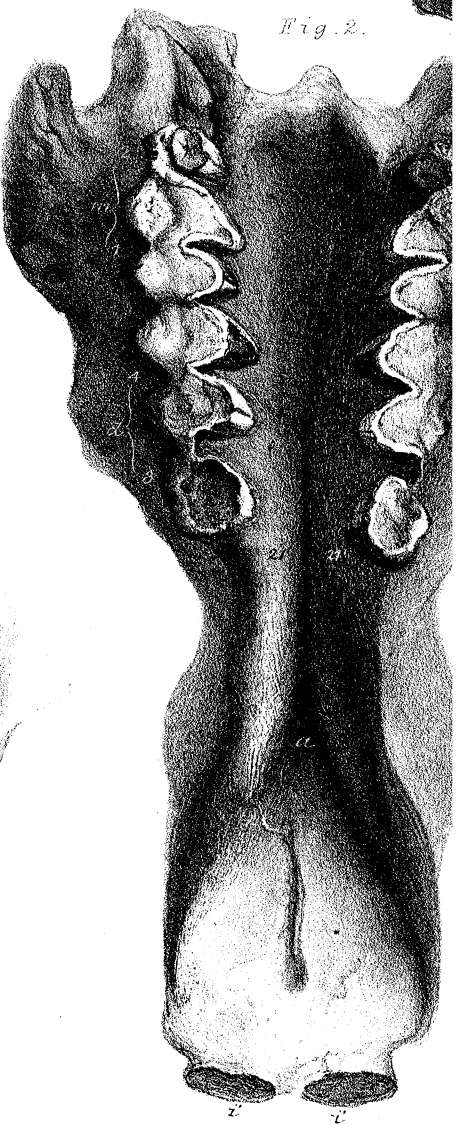
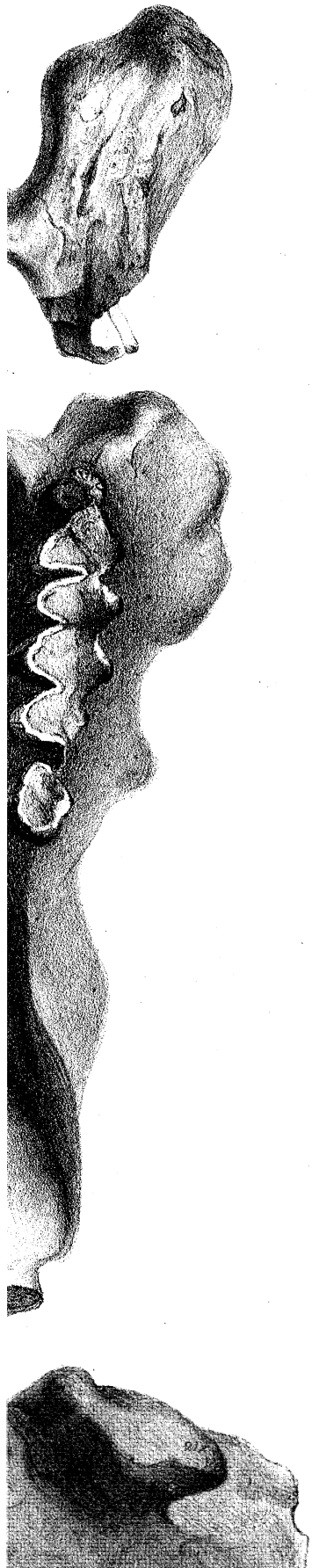
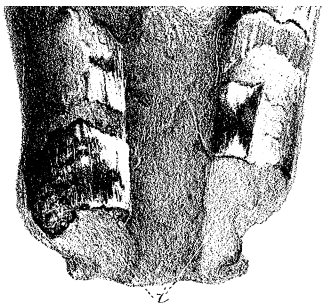
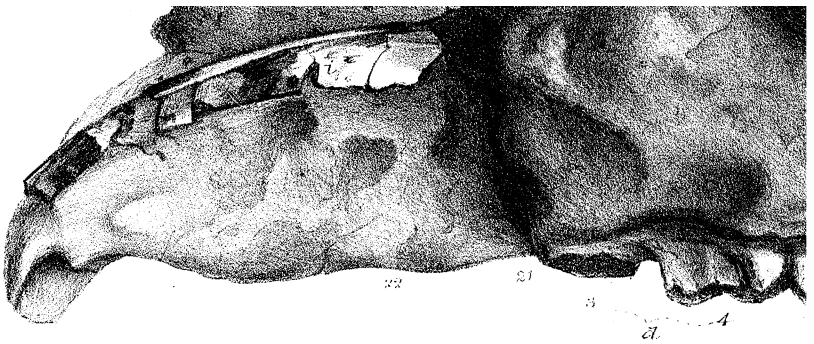


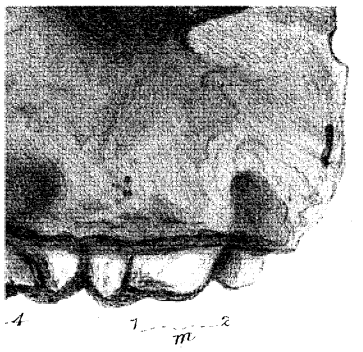
Fig. 5.

Fig. 3.



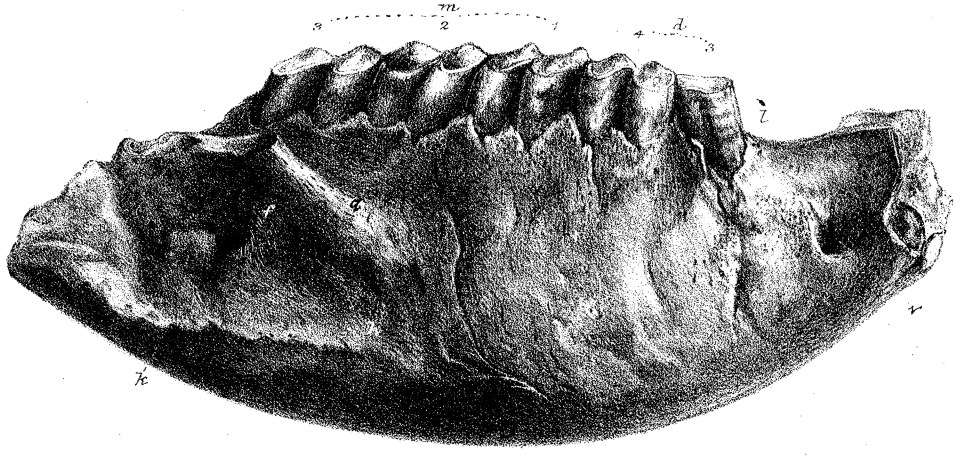






W. West & Co. lith.

Fig. 1.



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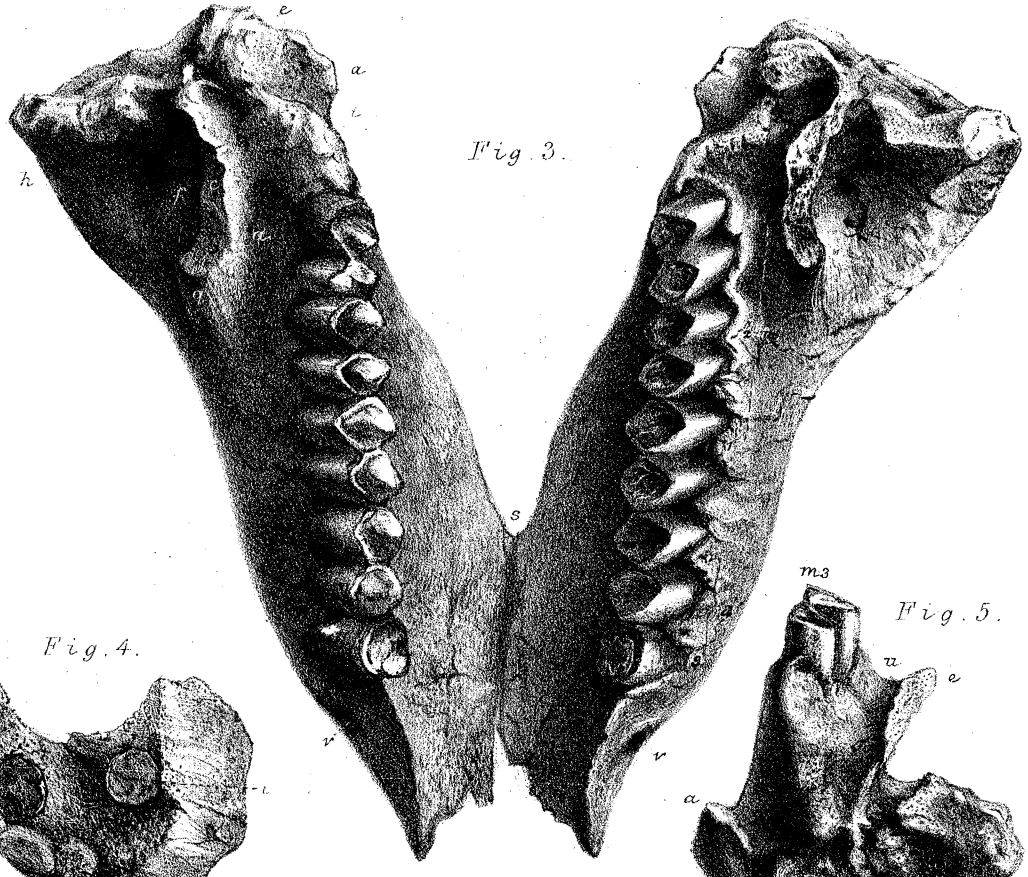
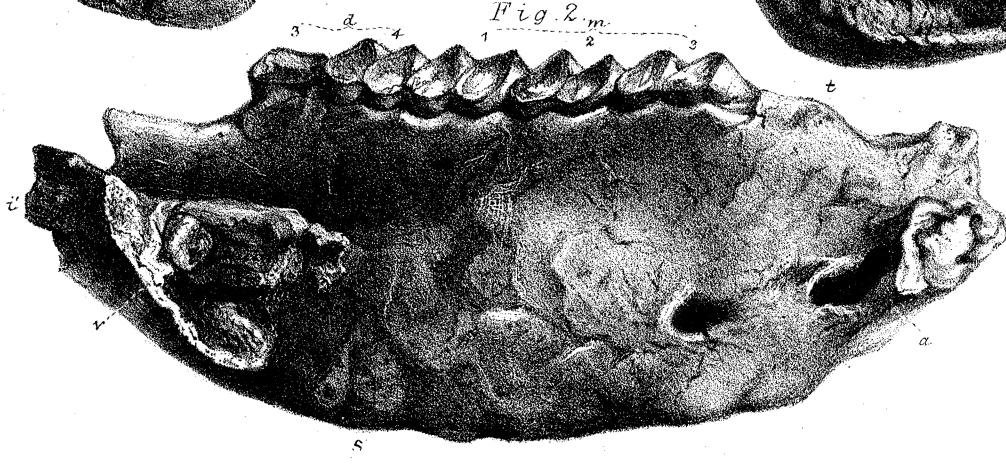


Fig. 4.

Fig. 5.

Fig. 2.



W. West & Co imp.

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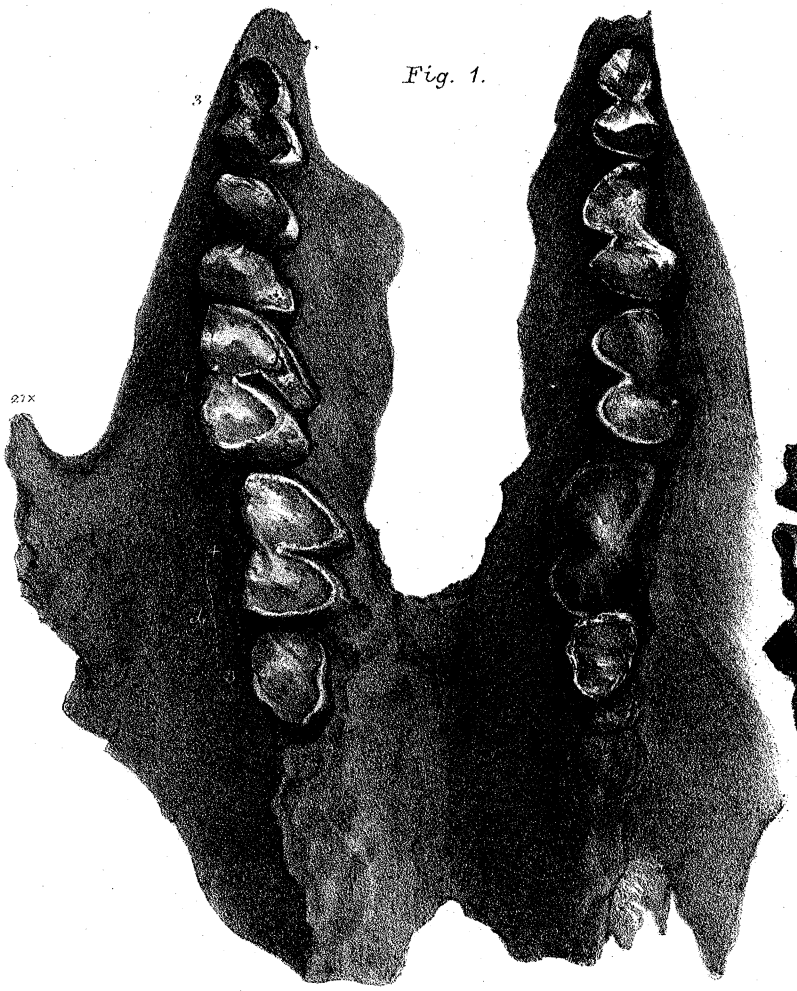

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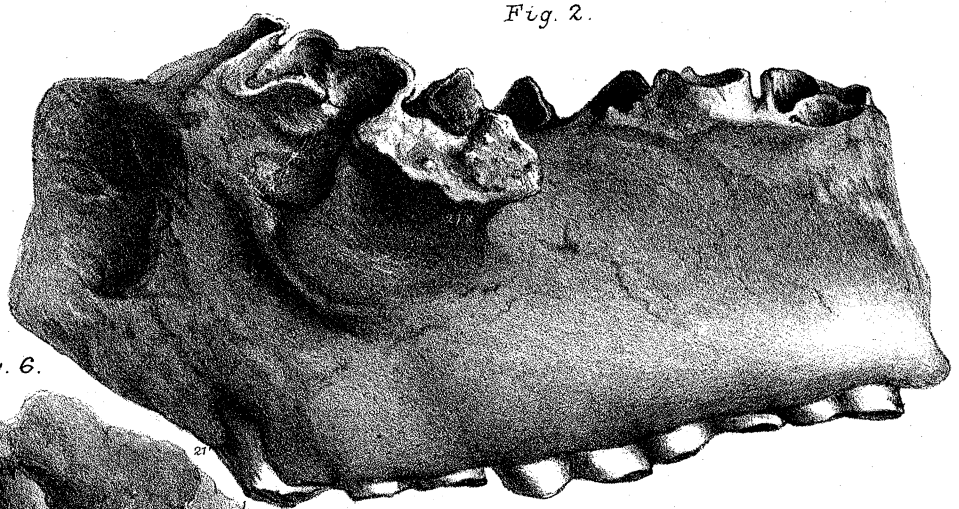


Fig. 6.

Fig. 3.

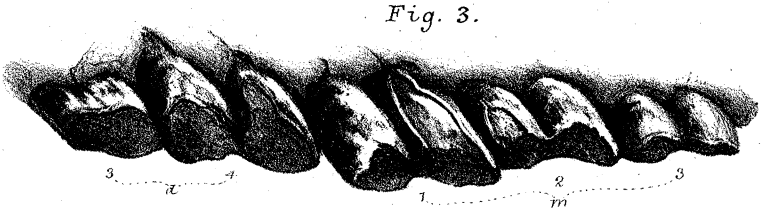
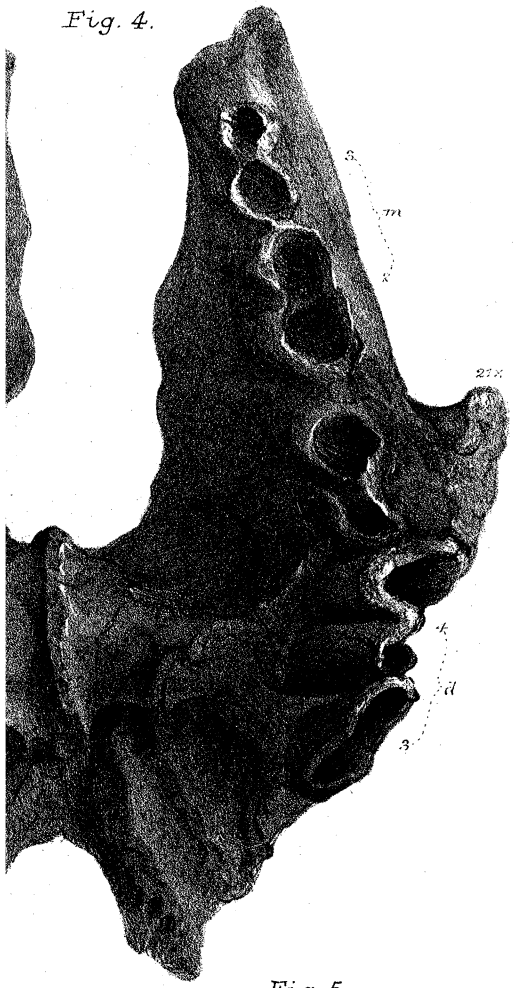


Fig. 7.

Fig. 4.



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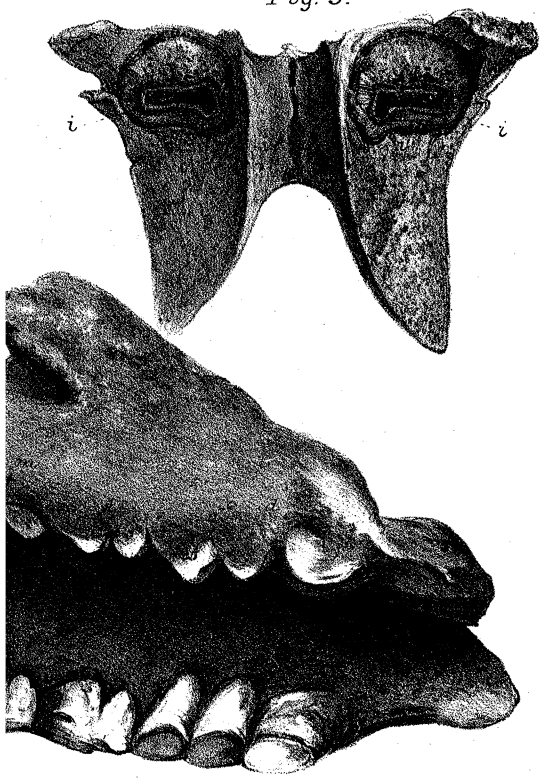

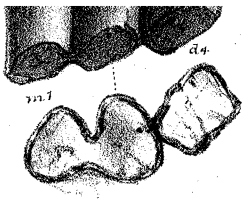
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3
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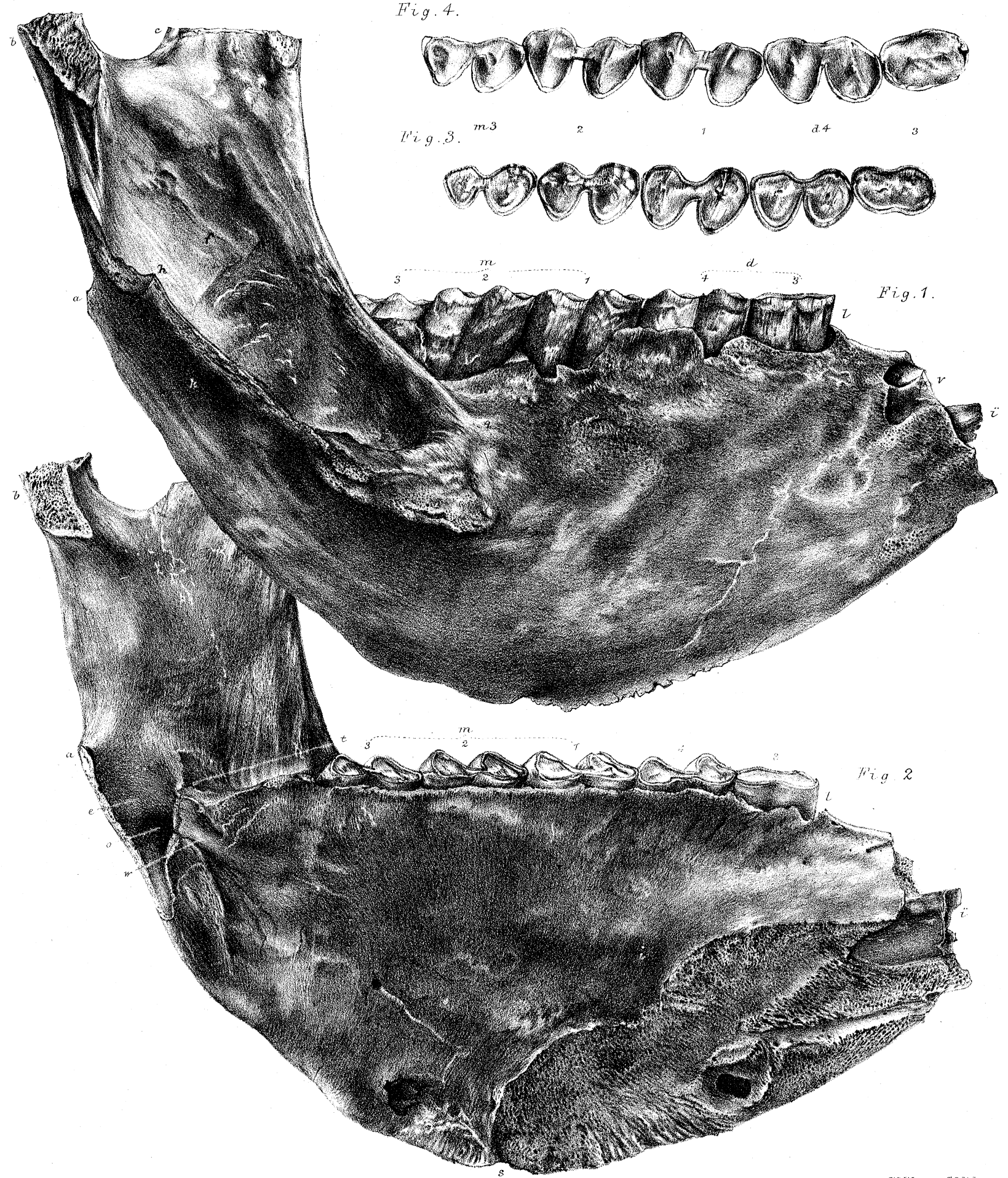
W. West & C.º lith.



Erxleben delt

W. West. & Co lith.

Fig. 4.

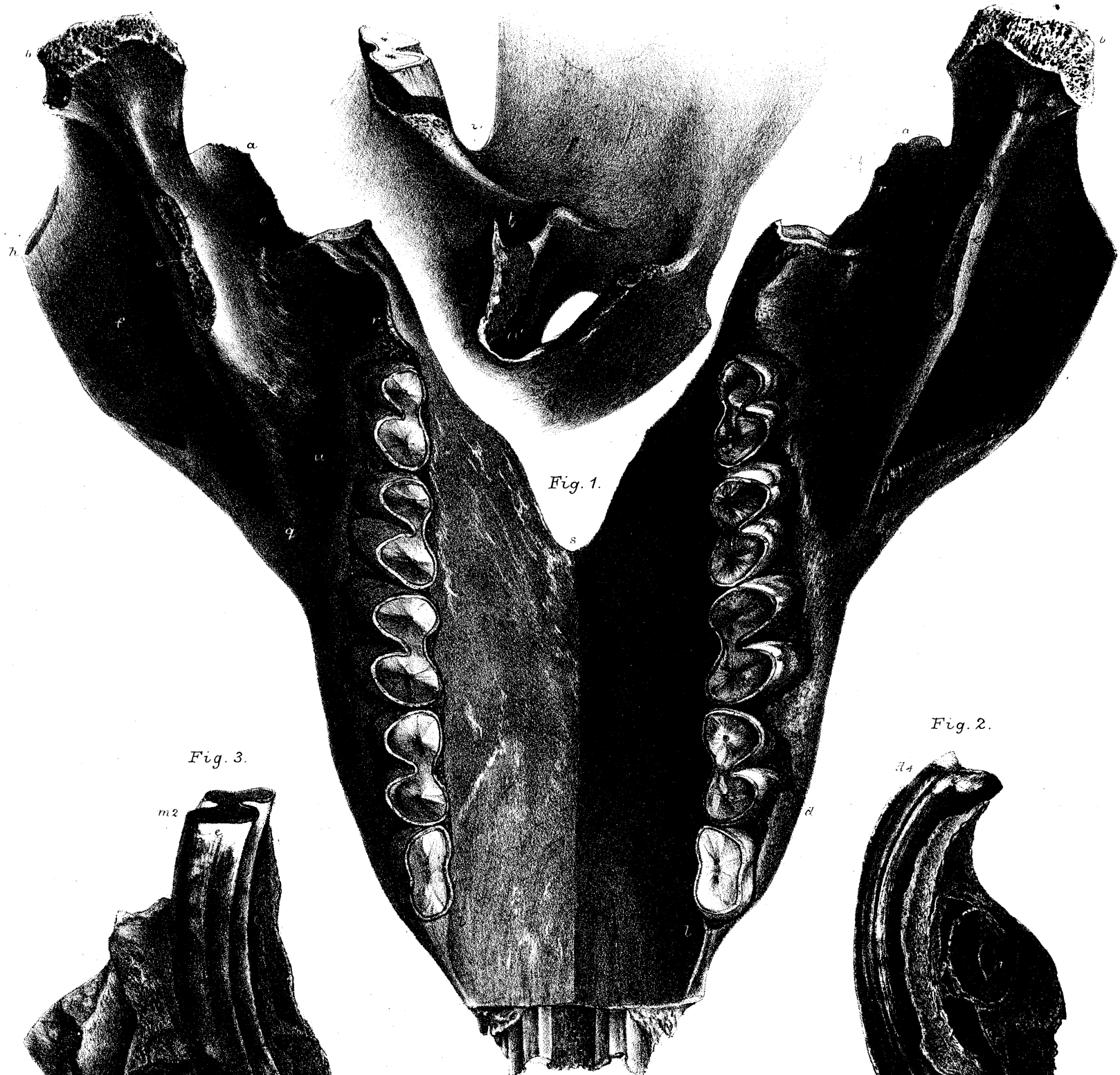


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 2.

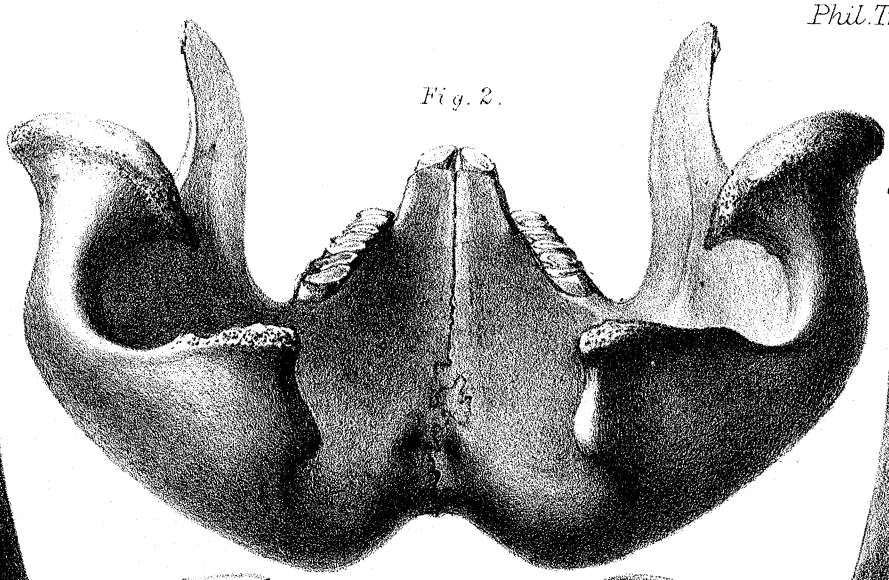


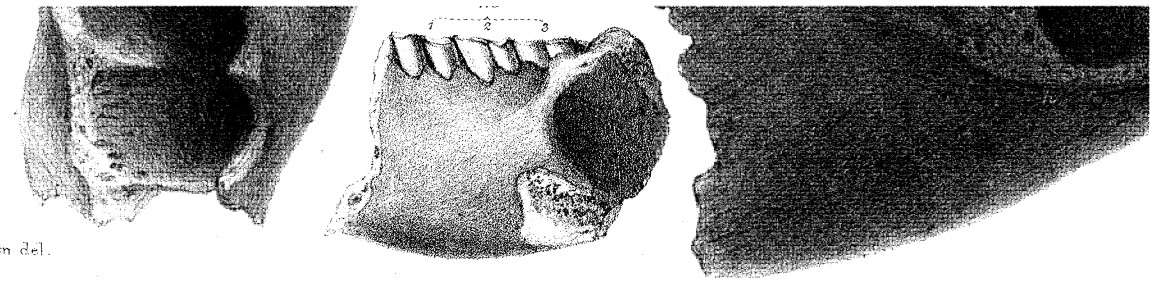
Fig. 6.

Fig. 4.

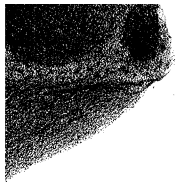
Fig. 3.

Fig. 5.

Fig. 1.



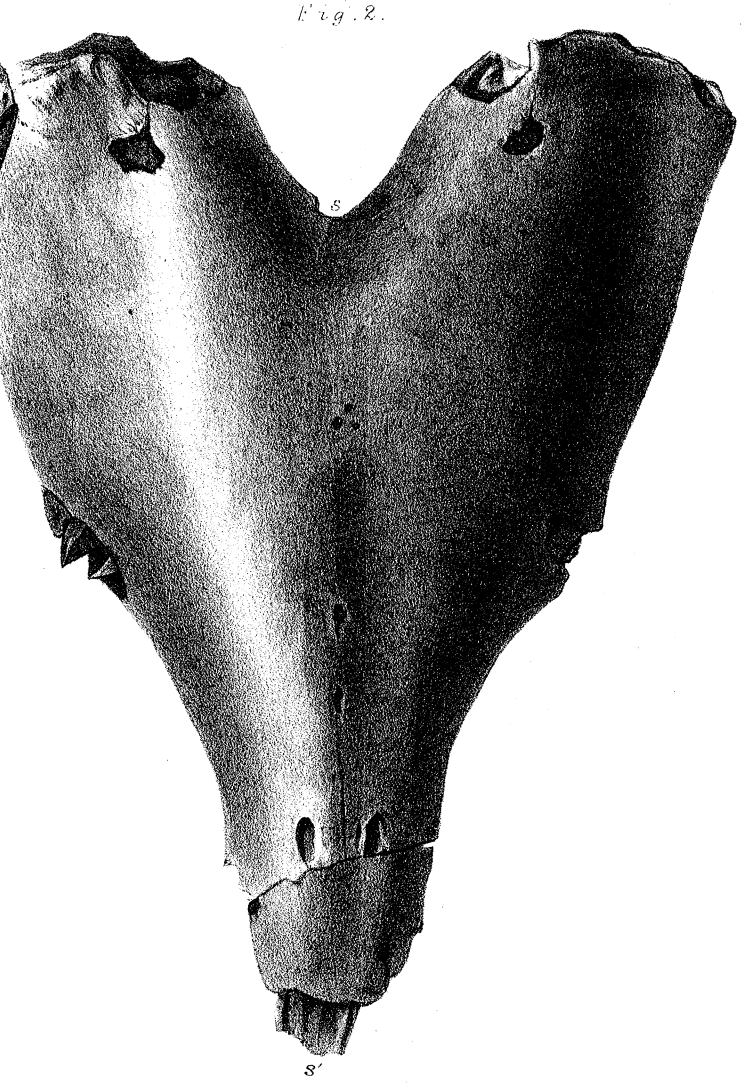
J. Barklaben del.



W. West & Co. lith.

Fig. 1.

Fig. 2.



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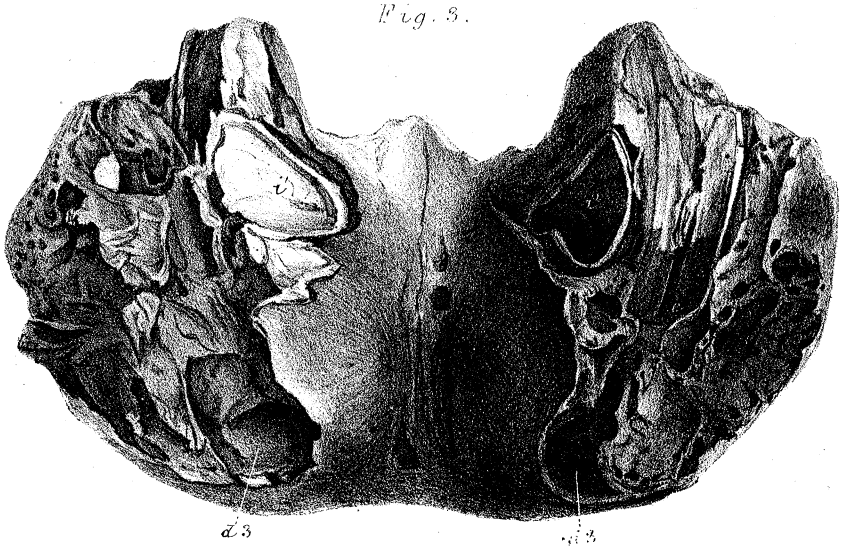

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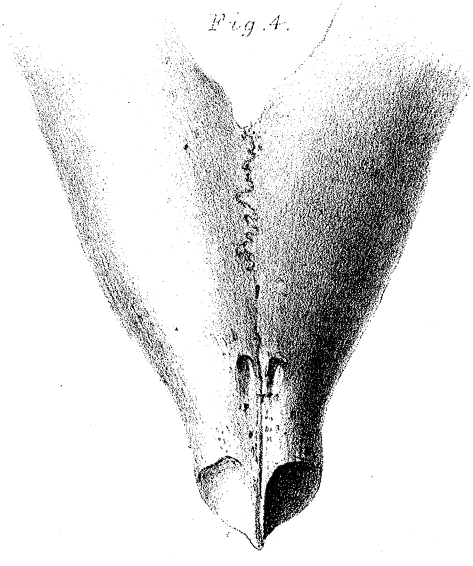
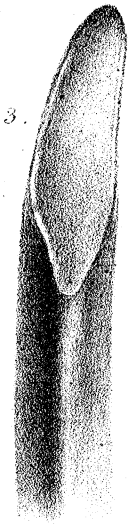


J. Erxleben del.

W. West & Co lith.

Fig. 3.



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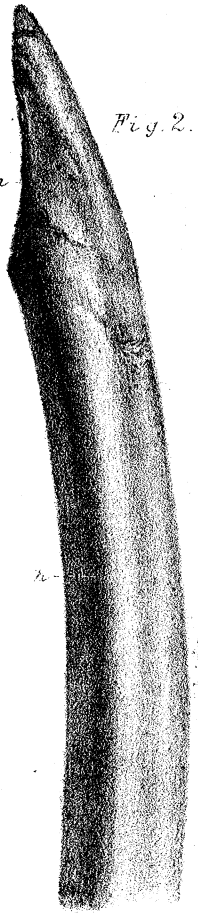

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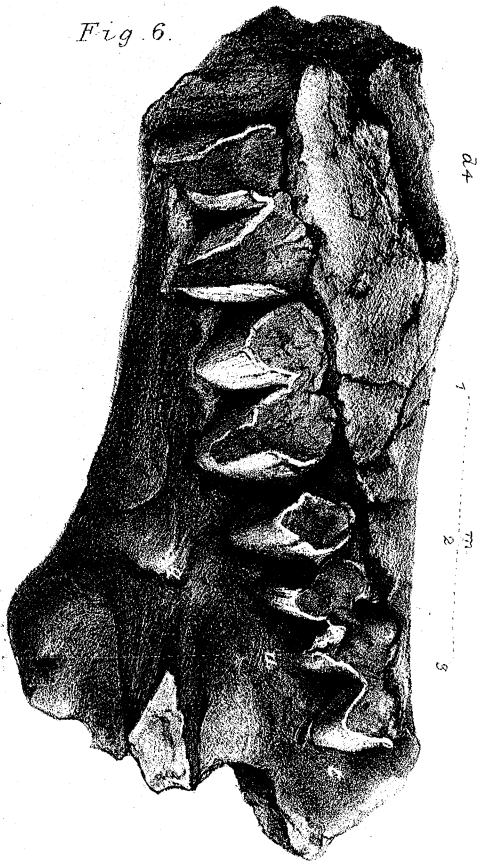
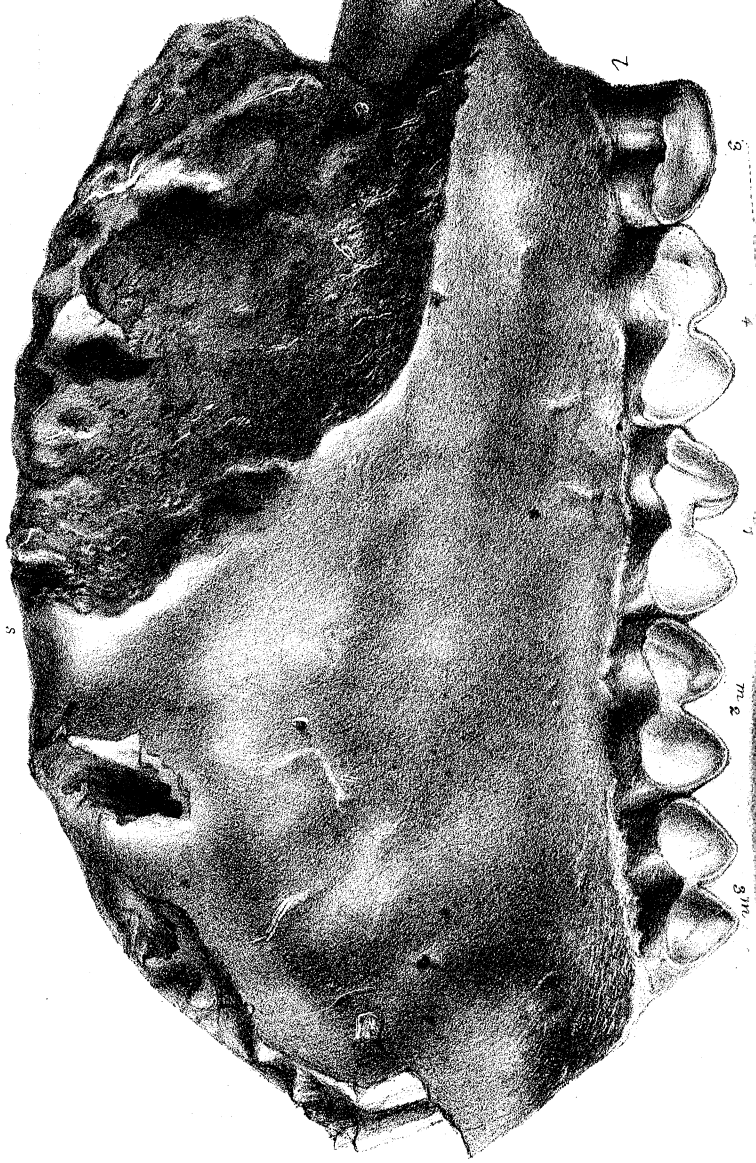


Fig. 4.

Fig. 1.



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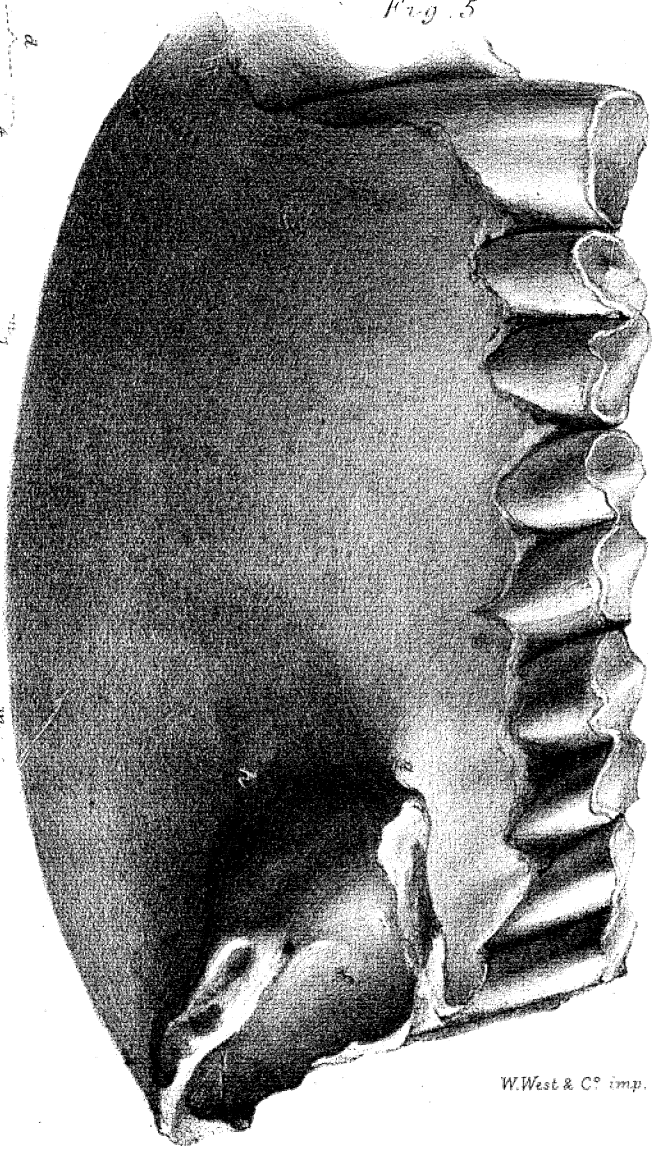
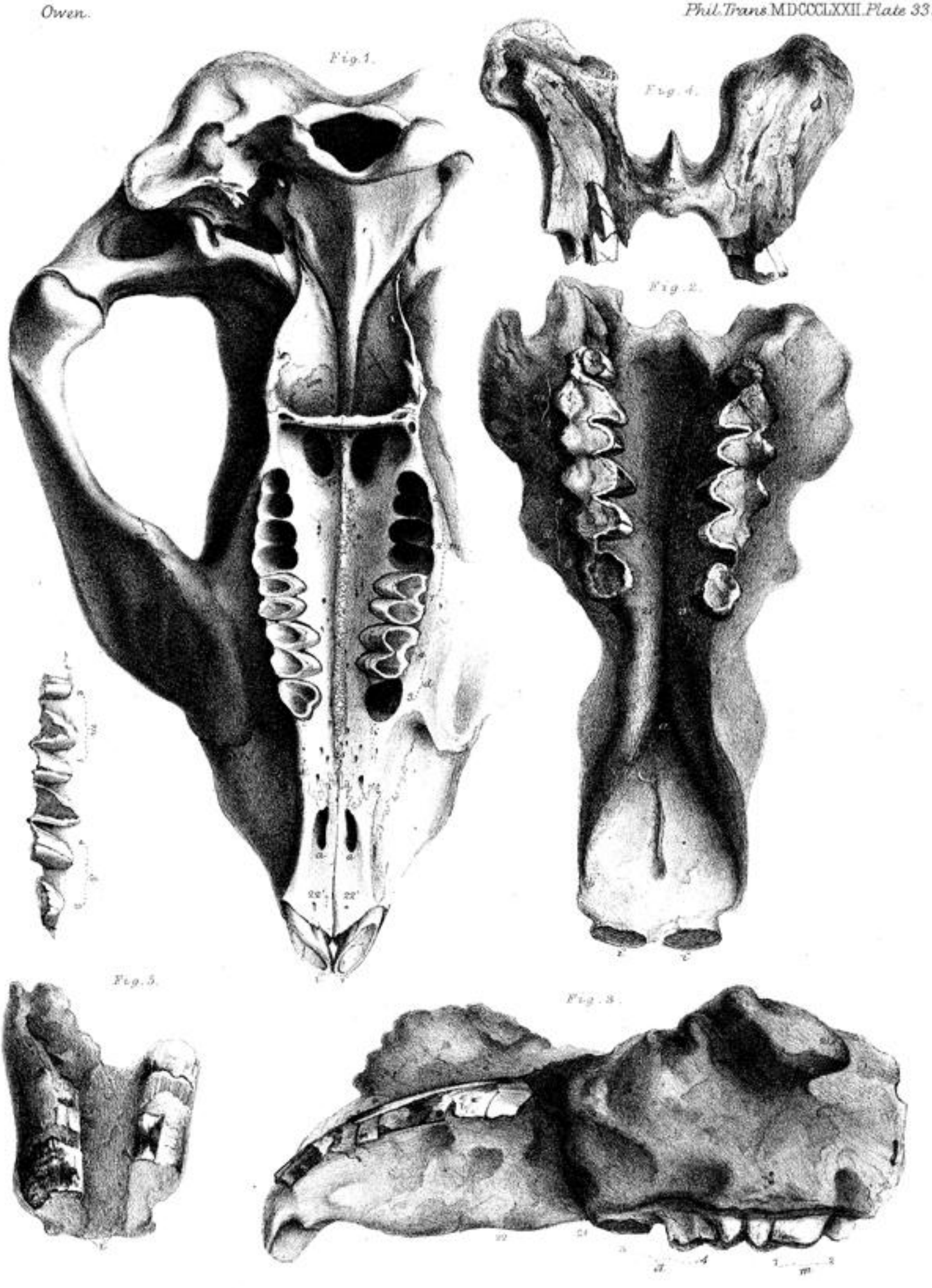


W. West & C° imp.



W. West & Co. lith.

Fig. 1.

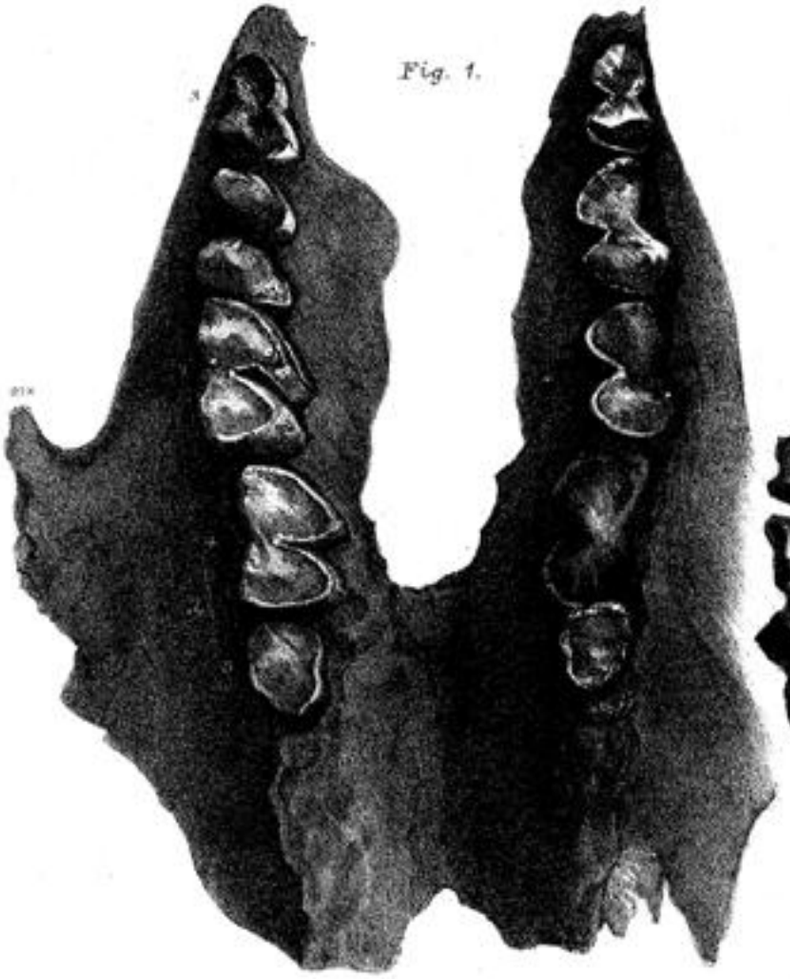


Fig. 4.

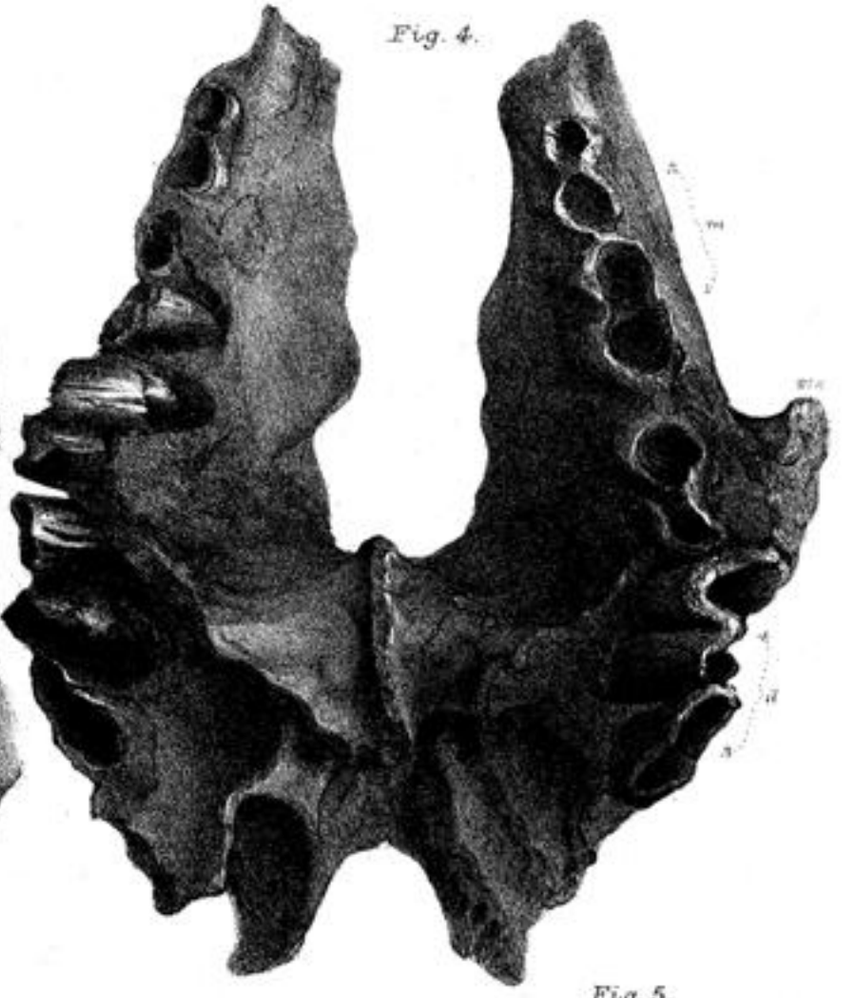


Fig. 5.

Fig. 2.

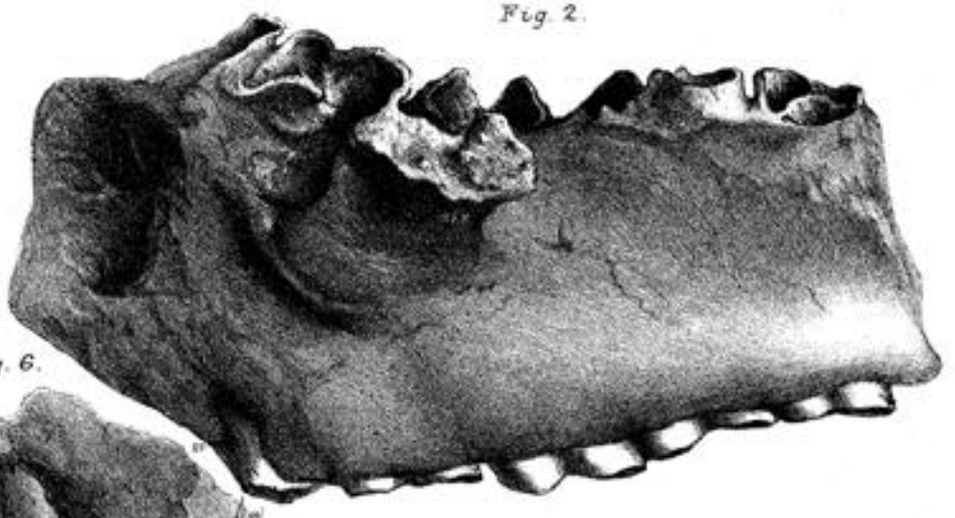


Fig. 6.

Fig. 7.

Fig. 3.

W. West & Co. lith.

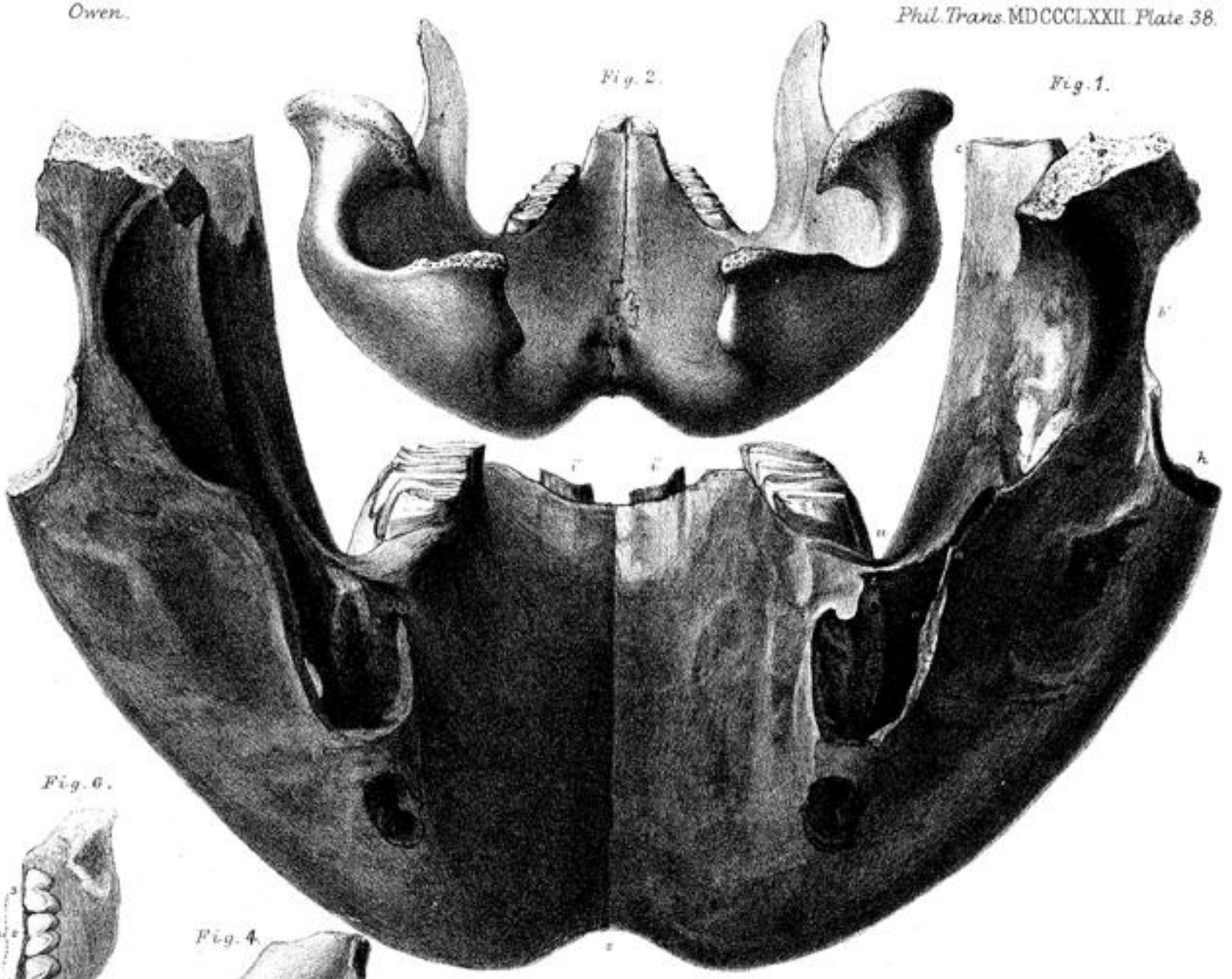


Fig. 6.

Fig. 4.

Fig. 3.

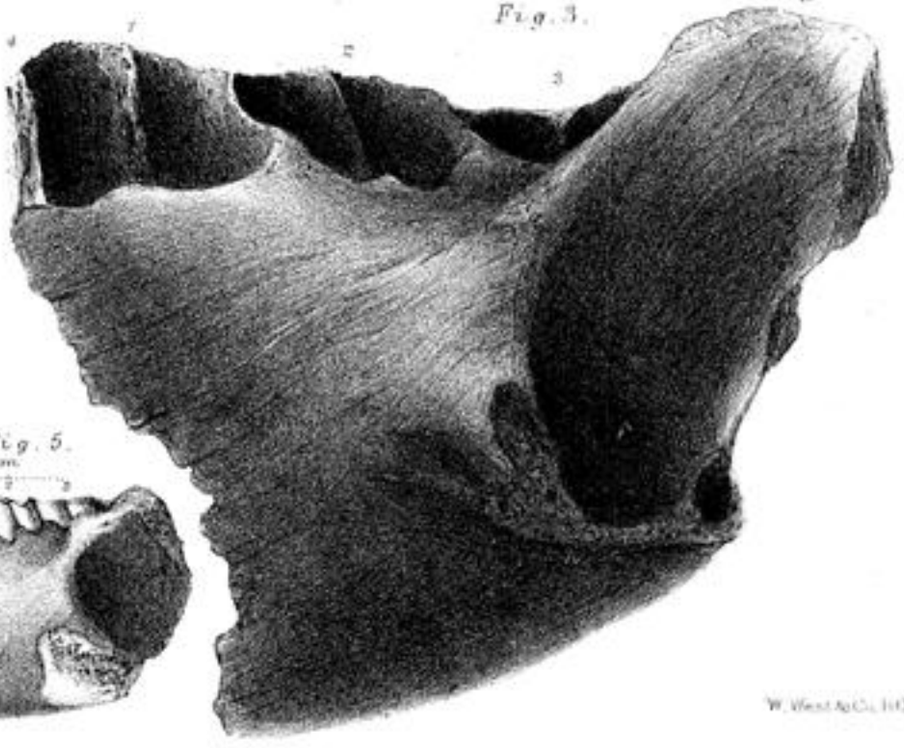


Fig. 5.