

PROCEEDINGS

OF THE

Cambridge Antiquarian Society.

26 OCTOBER 1914—24 MAY 1915

WITH

Communications

MADE TO THE SOCIETY

MICHAELMAS TERM, 1914, AND
LENT AND EASTER TERMS 1915.

No. LXVII.

BEING THE NINETEENTH VOLUME.

(THIRTEENTH VOLUME OF THE NEW SERIES.)



Cambridge:

DEIGHTON, BELL & CO.; BOWES & BOWES.

LONDON: G. BELL AND SONS, LTD.

1915

Price 7s. 6d. net.

ACOUSTIC VASES IN CHURCHES TRACED BACK TO
THE THEATRES AND ORACLES OF GREECE.

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(Read February 15, 1915.)

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A.

Introduction.

The oracles are dumb,
No voice or hideous hum
Runs through the arched roof in words deceiving.
Apollo from his shrine
Can no more divine
With hollow shriek the steep of Delphos leaving.
No nightly trance or breathed spell
Inspires the pale-eyed priest from the prophetic cell.

What had Milton in his mind when he wrote "hideous hum"? I have often asked that question, but have never received a satisfactory answer. The idea will hardly commend

itself to our notice that Milton, being like some common song writers, at a loss for a rhyme, put in a jingling alliteration which had no more meaning than if he had said "No voice, fi fe fo fum."

Moreover, a little further on he says:

In consecrated earth
And on the holy hearth
The Lars and Lemures moan with midnight plaint;
In urns and altars round
A drear and dying sound
Affrights the Flamens at their service quaint:
And the chill marble seems to sweat,
While each peculiar power foregoes his wonted seat.

What does he mean by the drear and dying sound which was heard in urns and around the altar? Why mention the *arched* roof and *hollow* shriek?

He was a fine classical scholar, familiar not only with the language but also with the literature of classic writers, and his long residence in Italy must have given him abundant opportunities of verifying or correcting impressions. The author of the great epic *Paradise Lost* and *Regained* cannot have passed with unobservant eye over any allusion to the relation of man to the unseen world.

Milton must have deliberately chosen those words and have believed that they would meet with an intelligent response in the minds of his readers.

In his time there must have been a belief that awe-inspiring noises accompanied the oracular responses and that moans seemed to issue from urns and altars in the midnight celebration of ancient mysteries.

B.

Decorative substitution.

Very often the use of an object is kept up although its structural intention has been lost sight of. It is traditionally repeated, and a simply decorative purpose or a real advantage, quite different from that of the original, is found to exist in it.

A good example we have frequently brought before us in the bases of mediaeval earthen vessels. When the thin clay bottom sagged, and caused the base to be round and unstable, a small bit of clay was stuck on, forming a sort of calkin, or the base of the vessel was pinched where necessary to produce the same result; then these impressions were made symmetrically or even all round, and, at last, they became merely an ornamental pattern of no use.

Or, to take a less obvious case, the best form of bracket for roof or ceiling is given by three pieces radiating upward from an upright beam as in the spring of a groined roof, and these became decorative and elaborated into the bucranium of the ancients or the cherubs of mediaeval times, which afterwards were often merely painted on.

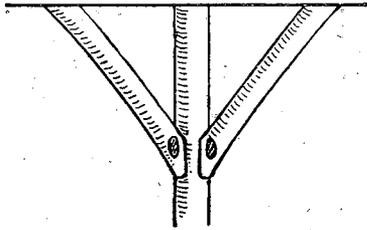


Fig. 1.

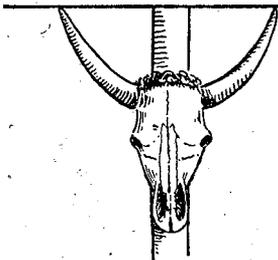


Fig. 2.



Fig. 3.

An urn was often built into the masonry of the fireplace as a charm against the house being burnt down. That might easily arise from the ancient custom of placing urns in the chancels of churches. When its use for resonance was lost sight of it was believed to be a protection against evil, and, if

placed by the altar of public worship, why not by the household ingle?

Why should we crave a hallowed spot?

An altar is in each man's cot.

WORDSWORTH.

C.

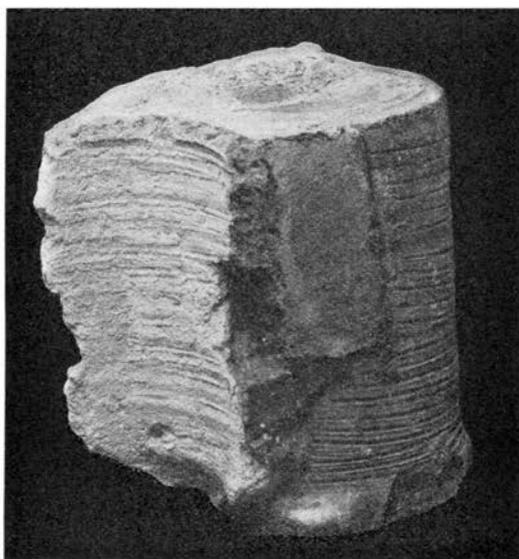
Urns, &c., built into arches for structural purposes.

There is no doubt that earthenware pipes can be advantageously used for building, and have been so used, especially in arches where strength and lightness were required.

I exhibit some cylindrical vessels (Plate XVII) which were found built into that portion of the arched roof of Cockerell's Building, at the University Library, that was removed to make way for the staircase.

They are $7\frac{1}{2}$ inches long by $4\frac{3}{4}$ inches in diameter and somewhat resemble a beretta in form, only that they are higher in proportion to their diameter. They are circular at one end, but at the other they are flattened into a four-sided figure measuring $4\frac{3}{4}$ inches each way. Both ends are closed; the square end has a slight depression in it, and the circular end has a hole in it $\frac{3}{4}$ of an inch across like that in the bottom of a flower pot. The exterior is covered with grooves irregularly produced by marking the clay when soft with a pointed instrument. This was probably to help the adhesion of the mortar in which they were imbedded.

These cylinders certainly do look as if they had been made to serve some such purpose as the production of resonance, and I know of no other object with which to suggest comparison. But, whatever they may have been originally made for, it was clear from their manner of occurrence in the masonry that they cannot possibly have been put into Cockerell's Building for acoustic purposes: they appeared to have been carefully built in to add to the mass and the strength without increasing the weight to the same extent as would solid stone, bricks or mortar. It is most probable that these earthen cylinders came from some earlier building where they had been built in for acoustic purposes, and were used with other old material in the



Earthen Vessels from Cockerell's Building.

erection of Cockerell's Building and put where they would lighten without weakening the arched roof.

With these specimens before us it is very interesting to read the following descriptions¹. The first is of one of the tubes or hollow cylindrical bricks of red terra-cotta discovered among the ruins of the tomb of the Scipios in the Via Appia at Rome. It measures seven inches in length, and about two inches and a quarter in diameter; it is surrounded by a spiral channel to afford a firm holding for the mortar; and at the closed end there is a conical spike which fitted into the open mouth of the next brick.

Another from the church of S. Vitalis at Ravenna "is of red terra-cotta slightly curved to coincide with the arc of the cupola. There is a broad spiral groove on the exterior, and the usual short conic stem or spike at the hollow end. It is nine inches and three-eighths in length and two inches and three-fourths in diameter."

At Arles, Strasburg, and in many Spanish churches, horns and pots and vases have been found built into the vaulted roofs. "Some have supposed that these vessels were placed there for acoustic purposes, the idea being drawn from the *Echea* of the Greek and Roman theatres, but there can be little doubt that in these cases they were introduced for the sake of lightness."

Another example from London Wall is given by the same author, and is worth quoting because the description agrees almost exactly with that of our hollow bricks from Cockerell's Building. It measures, he says, "seven inches and a half in height, and weighs three pounds and half an ounce; it is square at top and four inches in diameter, the lower end circular, impressed with five concentric rings, and having an orifice in its centre, seven-eighths of an inch in diameter. The cylindrical body of the brick is scored with a sharp instrument, not for the sake of ornament, but as a key for the mortar, some of which still adheres to the surface, and might pass for Roman Cement. It has been thought by some that the arch of which this specimen is a portion was the remains of a music room, the

¹ H. Syer Cuming, *Journ. Brit. Archaeol. Assoc.*, Vol. XVI. (Proc.), pp. 359-363.

hollow bricks serving for echea," but others were of opinion that these bricks were made hollow simply for the sake of lightness.

Hollow, or, as they are sometimes called "bottle" bricks, and "cones," were extensively employed in the eighteenth and nineteenth centuries in London and Liverpool for lightening the masonry in public buildings.

"In Upper Egypt, the walls of the peasants' houses are very frequently constructed in part of jars placed one over the other, and cemented together with mud. In walls of inclosures, or in such as require only a slight roof, the upper part is very generally formed of the same materials...." As "pot walls were in common use by the ancient inhabitants, the large mounds of broken pottery may be satisfactorily accounted for¹."

"The Roman builders introduced vessels and tubes into their noblest edifices²."

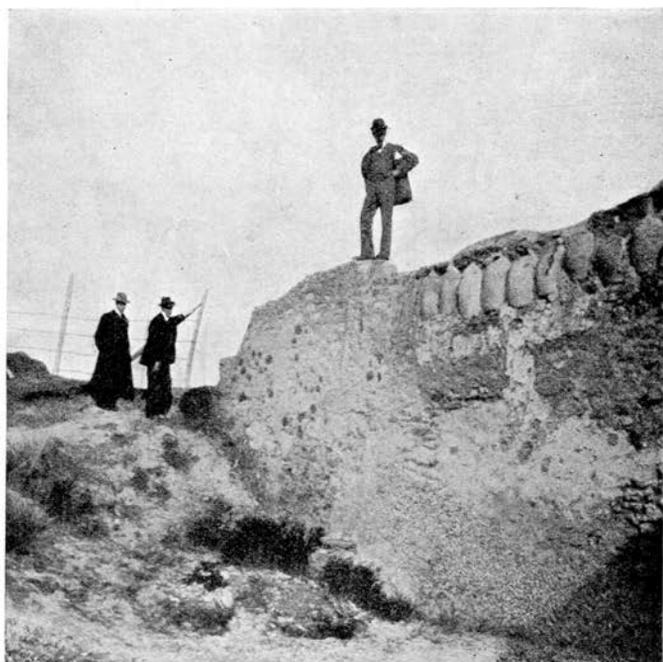
I have here (Plate XVIII) a photograph taken by Mrs Hughes of the interior of a room in Pompeii where there is a row of narrow amphorae carefully placed in a vertical position with the mouth up and built into the top of one of the walls. Whenever we have had good reason for believing that such objects were built in in this country to give strength with lightness they appear to have been laid sideways, but in the east, where the traditions of a remote past still linger, such vessels are often connected by rods and projecting points fitting into corresponding hollows in the adjoining tube in such a manner as to suggest that they represent the jointed bamboos of which their houses were originally built.

From this common use of urns in building it is probable that the wind was often heard whistling and sighing in them and producing musical notes, and this may have suggested their introduction into the surroundings of shrines and temples and at last into Christian churches.

At any rate there they are found, whatever may have been the object in putting them in.

¹ Burekhardt, *Travels in Nubia*, Vol. I. p. 94, 1822.

² H. Syer Cuming, *Journ. Brit. Archaeol. Assoc.*, Vol. XVI. (1860), p. 360. Seroux d'Agincourt, *The History of Art by its Monuments*, Vol. I.



Amphorae built into wall of room in Pompeii. From a photograph by Mrs Hughes.

D.

Hollow bodies placed under floors and in walls to improve sound.

Those who are familiar with rocky mountain paths must often have noticed that their footfall calls forth in places a hollow booming answer, which is due generally to the washing out of the earth from between the stones by subterranean runlets leaving the fragments supported by one another with empty interstitial spaces.

Brewster¹ says "a remarkable subterranean echo is often heard when the hoof of a horse or the wheels of a carriage pass over particular spots of ground. This sound is frequently very similar to that which is produced in passing over an arch or vault." He refers it to the reflection of the sound from the surfaces of broken rock having hollows "left entirely empty or filled up with materials of different density" from which there arises "a great number of echoes reaching the ear in rapid succession, and forming by their union a hollow rumbling sound."

He then describes the peculiar hollow sound which I have myself often heard when a particular place in the great crater near Pozzuoli is struck violently by throwing a large stone against it².

This very appreciable effect is produced by the existence of hollow spaces yielding echoing sounds to blows, and is called *repercussion* or *reverberation*.

But when we get the note played on a violin reproduced on another violin attuned to it; or the notes of a chord, sung in arpeggio, blended in harmony in a domed roof; or sounds bellowing through a cavern, or whispered from a bronze or earthen vessel, then we have something different, to which we must restrict the name *resonance*.

The Rev. T. Whiteside told me an interesting story which shows the prevalence of the belief that hollow objects placed

¹ Brewster, Sir David, *Letters on Natural Magic*, 1883, Letter VII, p. 224.

² Herschel. Dauberry, *Description of Volcanoes*, p. 170. Forbes, *Edin. Journ. Sci.*, n.s. No. 1, p. 124. Scrope, "Considerations on volcanoes, &c.," *Edin. Journ. Sci.*, No. 20, p. 261, and No. 14, p. 265.

beneath the floor would aid and improve musical notes produced in the room above them.

His story is this: "My father about the year 1860, when he was Perpetual Curate of Thrimby... while visiting at Thrimby Hall (Nicholsons)..., saw in the garden a heap of horses' heads which were now discoloured by exposure. On enquiry he was told they had been taken from under the parlour floor, where they had been placed for purposes of sound by the tenants who were a musical family.... The heads were supposed to have been collected after a skirmish at Clifton Moor." I exhibit one of them.

The boards on the ground floor would probably gape enough to allow the air and sound to pass freely through, and therefore there may have been resonance as well as reverberation in this case, and we must remember this when we come to consider the amphorae under the floor in the Vestal Virgins' room (see p. 82).

Mr Thomas Blashill¹ gives two similar cases.

"The idea," he says, "that an object of some kind, of a hollow form, might be used in building for increasing and improving sound has been carried out at a much later date" than that which had been assigned to the custom. "One curious instance," he adds, "impressed itself very much on my mind. The objects used in the instance to which I refer were not pots, but the skulls of horses. Any one who knows the anatomy of the horse knows that there are very large cavities in [horses'] skulls, in fact they are most remarkable and peculiar in that respect; and therefore if the skull of any animal be fit for such a purpose, that one would be selected. Thirty years ago I was present at a gathering in a large room in an old inn, called the Portway, about eight miles west of Hereford. Something brought the matter to the recollection of the landlord, and he stated that the floor of the room in which we were sitting was laid over a quantity of horses' skulls; he had been told indeed that two cartloads had been put there. I asked the reason, and he said 'to make the fiddle go better.' It was a place where music and dancing sometimes went on. I was

¹ *Trans. R. Inst. Brit. Architects*, 1882, p. 83.

there two or three years ago, and they were altering the building. The place was surrounded by scaffolding, and on the top of every scaffold pole was a horse's skull. It was a nine-days' wonder, and the workmen had decorated the building with these strange objects. The way they were found was thus: Twenty-four of them were screwed through the eye-holes to the under-side of the floor-boards in three rows. It was the ground floor, and nine of them were too much decayed to be examined. It would be necessary to test that room both with and without the skulls, and therefore I cannot say whether they made any difference.

"I remember also," Mr Blashill goes on to say, "a paragraph in the papers about twelve or fifteen years since, where it was mentioned that in removing a floor, I think it was in Lancashire, the main beam was found to have been laid on horses' skulls."

It will be noticed that the skull from Thrimby has been chipped on one side as if to make it lie close and evenly against the boards.

Few people would notice and fewer place on record such occurrences. Since I read this paper Dr Holden of Sudbury has sent me the following:

"In 1908 an old brick and stone wall, which was the only surviving part of the ruins of the Dominican Friary at Sudbury—dating 1272—had to be demolished; a layer of bones was found, laid the length of the wall (20 feet) and two feet above the ground. The bones were chiefly the tibias of the small ox of that period."

E.

Urns placed in walls for resonance.

What we have arrived at so far is that urns and other hollow bodies were built into masonry where lightness was sought combined with strength, and that hollow objects were placed under floors in the belief that that would assist music in the room above.

I pass over the methods of deception which Brewster¹ has so fully described, and we will now consider cases where there is good reason for the explanation that vessels were put in for acoustic purposes.

These have been found in various positions according to the shape and character of that part of the building in which they were placed. Some are said to have had the mouth of the urn or cylinder opening on the outside of the building, and this may explain the statement that they were used as dove-cots.

It may be that the effect of the voice or of the rising and falling wind upon some of these hollow bricks may have suggested the idea of putting them in on purpose to produce resonance.

The architect Vitruvius gave exact instructions how to place in a theatre bronze vessels so attuned, according to commentators², as to respond some to one, some to other notes in the actors' voices, and increase their audibility.

His are the only clear descriptions of what was aimed at, and what was achieved, and from him everybody traces the placing of vases in public buildings down to comparatively recent times and back to the theatres of Rome and Greece and to the awe-inspiring rituals of the earliest ages.

Vitruvius says that there was no arrangement of vases to give resonance in the Roman theatres, because these were chiefly constructed of wood, which is very resonant. But we require more knowledge of the details. Canon Pemberton tells me that the panelled room now occupied by the hospitable Vice-Master of Trinity, and therefore well known to almost everybody, is the worst room for music that he has ever played in.

Vitruvius does not bring forward a new acoustic scheme for assisting and improving the propagation of sound. He records a system in use; and there is much to suggest that it was widely used³.

¹ *Letters on Natural Magic*, 1833, Letter vii.

² Cf. *The Dictionary of Architecture*, Architectural Publication Soc., Vol. III., sub voc. "Echeium."

³ See Brash, R. R., *The Gentleman's Magazine*, Dec. 1863.

In many of the examples cited of hollow objects placed under floors there is an obvious similarity to the system described by Vitruvius where the tilted bells communicated by passages with the open theatre.

There are however a number of cases on record in which vessels have been found inserted in the masonry of churches in such a manner as to give the impression that some sort of resonance was aimed at, although the possibility of producing it was often destroyed in later times by plastering over or otherwise covering the mouth of the vessel when the utility or desirability of the structure was questioned.

In the fifteenth century earthenware pots were placed in the walls of the church of the Célestins at Metz¹, and it is on record that they were put in in order to give resonance and assist the singing, and in 1665 the Abbé Cochet² complains that the choirs of religious houses are so fitted with jars in the vaults and in the walls that six voices there make as much noise as forty elsewhere.

Here again some difficulties have to be explained. Many of the most remarkable examples have the urns so placed or so covered as to render them useless for producing resonance.

In most of these cases it is probable that they were built in by workmen who had no knowledge of the way in which they became effective, and ignorantly carried out incomplete instructions; while in other cases they may have reconciled their work to themselves by noting that hollow spaces when struck produced by reverberation loud booming noises, and there is no doubt that for intoning or recitative the reverberation produced by percussion from hollow spaces as well as by resonance from open chambers properly adjusted and attuned would effectively add to the volume of sound.

When, however, attention had been called to the frequent discovery of vases built into the walls of churches and discussion had arisen as to their purpose the custom was not always dismissed as an attempt to impose upon an ignorant and credulous

¹ Didron, *Annales Archéologiques*, Vol. xxii. 1862, p. 224.

² *Précis Analytique des Travaux de l'Académie Impériale de Rouen*, 1863-4, Rouen, Boissel.

public—"jouyr à plaisir aux foux"—or as a ridiculous notion—"ecce risu digna¹," but the subject was from time to time brought forward in the press or at meetings of Archaeological Societies.



Fig. 7.



Fig. 8.



Fig. 9.

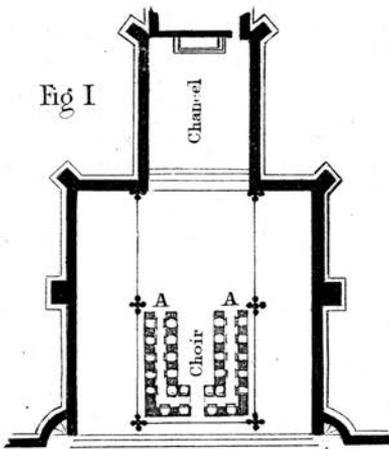


Fig. 10.

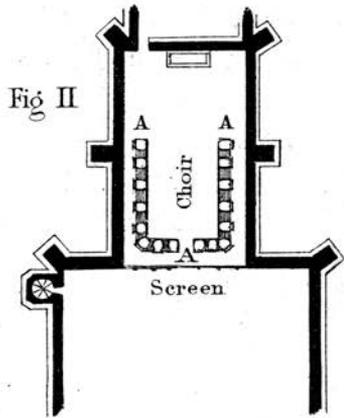
The paper by the Rev. G. W. W. Minns² is of exceptional interest because it gives the results of enquiries from original

¹ *Chronicle of the Cèlestins of Metz, 1432*. Bouteiller, Ernest de, 1862, *Notice sur le Couvent des Cèlestins de Metz*. Didron, *Annales Archéologiques*, 1862. Viollet-le-Duc, *Dictionnaire raisonné de l'Architecture Française*.

² *Norfolk Archaeology*, Vol. vii. 1872, p. 93; cf. *ib.* iv. p. 352; vi. p. 382; viii. 1879, p. 331. Cf. also Phipson, *The Builder*, 1863, p. 893.



Plan. St. Peter's Mancroft.



St. Peter's per Moutergate.

AA. Scite of Trench & Wall containing Acoustic Jars.

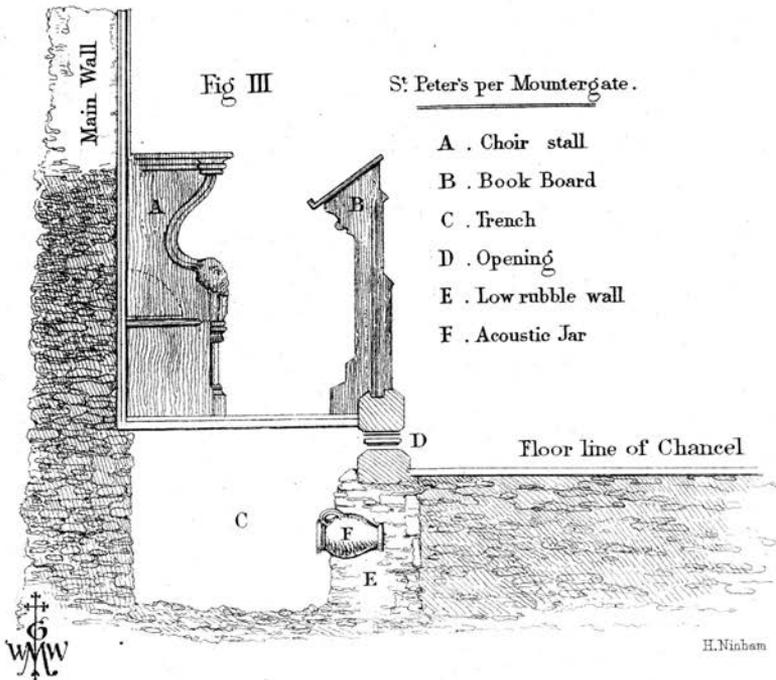


Fig III

St. Peter's per Moutergate.

- A . Choir stall
- B . Book Board
- C . Trench
- D . Opening
- E . Low rubble wall
- F . Acoustic Jar

H.Ninham

ACOUSTIC POTTERY IN NORWICH CHURCHES.

observers with illustrations of the manner of occurrence of the vessels. Some of these pictures, reproduced from the original blocks, I am able to give by the kindness of the author and through the good offices of his son, our Præsident.

After a short notice of previous observations he describes the vessels found embedded in masonry under the seats in the choir of the churches of St Peter Mancroft and St Peter Mountergate in Norwich. The vessels in this case were jugs and jars such as were in common use in the fourteenth century

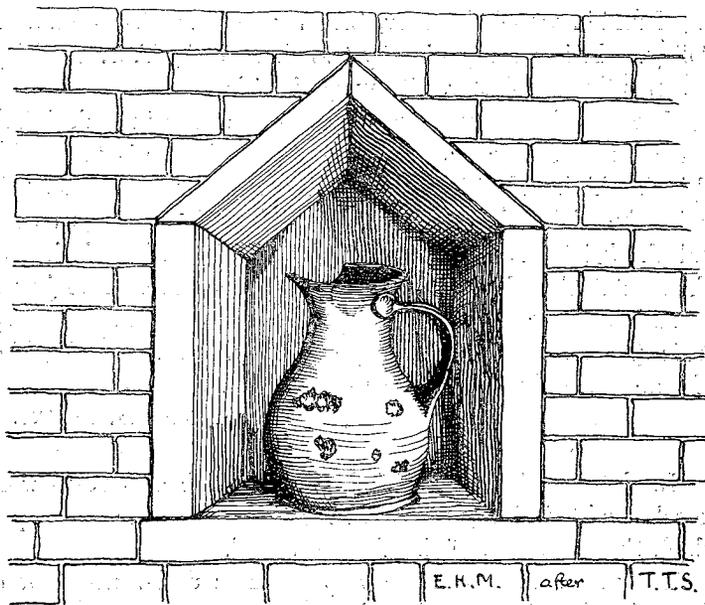


Fig. 11.

(Figs. 7, 8, 9, 10, p. 74) and were built into the walls of passages with the mouths of the vessels opening into the passages and the passages opening into the choir, as shown in Figs. I, II, III on Plate XIX.

Our Præsident has also kindly furnished the following description of the discovery of acoustic vases in the Chapel of Pembroke College. This also is of special interest not only because it refers to a local discovery, but also because the jug

(Fig. 11) which he exhibited obviously belongs to the fourteenth century.

“This jug, with six others, was found in the north wall of the Old Library of Pembroke College during the restorations of 1881. They were all found in similar situations to the accompanying rough sketch which I sketched on the spot.”

T. T. S.

“The above note gives all that can be recovered as to the jugs found in the Old Library, formerly the Chapel, of Pembroke College. It is accompanied by two sketches by T. T. Stoakley, formerly College Porter. They are in fair agreement with one another, and the above figure follows them even in such details as the size of the bricks about the niche. As the jug measures $9\frac{1}{2}$ inches high and $6\frac{1}{2}$ inches across its greatest width, this would make the niche about $16\frac{1}{2}$ inches high and 12 inches across, and the bricks as represented $1\frac{1}{2}$ by 4 inches, which is impossible. But the niche is probably fairly accurate. The jug is of hard black ware, and is ascribed to the fourteenth century. It is preserved in the College Library. I think Stoakley told me once that the niches were under the floor.”

ELLIS H. MINNS.

In the church of St Nicholas¹ in Ipswich also there were vessels found similarly placed in the sides of sleeper walls upon which the wood floor of the chancel rested.

The much discussed discovery of vases under the floor of Fountains Abbey² is another similar case.

All these appear to be attempts to carry out Vitruvius' system, and indicate the belief in the efficacy of intramural resonators.

Mr Gordon M. Hills³ has contributed an admirable description of the character and mode of occurrence of many of the

¹ *Journ. Arch. Inst.*, Vol. vi. 1849, p. 76; 1855, p. 276.

² Walbran, M. R., *The Builder*, 1854, pp. 342, 343; *Trans. Yorks. Architect. Soc.* 1854-5; Ripon, Studley, Fountains Abbey, Harrogate, &c., 1862.

³ *Trans. R. Inst. British Architects*, Session 1881-2, p. 65.

vessels commonly called acoustic vases which have been found embedded in the masonry of churches.

In the church of St Laurent-en-Caux, Dondeville, there was a vase in one of the angles of the choir, entirely enveloped in mortar. It was conical at one end, flat at the other, and was closed at both ends, but it had a sort of spout which appeared at the surface of the wall¹. I am able to reproduce a figure of this vessel (Fig. 12) from the block prepared in illustration of the paper by the Rev. G. W. W. Minns.

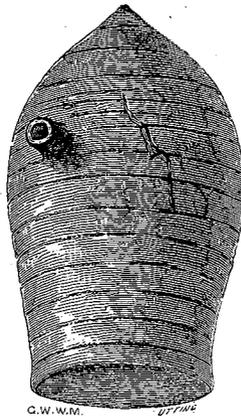


Fig. 12.

Viollet-le-Duc² says that he has frequently seen the "acoustic pots" in the choirs of churches of the twelfth and thirteenth centuries.

In the church of St Olave at Chichester jars were found built into the east-end wall of the chancel. The jars were placed on their sides, the mouths facing inwards to the church. The east window was of the fourteenth century.

Just above a thirteenth century arcade in the chancel of Denford Church in Northamptonshire there were openings in the stone facings of the wall within which were the mouths of jars lying on their sides.

¹ Crochet, *op. cit.* Minns, *op. cit.* p. 97.

² *Dictionnaire*, Article "Pots acoustiques."

In St Clement's Church at Sandwich in Kent a similar discovery was made, but here the pots were filled with mortar.

Some of these urns have been put under the floor, some in the walls, and some in the arches.

Some have been placed with the mouth of the vase opening into the building, some with the whole vessel so buried in masonry as to throw doubt upon the idea of their having been intended to produce resonance, and some have the neck turned towards the interior of the building, but have been plastered over or covered with a slip of wood and then plastered over.

The simple explanation seems to be that some have been used according to a well-known ancient method of construction in order to give body and strength with lightness of material to vaults and arches—that some have been placed there with a view to aiding the propagation of sound as suggested in certain cases by experience and supported by scientific instructions; while others are found where neither of these objects could be attained, and we must assume that they were put in in ignorance according to a misunderstood traditional method, or subsequently plastered over at the open end, or filled up altogether, or perhaps moved from their original position.

It does not appear to be necessary that the vessels should be embedded in masonry; indeed we may suppose that in some situations they would be more effective if they stood free in suitably constructed openings in the wall. The grey earthen jugs found in the old chapel, now the Library of Pembroke, stood in the north wall of the chapel in separate small recesses, the character of which is shown in Fig. 11.

There are many examples of the occurrence of such recesses which various authors¹ have assumed to have been intended for the reception of vases.

Behind all these examples we may fairly look for earlier practices dimly shadowing forth some scientific idea which was dying out for want of the support which would be gained by proved efficiency, but large enough and certain enough to make it worth following up.

One source of error in the examination of these instances is

¹ Hills, *op. cit.* p. 67.

that it is often difficult to determine whether the vessels are found where and how they were originally placed: for, if they were originally tilted like the bell-shaped vases of Vitruvius, or if they had been originally placed with open mouths opening into open cavities, though subsequently covered with mortar, they come under the head of disused resonators, rather than reverberators, that is hollow spaces giving out booming sounds under the influence of percussion. Of these last I do not think I can offer any satisfactory examples in mediæval times.

F.

Resonators and Echoes on Oracular Sites.

If then we can trace this belief back to the time of Vitruvius and find that he was only explaining a system then in widespread use, let us see how far the ancient cults made use of the solemnizing influence of strange sounds to control the unruly faith of novices and compel the acceptance of the priests' interpretation of what the suppliant himself had heard but had not understood.

Alongside the belief in the prophetic power of the oracle there soon sprang up a scepticism as to the real character of the phenomena. Was it divine inspiration or demoniacal possession or altogether an imposture? Was the *δαίμων* a familiar spirit more like a guardian angel, or a devil deceiving man and leading him astray?

The references in classic authors and in later writers of less note were collected to illustrate what was really thought of oracular manifestations in their time. Such a collection is given by Gallæus¹.

When at the birth of Christ it was said "The Oracles are dumb," there was a new development of the old controversies—and we have the opinions of the Fathers laid before us and various explanations offered of the Pythonesses and demoniacal possession.

¹ Servatius Gallæus, *Dissertationes de Sibyllis earumque Oraculis*. Amstelredami, 1688.

A good example of the arguments made use of in this connection we have in a treatise with the following long title: "An Answer to Mr de Fontenelle's History of Oracles in which Mr Van-Dale's System concerning the Authors of the Heathen Oracles, and the Cause and Time of their Silence is confuted: and the Opinion of the Fathers upon that Subject vindicated. Translated from the French. With some Reflections upon the Remarks of Mr Le Clerc, in his *Bibliothèque Choisie*, in a Preface. By a Priest of the Church of England. To which is prefixed a Letter to the Translator by the Reverend George Hicks, D.D. London. Printed by W. B. for Henry Clements at the Half Moon in St Paul's Churchyard, 1709."

Whatever may be the value of such treatises, it is largely to the controversies which gave rise to them that we owe the preservation of the great body of descriptions and explanations which enables us to form an opinion as to the belief in and the character of oracular manifestations.

Many of the places celebrated for oracular responses have some natural phenomena such as caverns and chasms connected with them:

Outhewn in cavern was the vast Euboic mountain side,
Whither conduct a hundred mouths a hundred entries wide;
Whence voices hundred rushed abroad, the Sibyl's prophesies.

Such-wise the Sibyl from her cell, the maid Cumaean sings
Her riddles dread—the vaulted cave with bellowing echo rings.

Pausanias saw at Olympia an enclosure sacred to Zeus, close by the mouth of a great cavern.

The Votary who consulted the oracle of Trophonius had to take part in terrifying rites and then descend in darkness into the deep recesses of a cave whose extent and shape were unknown to him save by the confused echoes of his own voice and footfalls. He heard no articulate response, but, on his return, he told the priest all that had occurred to him and his impressions, and from these the priest drew up an oracular response.

Brewster says "there is no species of deception more irresistible in its effects than that which arises from the

uncertainty with which we judge of the direction and distance of sounds¹."

Persons already in a state of nervous tension would readily yield themselves to the influence of awe-inspiring sounds in solemn surroundings. I have myself heard ghosts, but I was not in the proper frame of mind, so I investigated them and found them out.

Once in the stillness of the night I was sitting with a friend in the parlour of an old inn close to the churchyard of a celebrated Abbey. We both heard a wailing sound, but neither could say where it came from—both felt that it was in the room. I opened cupboards, doors, windows; when I was here, it was there; when I was there, it was here.

I at last suspected a tall vase with a trumpet-shaped mouth, and in it found an enormous fly the spread of whose wings prevented his getting out, so that he hung for a few seconds buzzing in the neck. If it had been some of you doing penance in the church instead of me in the inn parlour the account would probably have been different.

Another time I was in an inn in a provincial town with a friend. Our sitting-room was between two other rooms, a larger and smaller, and had a door into the smaller, but was cut off from the larger by a wooden partition. Night after night we heard the rustling of a silk dress—now here, now there. We rushed out into the passage, one through one door, one through the other, but saw nothing. We knew everybody in the inn. No one had a silk dress. We waited in the large nearly empty room and found that when an outside door was opened downstairs a draught blew a lot of large placards about against the wooden partition, and the sound, getting through the cracks, appeared now here—now there—now all about.

In the wild crags between Settle and Austwick there is a cave of that shallow kind which the French call an "abri," and in it there dwells a bogey known as "Boggart of Cave Ha." A servant riding home along the road which runs close by it, having taken measures to fortify himself before starting, once saw the boggart, which leapt on to his horse in front of

¹ Sir David Brewster, *Letters on Natural Magic*, 1883, Letter vii, p. 231.

him. But it was more often heard than seen. I have heard it. The site and tumbled débris in the cave suggested that remains of primaeval man and ancient beasts might be found there, so I dug it out, and, when I had got to a lower level than was at first exposed, I heard a strange combination of sounds—wild birds—children—cattle, &c., and soon made out that I was in the focus of sounds collected in the dome-shaped roof from all the valley far below.

We might in this connection adduce numerous examples of sounds naturally produced by the air being forced in or out of hollow places in the rocks or even in carved images. On the coast of Pembrokeshire near St Davids there is a place called Lle sugn, from the loud sucking noise made by the air being drawn back into a cavern, or perhaps from *sygan*, from the whispers and murmurs it makes when it is being forced out through a small aperture by the inrushing wave—and *mutatis mutandis* similar explanations are offered of the sounds heard as the sun falls on or off the pedestals or bodies of hollow images¹.

Sir Thomas Browné, in the dedicatory preface to his *Hydriotaphia*, records a belief that there were resonators in the Hippodrome in Rome when he says "We cannot but wish these urns might have the effect of theatrical vessels and great Hippodrome urns in Rome to resound the acclamations and honour due unto you." A footnote explains that this refers to "the great urns in the Hippodrome at Rome, conceived to resound the voices of people at their shows."

In one of the lowest rooms of the building assigned to the Vestal Virgins in Rome there was an open space with large globular amphoræ sawn in half and placed side by side with the opening down under a floor which was thus raised above the original level of the ground. I had no opportunity of ascertaining whether when first discovered they were not slightly tilted so as to act as resonators, as would be suggested by the description given by Vitruvius of the arrangement of the brass vessels placed between the seats of a theatre for acoustic

¹ Philostratus, Pausanias, Strabo, Juvenal, refer to the sounds issuing from the statue of Memnon. Sir A. Smith, *Revue Encyclopédique*, 1821, T. ix. p. 592; Dussaulx, *Trans. Juvenal*.

purposes. He says that they had to be placed in cavities in sequence, according to the note to which each responded (see above, p. 72), with a clear space around and above them; and, on the side next the auditorium, they were to be supported by wedges or blocks at least six inches in height and openings were to be left through the lower steps. Whether these urns in the vault-like room in the house of the Vestal Virgins were intended by resonance to strike terror into the worshipper by "voice or hideous hum" or when stamped upon to respond in deep booming reverberations, there must have been some intention in placing them there¹.

Here was one of the centres of worship and the site of some of the highest ritual of the Roman cult.

It has been suggested that it was done to keep the room dry, but if, as is recorded, the spaces between the vessels were packed with potsherds and other dry rubbish one would think that it was unnecessary to arrange a series of urns symmetrically over the floor as well as in order to keep away the damp, but the interstitial spaces between the potsherds would aid the echoes and not destroy the resonance of the urns.

Within the Delphic adyton the Pythian priestess sat on a tripod over a cleft in the rock. The suppliant waited till she appeared to be in a state of ecstatic frenzy, when she uttered incoherent cries and unintelligible words. A priest stood by her. The suppliant heard but could not understand. The priest interpreted the will of the god as conveyed in the sounds, and gave him versified maxims or advice with double meaning to carry away for his guidance. These are briefly the facts as we have them handed down, but the explanation of the phenomena opens up a varied and wide field of speculation².

¹ Cf. Jourdan, *Vesta, Auer: Notizie degli Sci.* 1883; Gilbert, *Topogr.*; C. Huelsen, *Röm. Mitth.* 1889, 1891, 1892; Prof. J. H. Middleton, "The Temple and Atrium of Vesta and the Regia," *Archaeologia*, Vol. XLIX. Part 2, 1886, p. 405; *Ancient Rome* in 1888, p. 189; Esther Boise Van Deman, *The Atrium Vestae*, Carnegie Institution of Washington 1909, Publication No. 108, p. 32. I am indebted to Commendatore Boni and to Dr Ashby for kind help and references.

² Cf. Boucher Leclerc, *Histoire de la Divination dans l'antiquité*; Carapano, *Dodone*.

In the first place we must clearly distinguish between the inarticulate sounds uttered by the priestess and the ambiguous answers elaborated by the priest. Next we must enquire whether there was anything in the character of the spot so carefully chosen and so rigorously adhered to, to explain the strange condition into which the priestess appears to have been thrown.

Mephitic vapours issuing from the rock have been suggested, but no explanation seems to have been offered of their occurrence here. Carbonic acid gas is heavier than atmospheric air, and would not rise from subterranean sources except under pressure. There are plenty of clefts and chasms in the cavernous limestone of Greece, but they are scoured out in the rainy season by the torrents which gather on the surface and plunge into the Katabothra, searching out every hole and corner in their underground passage to the sea. For this reason there is seldom any accumulation of carbonic acid gas in limestone caves, and there is nothing like the solfatara anywhere near Delphi. Supposing carbonic acid gas had formerly been forced up here, the effect of it would not be to excite the persons subjected to it and throw them into a state of frenzy. They would be rendered insensible by it, as is the dog in the Grotta del Cane; and anything of that sort which could have affected the priestess must also have affected the priest who was standing beside her.

Moreover, when the French excavations were carried out on what was supposed to be the exact site of the oracular manifestations no cleft or cavern was found, but only artificially constructed underground chambers, suggesting quite a different explanation of the phenomena.

We are told that the Pythian priestess sat on a three-legged stool, a most awkward seat to place over a chasm: one leg must have gone in.

On another tripod elsewhere we are told there was an inscription. It would not be easy to place a long inscription on a three-legged stool in any position where it would be likely to catch the eye.

But more conclusive is the fact that round the temple of

Zeus at Dodona¹ there were bronze vessels standing on three feet and hence called tripods. Here the response of the Deity was obtained from the interpretation put by the priests upon the rustling of leaves, the cooing of doves, the bubbling of the brook, but chiefly upon the notes produced by the wind in these tripods or bronze urns: just as we make children listen to the sound of the sea in a hollow shell, or perhaps like the attuned urns described by Vitruvius responding to the various notes of the human voice, or like an æolian harp rising and falling in harmony.

On such a vase, we may therefore infer, sat the Pythian priestess, but in her wild gesticulations she could well have called into that deep chasm and resounding urn sounds which when blurred by resonance and reverberation, and carried by the draughts that issued and by the southing wind, reached the suppliant as a shriek and hideous hum, terrifying from the surroundings, and an awe-inspiring ritual.

The priestess was not an improvisatrice who could turn out hexameter verses to order. The priests from whom the suppliant received his answer took their own time over that, and the ambiguity which has become proverbially the characteristic of an oracular response, as when Croesus was told that if he went to war he would destroy a great nation, came not from the unintelligible utterances of the frenzied priestess, nor from the inarticulate sounds emitted by birds or even issuing from inanimate objects, but was due to the deliberate or self-deceptive mystification of the priests.

The suppliant did not hear that uttered, but only a confused and terrifying noise as of a human being in agony, multiplied and carried into the air in the reduplicated echoes of subterranean cavities or the sustained resonance of an acoustic urn.

Such the scientific facts and such the ritual from which the use of acoustic vases seems to have come down to us through the ages.

¹ Leake, Col., *Northern Greece*, Vols. I., IV. *Revue Archéologique*, 1877, pp. 329, 397.

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(b) Also by Viollet-le-Duc in the *Dictionnaire raisonné de l'Architecture Française*, Vol. vii, p. 471.

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ACOUSTIC VASES. *Cochet*, Abbé, 1863. *Précis Analytique des Travaux de l'Académie Impériale de Rouen*, 1863-4. Rouen, Boissel.

At Montivilliers jars with simple neck moulding and conical base found at four angles of vault of choir.

At Fry, Canton Arqueil four jugs with handles like those at St Peter per Mountergate, Norwich.

At St Laurent en Caux a large earthen vessel in one of angles of choir closed at both ends and entirely buried in mortar *except a sort of spout which appeared in the face of the wall*. Refers to Abbé Saint Leger.

ACOUSTIC POTTERY. *Minns*, Rev. G. W. W., 1872. *Norfolk Archaeology*. *Norfolk and Norwich Archaeol. Soc.*, Vol. vii, p. 93. "Acoustic Pottery."

ACOUSTIC VASES. *Bensley*, 1879. *Norfolk Archaeology*, Vol. VIII, 1879, p. 331.

Mr Bensley exhibited an earthen jar of "Acoustic Pottery," discovered in the upper part of the wall of the chancel of East Harling Church.

Blackish grey ware of early date 1 foot in diameter and 10 inches high.

TRIPOD. *Boucher-Leclerc*, A., 1879. "Histoire de la Divination dans l'Antiquité," 4 Vols., Vol. III, p. 91. Paris, 1879.

"Le trépied étant un siège et non une marmite, ni une table, ὄλυμος ne peut avoir été qu'un support plat, appelé κύκλος parce qu'il est circulaire. Il pouvait avoir un couvercle hémisphérique dans l'intervalle des consultations; mais quand il servait, il portait ou la pythie elle même, maintenue par les trois oreilles du trépied, ou plutôt le siège de la pythie. Si le trépied avait un bassin, ce qui était bien inutile, ce bassin était la cortina ou ἄξων."

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RESONANCE. SOUNDING STONES. *Tingle*, Alfred, 1906. *Nature*, Jan. 4, p. 222, Vol. 73. "Sounding Stones at Ch'ufu, Shantung."

SOUNDING STONES. *Wheeler Cuffe*, O. F., 1906.

Referring to Mr Tingle's letter in *Nature*, Jan. 4, p. 222, on Sounding Stones, Wheeler Cuffe says that he has "seen at Pagan (former capital of Burma) a large log of fossil (or rather silicified) wood used as a gong. It emits a clear ringing note when struck, and is used, like all pagoda bells or gongs, to direct the attention of the guardian

spirits to the offering about to be presented by the pious Buddhist."

SOUNDING STONES. *Carus-Wilson*, Cecil. *Nature*, Vol. 73, Jan. 11, 1906, p. 246.

SOUNDING STONES. *Barnett*, W. G. *Nature*, Vol. 73, Feb. 22, 1906, p. 390.

VITRUVIUS. Translated by *Morgan*, Morris Hicky. Illustrated by *Warrén*, Herbert Langford. 1914.

Vitruvius. *The Ten Books on Architecture*. Translated by M. H. Morgan. With illustrations and original designs prepared under the direction of H. L. Warren.

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Vitruvius was architect and engineer under Julius and Augustus Caesar.

ACOUSTIC VASES. *Norfolk Archaeology*, Vol. IV, p. 352; Vol. VI, p. 382.

Discovered in churches of St Peter Mancroft and St Peter per Mountergate, Norwich.

Various conjectures as to use: to receive ashes of hearts of Canons; drink at commencement of building; dove cots; warming apparatus; for strength with lightness; ventilation; keep off damp.

ACOUSTIC VASES. *Trans. Kilkenny Archaeol. Soc.*, Vol. III, p. 303.

Five earthen jars on their sides opening into five holes in western ends of N. and S. walls of choir in church of St Mary, Youghal, Cork.

ACOUSTIC VASES. *Viollet-le-Duc*. *Dictionnaire raisonné de l'Architecture Française*, Vol. VII, p. 471.

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PROCEEDINGS
OF THE
Cambridge Antiquarian Society,
WITH
COMMUNICATIONS
MADE TO THE SOCIETY.

VOL. XIX.



NEW SERIES.

VOL. XIII.

1914—1915.

CAMBRIDGE:

PRINTED FOR THE CAMBRIDGE ANTIQUARIAN SOCIETY.

SOLD BY DEIGHTON, BELL & CO., LTD.; AND BOWES & BOWES,
LONDON, G. BELL AND SONS, LTD.

1915.

Cambridge:

PRINTED BY JOHN CLAY, M.A.

AT THE UNIVERSITY PRESS.

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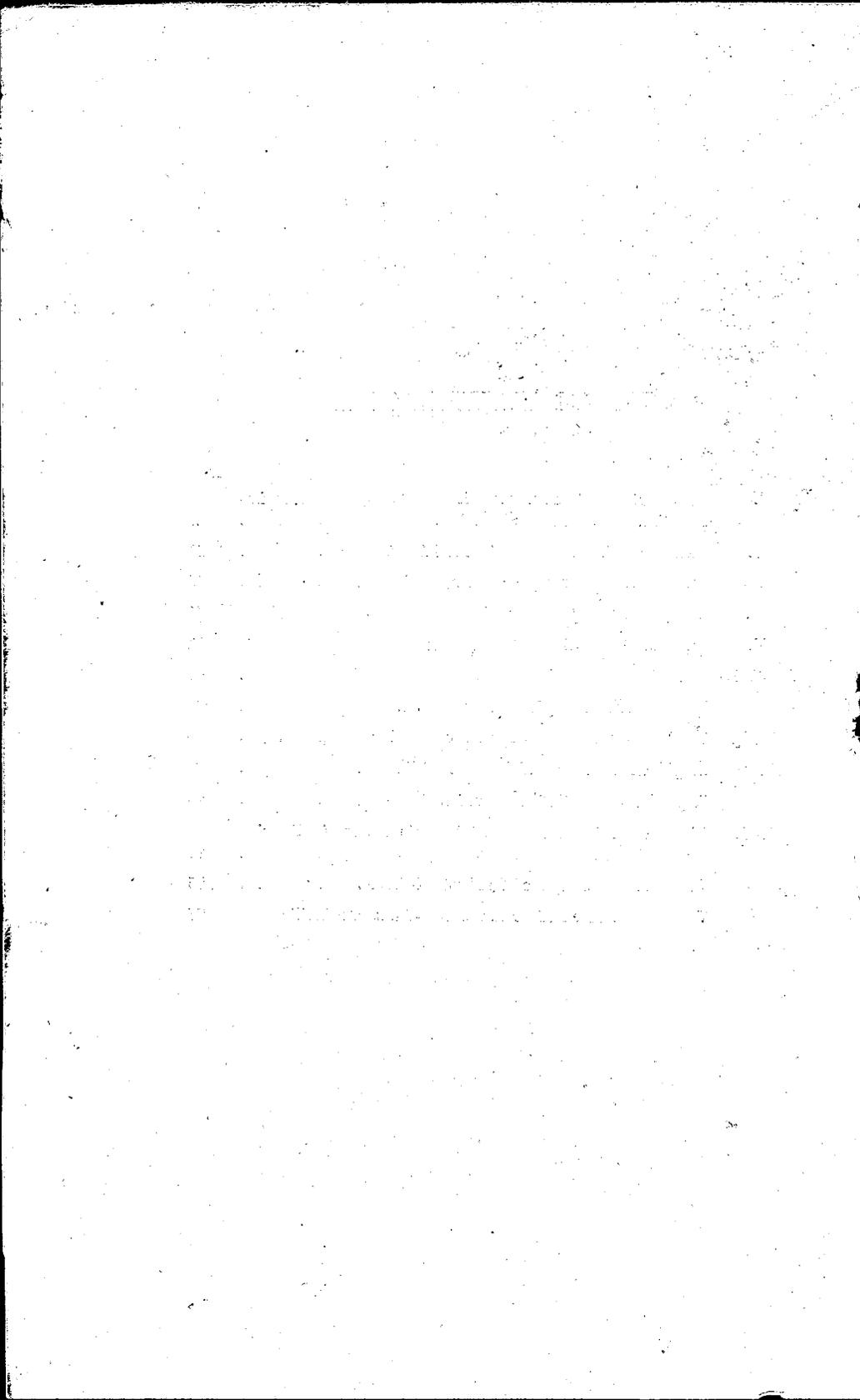
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