ROMAN GRANARIES AND STORE BUILDINGS

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Nunc argumentum vobis demensum dabo,
non modio, neque trimodio, verum ipso horreo:
tantum ad narrandum argumentum adest benignitas.

Plautus, *Menaechmi*, lines 15 ff.

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PREFACE

The origins of this book are no doubt all too obvious. The thesis, upon which it is based, entitled 'The Design, Structure and Organisation of *Horrea* under the Roman Empire', was written in Rome and Oxford in the years 1958–62.

The attraction of the subject lay not least in that it had both archaeological and historical aspects, and that it had been curiously neglected. The only general studies were in the form of articles in the French, German and Italian classical encyclopaedias. Among these the only comprehensive attempt to deal with the whole topic—design, structure and organisation—was in the Italian article by Professor Romanelli. But this impressive piece of work was published in 1922 and without illustrations.

Since then our knowledge has been greatly increased, particularly by the excavations at Ostia just before the Second World War. The town plan now revealed derives much of its distinctive character, perhaps of its distinction, from the dispositions of the *horrea* which occupy so much of it. It is to be hoped that a full study of these buildings will appear in the brilliant *Scavi di Ostia* series. Certainly the brief descriptions and discussion of the Ostian *horrea* in Chapter I of this book in no way compensate for the lack of a detailed joint study of these buildings by an architect and archaeologist. But any work on *horrea* undertaken now must not simply take account of the Ostian evidence, but must start from a consideration of the Ostian buildings. They are the best-preserved and most readily accessible examples of one of the finest building-types in the Roman architectural repertoire.

For Rome itself we have far fewer excavated examples, but we have the unique evidence of the Severan Marble Plan of Rome. This evidence is now available in a more accurate form than ever before, thanks to the patient detective-work of a devoted group of Italian archaeologists. The result is one of the great achievements in Italian archaeology in this century. It is now possible to combine the evidence from Rome and Ostia so as to provide a vivid picture of the storage facilities of both the capital and its port.

The amount of new work undertaken in the military installations in the provinces of the Roman Empire during this century needs no

advertisement, but there had been little attempt at comparative study of the evidence obtained.

Constant excavations provide endless new material. When therefore in 1967 Cambridge University Press accepted my work for publication, there was the difficult task of trying to take account of the new discoveries since 1962. This was particularly important for the study of wooden military granaries of the early first century A.D. because of Professor Schönberger's excavations at Rödgen in Germany and Professor Cunliffe's work at both Richborough and Fishbourne in Britain. I have tried to take account of all work up to the summer of 1968.

But the study of *horrea* includes more than the archaeological evidence and its problems. The historical and legal aspects of warehousing may not be neglected. Since I wrote my thesis a French book has been published, concerned directly with these legal aspects: C. Alzon, *Problèmes relatifs à la location des entrepôts en Droit romain* (Paris, 1965). M. Alzon is a student of Roman law and mainly concerned with the legal problems inseparable from the renting of warehouses, but he takes a broad view of his subject and discusses in passing many topics, including the administration, appearance and geographical distribution of *horrea*. The author is clearly a man of enthusiasm, and the book is remarkable mainly for its collection of evidence, more or less relevant to *horrea*, amassed in the enormous footnotes. The value of the work is sometimes impaired by a lack of discrimination in using the evidence collected, sometimes by a lack of knowledge, or the quotation of out-of-date sources, about the physical remains. I have tried to take account of Alzon's views, particularly on legal matters, where these seemed unusual or new, but I have often found no reason to change the opinions I had already formed.

The fact is that anyone who attempts to take in all the many aspects relevant to the study of Roman granaries and storehouses lays himself open to criticisms of inadequacy in dealing with some parts of the evidence. But the attempt to deal with the whole subject has advantages, which perhaps justify the risks.

The risks I have taken have been lessened by the generous help I have received, both while writing the thesis and preparing the book for publication.

The thesis was supervised by the late Sir Ian Richmond. At every stage he followed the work with the keenest interest, and subjected it

to sharp and stimulating criticism. His death in 1965 was both a severe personal loss and a devastating blow to the study of the archaeology of the Roman Empire.

It is a pleasure to acknowledge a debt to the Craven Committee for election to the Henry Francis Pelham Studentship in 1958 and to The Queen's College, Oxford, for election to a Junior Research Fellowship in 1959. The first made possible the work on the Ostian *horrea* by taking me to Rome for a year; the second allowed me to continue my research in distinguished congenial company for three years.

In Rome and Ostia I have to thank particularly Mr J. B. Ward-Perkins and Professor Pietrogrande. Dr and Mrs M. H. Ballance and the late Miss Marion Blake also gave encouragement and advice on architectural matters.

The examiners of the thesis, Professor S. Frere and Mr R. Meiggs, made valuable criticisms, and Professor Frere has directed my attention to new work since 1962.

On legal matters Mr J. Crook in Cambridge, and Professor A. M. Honoré and Mr J. K. B. Nicholas in Oxford, helped at various stages to save me from several errors in the chapter on *Locatio–Conductio*.

Others who have helped in various ways include Dr H. W. Catling, Professor G. E. F. Chilver, Mr M. Frederiksen, Mr E. W. Gray, Professor J. R. Harris, Professor R. M. Harrison, Dr F. G. B. Millar and Mr P. J. Parsons.

Professor Gordon Williams in St Andrews read the Introduction to the book to my profit.

My greatest debt in this respect is, however, to Professor Jocelyn Toynbee, who urged me to publish my work, and who read the whole text prior to publication and tried to bring it nearer to her own impeccable standards of accuracy and lucidity.

Mrs P. Clarke of the Ashmolean Museum, Oxford, undertook the burdensome task of drawing most of the plans, which were paid for by the Research Fund of St Andrews University.

I am most grateful to the staff of the Cambridge University Press for their meticulous concern over the lay-out and the accuracy of the book. Mistakes would be more numerous and the text less readable without their help. The responsibility for the blemishes which remain is mine.

Much of what I have written is based upon the work of others, excavators and scholars, whose writings I have ransacked and some-

times ungratefully criticised. To all of them I owe a great debt, which I wish to acknowledge now. If the need to correct what I, in my turn, have said in this book stimulates new interest in *horrea* and the many problems connected with them I shall be satisfied.

My wife typed the manuscript of the thesis several times and then retyped the book. More important she retained her confidence in the work at times when I had lost mine. The book is in consequence dedicated to her. G. E. R.

St Andrews, September 1970

ABBREVIATIONS

AA[4]	*Archaeologia Aeliana*, 4th Series
ACl	*Archeologia Classica*
AE	*L'Année Épigraphique*
AJ	*Archaeological Journal*
AJA	*American Journal of Archaeology*
Ann.Eg.	*Annales du Service des Antiquités de l'Égypte*
Ann.Inst.	*Annali dell'Instituto di Corrispondenza Archeologica*
AntCl	*L'Antiquité Classique*
Arch.Cambr.	*Archaeologia Cambrensis*
ArchPF	*Archiv für Papyrusforschung und verwandte Gebiete*
BCH	*Bulletin de Correspondance Hellénique*
BCom	*Bullettino della Commissione Archeologica Comunale di Roma*
BInstFrAOr	*Bulletin de l'Institut Français d'Archéologie Orientale*
BonnJb	*Bonner Jahrbücher*
Bull.Inst.	*Bullettino dell'Instituto di Corrispondenza Archeologica*
CIL	*Corpus Inscriptionum Latinarum*
CPL	Robert Cavenaile, *Corpus Papyrorum Latinarum*
CRAI	*Comptes Rendus de l'Académie des Inscriptions et Belles-Lettres*
CW[2]	*Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society, 2nd Series*
Diz.Epig.	*Dizionario Epigrafico di Antichità Romane di de Ruggiero*
D–S	Daremberg et Saglio, *Dictionnaire des Antiquités*
EE	*Ephemeris Epigraphica*
IG	*Inscriptiones Graecae*
IGLS	*Inscriptions Grecques et Latines de la Syrie*
IGRR	*Inscriptiones Graecae ad res Romanas pertinentes*
ILS	*Inscriptiones Latinae Selectae*
Jahresbericht Pro Vindon.	*Jahresbericht (Gesellschaft Pro Vindonissa)*
JEgA	*Journal of Egyptian Archaeology*
JHS	*Journal of Hellenic Studies*
JJurP	*Journal of Juristic Papyrology*
JRS	*Journal of Roman Studies*

MAAR	*Memoirs of the American Academy at Rome*
MDInstKairo	*Mitteilungen des Deutschen Archäologischen Instituts. Abteilung Kairo*
Mélanges	*Mélanges d'Archéologie et d'Histoire de l'École Française de Rome*
MonAnt	*Monumenti Antichi Pubblicati per Cura della Reale Accademia dei Lincei*
NSc	*Notizie degli Scavi di Antichità*
OJh	*Jahreshefte des Österreichischen Archäologischen Instituts in Wien*
ORL	*Der Obergermanisch-Raetische Limes des Römerreiches*
PBSR	*Papers of the British School at Rome*
PSAL	*Proceedings of the Society of Antiquaries of London*
PSAS	*Proceedings of the Society of Antiquaries of Scotland*
PSI	*Papyri Greci e Latini* (*Pubbl. della Società Italiana*)
RA	*Revue Archéologique*
RAfr	*Revue Africaine*
RAL	*Rendiconti della Classe di Scienze Morali, Storiche e Filologiche dell'Accademia dei Lincei*
RE	Pauly–Wissowa, *Real-Encyclopädie der Classischen Altertumswissenschaft*
REA	*Revue des Études Anciennes*
REG	*Revue des Études Grecques*
RendPontAcc	*Rendiconti. Atti della Pontificia Accademia Romana di Archeologia*
RIntDroitsAnt	*Revue Internationale des Droits de l'Antiquité*
RM	*Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung*
RStLig	*Rivista di Studi Liguri*
SDHI	*Studia et Documenta Historiae et Iuris*
TAPA	*Transactions of the American Philological Association*
TrierZ	*Trierer Zeitschrift*
ZSavignyStift	*Zeitschrift der Savigny-Stiftung für Rechtsgeschichte, Romanistische Abteilung*

SPECIAL ABBREVIATIONS

Frank, *ESAR*	Tenney Frank, *An Economic Survey of Ancient Rome*, 5 vols. (Baltimore, 1933–40)
Lugli, *Tecnica*	G. Lugli, *La tecnica edilizia romana*, 2 vols. (Rome, 1957)
Meiggs	R. Meiggs, *Roman Ostia* (Oxford, 1960)
Pianta Marm.	G. Carettoni, A. Colini, L. Cozza, G. Gatti, *La pianta marmorea di Roma antica*, 2 vols. (Rome, 1955)
Romanelli	*Dizionario epigrafico di antichità romane* (de Ruggiero), s.v. *horrea*
Rostovtseff, *SEHRE*	M. Rostovtseff, *The Social and Economic History of the Roman Empire* (2nd ed., by P. M. Fraser), 2 vols. (Oxford, 1957)
Scavi	*Scavi di Ostia* I– (Rome, 1953)

INTRODUCTION

Tertullian, writing in the second century A.D. and warning his Christian flock against the dangers of heresy, used a homely metaphor of which the Church has remained fond. The chaff of little faith, he warned, would be blown away and only the good grain be gathered up into the storehouses of the Lord.[1] This simple metaphor still works for us, and it worked for Tertullian because the Latin word he used for storehouses, *horrea*, was part of the everyday life of the Roman world in which he lived. It was used constantly and in widely different contexts. It occurred in simple rural transactions, military orders, sophisticated commercial dealings and even, in transferred or metaphorical uses, in the conceits of literary authors.[2] The word *horrea* simply designated buildings where anything could be stored.

I

A major problem both for Rome itself and for her armies was the proper organisation of a food supply. Adequate storage facilities for foodstuffs were clearly one of the keys to the solution of this problem. The most important food in the ancient world was corn, and buildings devoted to the storage of corn have to meet certain demands. In general they must be well placed to serve their particular purpose, easy of access, with adequate space for loading and unloading, and completely secure. Such general considerations helped to dictate the siting of strong granaries, whether in legionary fortresses and auxiliary forts along the frontiers, or in Ostia and Rome. But the actual plan and structure of such granaries was more influenced by the special difficulties imposed by a granary's function. Grain must be kept dry when in store. The safe limit of moisture in stored grain is usually between 10 and 15% depending upon the type of grain, the climate, and the length of storage. Grain must also be kept cool, if possible below 60 °F, and free from vermin, which tend to breed if the grain overheats. If grain is stored

[1] Tertullian, *De Praescr. Haeret.* 3. 9.

[2] *Thes. Ling. Lat.*, s.v. *horreum*. The Latin word *horrea* is, of course, a neuter plural, but when, as often throughout this book, it is used to refer to a single building or a single building complex, I have treated it as a singular concept.

loose or in bins, the walls of a grain store must be capable of supporting considerable lateral thrust. The lateral pressure of grain is about two-thirds of the vertical pressure. So, for example, the walls of a container holding 30 tons of grain must be able to resist a pressure of 20 tons.

These problems, of course, bedevil the storage of grain in any age, but they became enormous for Rome as a result of her growth in size and power in the third and second centuries B.C. The Republican stages of the Roman attempt to deal with storage problems are to some extent lost, because the material remains of most of the warehouses we have found belong to the Imperial period, but there are some clues.

In Roman military installations under the Empire, the granary was always a long, narrow, rectangular building, strongly constructed, with buttresses if built in stone, and with raised floors, under which a freely flowing current of air was created by means of ventilators set in the walls.[1] These buildings are so common that they were amongst the first military buildings whose function was clearly identified and they occur in a more or less standard pattern (although with local variations) all over the Roman Empire. The building type seems to have been fixed early for, if we can trust Schulten's excavations at Numantia, there are clear Republican examples in the camp built by Scipio Aemilianus in 134 B.C. while besieging Numantia. It may be that the Romans themselves were drawing on a building type current in the Hellenistic world and even much earlier in the East, because five arsenals of similar proportions with raised floors and ventilators dated 283–261 B.C. have been excavated on the acropolis at Pergamon, and twelve granaries, remarkably similar to the Pergamene examples but dated about 2000 B.C., have been discovered at Harappā on the Indus. There was no doubt development in the various structural devices used in these buildings. For example, it may have been the case that only wooden floors were originally raised, a common tradition anyway in the damp climate of north Europe, and that the building of raised floors composed of tiles or slabs of stone was a later and more sophisticated development. Certainly the methods of supporting the floors by dwarf-walls or small piers changed from time to time. At all times these buildings were most carefully constructed. Wooden granaries dealt with the weight of the grain by means of ties and trusses within the building. Stone granaries had walls of great thickness (3–4 feet thick)

[1] See Chapter VII.

and large buttresses from $2\frac{1}{2}$ to 3 feet square bracing the long sides of the buildings at intervals of 7–15 feet. Whatever materials were used in the walls, the roofs were always constructed of slates or tiles and often had a wide overhang at the eaves to shelter the grain as much as possible.

These granaries inside forts and fortresses were always carefully positioned. In auxiliary forts they were near if not flanking the headquarters building itself, but often had their entrance opening on to a quiet square where loading and unloading would cause the least inconvenience. In the legionary fortresses, they were positioned near the gates, and particularly near those gates that might be connected with some form of water transport. The cartage of bulky goods was always tedious and expensive in the ancient world, and the Romans used water transport wherever they could. The problem may have been particularly difficult in Britain, where most of the corn-growing districts were south of the Trent–Severn line, and the main military installations were from the end of the first century A.D. well to the north and west. As many supplies as possible must have been shipped to places like South Shields and *Horrea Classis* on the Tay, and cleared from there as far as possible by river.

The military supply system even in the early Principate was still largely one of purchase, *frumentum emptum*, with payment by the troops for their food, backed up by *ad hoc* plundering and some requisitions. Gradually, however, there did evolve a specific tax-in-kind, the *annona militaris*, devoted to feeding the troops, organised by the state at the expense of the provincials.[1] It was known from the *Codex Theodosianus* that a great network of collecting depots, quite distinct from the granaries within the forts, grew up in connection with this tax. Now we have two actual examples of this kind of storehouse of the late Empire, one found at Trier, a key centre in the Empire for the organisation along the Rhine, and the other at Veldidena near Innsbruck on the main route from Italy through the Brenner Pass to the Danube. Each consists of two huge halls separated by a courtyard but bound into one architectural unit by curtain walls. The only difference is that at Veldidena the whole unit was fortified with square projecting towers. Other examples of this type of late Roman warehouse will surely be found in the future.

It has also become increasingly clear in recent years that in legionary

[1] See Chapter VIII.

fortresses at least there was in addition to the granaries yet another type of storage building, perhaps serving the purpose of a general baggage store. These *horrea*, of which the best and most recent example was discovered at Vindonissa in Switzerland, consist of a great open central courtyard, around which were constructed four ranges of rooms opening on to an arcade.

These buildings are particularly interesting because they are exactly comparable with the largest civil *horrea* in Ostia and Rome itself.[1]

What the origin and development of this type of building was we do not know, although a tentative derivation from a building tradition prevalent in the ancient Near East is suggested later.[2] The main difficulty is that Ostia, our best source of information about this type of building under the Empire, has its Republican levels more or less completely covered by later buildings. It is doubtful anyway whether it would fill in the gap in our knowledge, since it was Puteoli, more or less unexcavated, that was important as the port of Rome in the late Republic and even in the early Empire, before the Emperors Claudius and Trajan improved the river port of Ostia so that it could cope with the bulk of Rome's imports.

It is certain that Rome itself does not provide us with an answer to when these courtyard *horrea* began to be built or what their derivation was. From literary sources[3] it seems that the major development of Rome's river port and its attendant warehouses did not take place until the early second century B.C. Earlier the old Forum Boarium and Forum Holitorium in the centre of Rome seem to have coped with the main flow of food imports which had probably come down the Tiber from the Italian hills. But in the early second century B.C. the Aventine district further south below the Pons Sublicius, the first city bridge, and away from the centre of Rome's political life, was systematically developed to cope with the landing, storage and distribution of the massive imports up the Tiber from the sea. At first all that seems to have been done was the paving of a stretch of the river bank with steps down to the river itself, and the building of a great portico measuring some 1,500 feet by 300 feet. This, the great Porticus Aemilia, remained a feature of the district down to the late Empire, but it belongs essentially to the Greek tradition of the commercial *stoa*. Even the name,

[1] See Chapter I and Chapter II. [2] See Chapter IV.
[3] Livy 35. 10. 12 (193 B.C.) and 41. 27. 8 (174 B.C.).

Emporium, which was early attached to this district, suggests Greek influence. The *horrea* which were built in such great numbers that this whole thirteenth region of Rome finally had the name *horrea* or *orrea* attached to it,[1] must have been built later in the second and first centuries B.C.

The largest *horrea* in Ostia and Rome were very large indeed. In Rome the *Horrea Galbana* covered some 225,000 square feet, and more than 140 rooms were available for storage on the ground floor alone. The remains at Ostia show that they were carefully constructed of the finest materials of the day, large tufa blocks or concrete faced with brick and tufa, and that great attention was paid to devices for raising the floors on dwarf walls, draining the courtyards, and, in some of the buildings, locking not only the doors to individual rooms but also the doors to staircases between the different floors of the building.

The *horrea* which provided such massive storage capacity in these areas seem not only to have been built by great Roman families, for example the Sulpicii, the Lollii, but perhaps to have been owned by them originally.[2] Whether or not that is true, there can be no doubt that *horrea* or parts of *horrea* in Rome were available for hire, either to merchants storing their goods temporarily or to private citizens storing their valuables. As a result of this the organisation of civil *horrea* has a fascinating complexity. On the one hand the state was vitally concerned with any organisation that involved the storage of grain. In fact the state exercised an increasing amount of interference exemplified in the great stream of detailed orders preserved in the *Codex Theodosianus*. On the other hand the renting of storage facilities to private individuals involved more general questions in Roman law about contracts, liability and protection of all the individuals involved.[3]

It must be admitted that much of the evidence, material, epigraphic and legal, for the study of civil *horrea* has particular reference to Ostia and Rome. It may, therefore, be as well to indicate now the background to this evidence and the special problems that had to be faced there.

[1] See Appendix 5. [2] See Chapter V.
[3] See Chapter VI.

2

Originally not only Rome, but Ostia as well, were river ports.[1] The river Tiber, despite some seasonal variation in level, did not dry up or lower its water level disastrously in the summer months.[2] Although its current was swift and it brought down large deposits of silt, it was navigable, certainly between Ostia and Rome, for ships of a certain size. What was the largest size of ships that could get from Ostia to Rome has always been something of a problem. Until recently it has been widely believed that ships of only 78 tons capacity were the largest that could manage the journey.[3] It seems more likely now that ships carrying up to 200 tons could in theory get as far as Rome, a suggestion which is reinforced by the fact that in the nineteenth century when the Tiber was still used regularly for navigation, ships of 190 tons could get even 100 miles upstream.[4]

Whether all those ships, which *could* make the journey, would wish to, is another matter. It was not easy for ancient merchant ships to go upstream against the current on a winding course, where they might be unable to make much use of the wind with their square-rigged sails. For most merchantmen—of whatever size—the only way of getting upstream was to be towed. Philostratus reveals that the trip up the Tiber by boat to Rome took three days,[5] while the journey by road, either the Via Ostiensis or the Via Portuensis, took only $2\frac{1}{2}$–3 hours.

In addition to this, recent work done on the tonnage of ancient merchant shipping suggests that even 200 tons would be well below the average of big sea-going merchantmen, particularly those involved in the corn trade.[6] Although the smallest capacity encouraged by the Emperor Claudius for the corn trade was a mere 10,000 *modii* (about 70–80 tons),[7] it is clear that by the end of the second century A.D. the standard size of ship used for the transport of grain had to have a

[1] For the whole question of commerce in the Mediterranean see J. Rougé, *Recherches sur l'organisation du commerce maritime en Méditerranée sous l'empire romain* (Paris, 1966).

[2] J. Le Gall, *Le Tibre, fleuve de Rome, dans l'antiquité* (Paris, 1953).

[3] For example, Meiggs, p. 51.

[4] H. T. Wallinga, 'Nautika I: The units of capacity for ancient ships', *Mnemosyne* XVII (1964), 1–40; L. Casson, 'Harbour and river boats of ancient Rome', *JRS* LV (1965), 31–9. On the difficult question of tonnage in general, see Rougé, *Recherches*, p. 66.

[5] Philostratus, *Vit. Apoll. Tyan.* VII. 16. Cf. Le Gall, *Le Tibre*, p. 257.

[6] L. Casson, 'The size of ancient merchant ships', *Studi in onore di Calderini e Paribeni* I (1956), 231.

[7] Suet. *Claud.* 18; Gaius, *Inst.* I. 32c.

capacity of at least 50,000 *modii* (between 340 and 400 tons).[1] The great Alexandrian corn freighter described in detail by Lucian in his *Navigium* has been computed to have had a carrying capacity of between 1,200 and 1,300 tons.[2]

Originally the very biggest of these ships could not contemplate docking in Rome nor run the hazards of unloading at the mouth of the Tiber. They went therefore to Puteoli and from there the corn was sent in smaller vessels up the coast to the Tiber mouth. Other ships too big to make the journey to Rome would either dock at Ostia or more likely unload at the river mouth into lighters. Most of the goods that were unloaded in this way were in transit for Rome and therefore the warehousing facilities at Ostia were bound to provide accommodation only until the goods could be cleared away upstream. This basic fact about Ostia was not changed by the later developments and should not be forgotten in assessing the evidence from Ostia.

Despite, apparently, the plans of Caesar for a proper harbour at Ostia, Augustus and Tiberius seem to have devoted themselves only to improving the existing facilities, including warehousing at the old river port of Ostia. It was Claudius, and later Trajan, who created the proper harbours just to the north of the river mouth at Ostia. Claudius' great circular basin of about 200 acres and Trajan's smaller hexagonal basin of about 80 acres together made up an outer and inner harbour, and offered proper protection for big sea-going ships as they unloaded.[3]

These new arrangements meant ultimately that the Alexandrian and African corn fleets, and no doubt other big ships, no longer went to Puteoli, but to the Ostia harbours. In the end this helped to create a new centre, Portus, that was to be independent of Ostia itself, but this was certainly not the immediate result. In both the Claudian and Trajanic–Hadrianic periods the warehousing facilities at Ostia itself were much increased. But the rhythm of the city and its life was to some extent changed by the existence of the new harbours—not least in the diminishing importance of the sea-going lighters prepared to unload ships at the river mouth, and the vastly increased importance of tugs which seem to have met the ships at the harbour mouth, assigned berths to them and if necessary helped to pull them into position.[4]

[1] Scaevola, *Digest* I. 5. 3.

[2] L. Casson, 'The Isis and her voyage', *TAPA* LXXXI (1950), 51–6.

[3] See Chapter III.

[4] L. Casson, *JRS* LV (1965), 34–5.

As the ships arrived at the harbours there must have been a mass of paper-work involved: the checking of ships' papers, the inspection of cargo and payment of harbour dues. There may even, in the case of ships carrying corn, have been the checking of the quality of the cargoes against the *digmata*,[1] the samples often sent in small sealed pots or leather wallets with such ships to prevent fraud during the course of the journey.

The cargoes were laboriously unloaded by countless porters, the *saccarii*, who ran along the gang planks laid from the prows of the ships to the quayside and humped either bundles, or sacks of produce, or *amphorae* of wine and oil on their backs. The *saccarii* took their goods either straight to the storerooms earmarked for them or loaded them on carts for more distant warehouses, where in turn they would be unloaded again by porters. In no example known to me was it possible for carts to enter the courtyards of the Ostian warehouses. Everything, even the staircases partly, but only partly, constructed in the form of ramps, was designed for *men* who carried the loads. Given the fact that many of the Ostian warehouses would act largely as stores for goods in transit, the goods may have been left in the containers in which they arrived. Certainly the warehouses were often positioned near the river or the sea, with their entrances conveniently situated for goods from that direction.

The goods for Rome were reloaded into a special form of lighter, the *navis codicaria*, which, among all the different types of craft making their way to Rome, was both the most common and specially suited to this job. The mast in these ships was set well forward and was used perhaps for a fore-and-aft sprit sail to allow it to catch what wind there might be and certainly for attaching a tow rope. These ships were most often dragged up the Tiber by teams of men, although animals, such as oxen, may also have been used. There were towpaths on either side of the Tiber and although we are ill-informed about them, they must have been carefully maintained and protected from floods. Procopius[2] reveals that in the sixth century A.D. the towpath from Ostia to Rome along the left bank of the Tiber had already disappeared, although that on the right bank from Portus to Rome was still regularly used.

[1] *Cod. Theod.* XIV. 4. 9 (A.D. 417); see Chapter V.
[2] Procopius, *De Bell. Goth.* V. 26. 9.

As the *naves codicariae*, barges and smaller merchantmen neared the city wharves, there must again have been some sort of attempt at organisation. The masters of many ships no doubt knew to which warehouses they had to deliver their cargoes and consequently went to the appropriate quays. Others with goods of a specialised kind, such as marble blocks, seem to have gone to the particular wharf which dealt with their material. The Via Marmorata just below the Aventine preserved in its name the memory of just such a specialist area, where in fact many abandoned flawed marble blocks were found in excavations. We know of specialist warehouses, too, such as the *Horrea Piperataria*, *Horrea Chartaria* and *Horrea Candelaria*.[1]

Long stretches of the river bank in the Aventine area and on the opposite side of the Tiber were carefully walled, particularly in the Trajanic and Hadrianic periods, in a way not to be equalled until the modern embankments. There were plentiful mooring points made from great travertine blocks, sometimes shaped in animal heads set into the concrete brick-faced embankments. In many places there were ramps and steps leading down to the river, either from the quays or directly from the warehouses themselves.

To these wharves and the great buildings along the river banks came the traders of the capital and even ordinary townsfolk to buy directly from the ships or the warehouses the goods they wanted.[2] In the case of grain there can have been little haggling, the government being keen to keep the price low and level even if that meant a state subsidy to the merchants. But in the case of goods such as wine landed in bulk near Monte Testaccio, there would have been brisk business and auctions of cargoes in whole or in part, involving no doubt some convivial sampling of the quality. The docks were thus a magnet for many different kinds of people including quite ordinary inhabitants of Rome, in a way totally unlike the commercial docks of the modern world.

The size and complexity of the problems concerning storage and organisation of commerce that faced Rome were not helped by the fact that the sea was more or less closed to regular merchant traffic from November to March.[3] It is true that merchantmen caught at the end of the sailing season in mid-Mediterranean and wintering in a friendly

[1] See Chapter II.
[2] H. J. Loane, *Industry and Commerce of the City of Rome, 50 B.C.–200 A.D.* (Baltimore, 1938).
[3] Vegetius IV. 39.

harbour might be tempted to make a run in a spell of fine weather,[1] but this does not alter the fact that most ships reached the ports of Rome in the summer.

The Egyptian grain, for example, seems to have been collected in Egypt by the central administration in the period from March till May. It was gathered first into the village storehouses, then assembled at the harbours on the canals and the Nile itself, and finally systematically cleared down the Nile to Alexandria.[2] The Alexandrian corn fleet, often sailing as one group, ran laboriously against the prevailing northerly winds in a journey that might take up to two months from Alexandria to Rome.[3] Seneca told of the excitement and sense of relief when the lookouts spotted the first ships of the Alexandrian fleet making for Puteoli in his day[4]—with reason, for Egypt sent Rome 20 million *modii*, nearly 150,000 tons of corn, in the mid-first century A.D. The arrival might be a relief but the docking, unloading and administrative arrangements had to be able to take the sudden strain. The barging of the goods upstream could be spread out over the winter months, if need be, but the sea-going ships had to be freed as quickly as possible so as to make other journeys and that might not always be easy. In a famous letter of late second century A.D.[5] from a man who had sailed with the Alexandrian corn fleet, we know that he arrived on 30 June, but did not unload until 12 July. He himself went up to Rome on 19 July and even on 2 August no member of the fleet had been allowed to leave for the return journey.

Egyptian grain was, of course, only a small part of the problem. Africa, outside Egypt, sent twice as much grain as Egypt to Rome and there were corn imports from Sicily, Gaul, Spain and places like the Thracian Chersonese. In addition there were massive imports of wine and oil, building materials, fabrics and luxury items, adding up, I suspect, to perhaps one million tons of goods passing through the docks of Rome each year.[6]

To cope with such a volume of goods the labour force must have been gigantic. If the 70 million *modii* of corn from Sicily, Egypt and

[1] Not always safely; compare the experience of St Paul being brought, on an Alexandrian freighter, to Rome in A.D. 62 (Acts 27).
[2] See Appendix 2.
[3] L. Casson, *TAPA* LXXXI (1950), 43.
[4] Seneca, *Ep.* 77.
[5] Hunt and Edgar, *Select Papyri* (Loeb), I, no. 113.
[6] Loane, *Industry and Commerce of the City of Rome*.

Africa alone is divided into sackloads able to be carried by a man, we must think of about 10½ million sacks, which have to be moved from ship to warehouse to ship at Ostia, and then unloaded again at Rome. It would need 1,400 merchant ships to bring 70 million *modii* of corn to Rome, if the *average* capacity of a corn ship was 50,000 *modii*, as the *Digest* might seem to suggest. If the average capacity of the river craft used to transport goods upstream to Rome was about 68 tons, then the 70 million *modii* alone would provide 8,000 boat loads. Given the fact that it took some three days to be towed upstream to Rome, it is clear that even with the winter months being used for barging goods up the Tiber, a massive number of river craft would have to be available. This supposition is clearly borne out by the passage in Tacitus' *Annals*[1] which reports the loss of 200 ships, almost certainly *naves codicariae*, in the Claudian harbour at about the same time as a hundred ships full of corn were burned by a chance fire at the docks in Rome itself. Besides the large numbers of porters, sailors, and towpath men implied by these figures, there were also men like *saburrarii*, the men who carried off the sand used for ballast, the *urinatores*, who seem to have salvaged merchandise that had fallen overboard or from ships that had sunk, and *mensores* everywhere.

3

In both military and civil life, therefore, the storage of goods set the Romans problems in architecture, law and administration, all the more complicated because of the extent of Rome's power and the size of the Imperial city itself. The architectural and structural problems led to the use of the finest available building materials and specific structural devices, such as ventilators, raised floors, slit windows and buttresses to deal with the particular problems raised. The building types adopted in military and civil life were not the same, but each was so well constructed and so apt for its purpose that they have both featured amongst the best preserved and most easily identifiable buildings constructed by the Romans. They may well have had an influence on later architectural themes not always recognised. The administrative problems were perhaps never so completely solved, or at least our evidence does not permit us to say that a fully successful solution was achieved. The tendency in both military and civil administration as the Empire evolved

[1] Tac. *Ann.* XV. 18. 3 (A.D. 62).

was for a constant growth in direct state interference and bureaucracy, which still did not achieve its aim of simple efficiency, but the struggle to try to make the system work is fascinating to watch.

It is often very difficult to build up from our literary, legal and epigraphic sources a realistic picture of how things actually worked in the ancient world. This study of Roman granaries and storehouses, with its stress on *Realien*, will, I hope, shed a little light on some aspects of Roman commerce and the Roman military system.