WEEKENDS IN THE SOIL

by Edward L. Lenik

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Many years of excavation work, personal experiences, and people contacts have gone into the preparation of this book. The need for such a book became apparent from the first day I began to excavate a historical site. I saw quickly that many students of history and archaeology were keenly interested in our buried past but did not know how to properly proceed with excavation. My continuing work with historical and archaeological societies has shown that these groups want to dig, will dig, but do not know how. Hopefully, this book will serve as a beginning framework upon which the serious excavator can build his/her skills in properly excavating and recording a historical site.

It is difficult to properly thank and acknowledge all the people who provided some input for this book. In my career as a historical archaeologist, two individuals stand out as a source of inspiration and guidance for this book:

Jim Norman of Newfoundland, New Jersey and Mead Stapler of Riverdale, New Jersey are two individuals who had a profound effect on my career. Jim taught me how to feel and read the physical and natural features of a site. His vast knowledge of the outdoors was a tremendous source of information. Mead Stapler, on the other hand, is a dedicated historian; a writer and editor of a quarterly journal. More importantly, Mead's interests are deep-rooted and broad and he has often communicated this to me. I am grateful for the guidance and perspective he has provided me through the years on many of my projects.

Special thanks must also go to Lura LaBarge of Newton, New Jersey and Jack Mead of Cornwall, New York. Lura reviewed the manuscript and suggested many changes which would be helpful for a better understanding from the layman's point of view. Jack provided considerable guidance in the area of digging techniques. My experience in working with him at Fort Montgomery has been invaluable.

Several individuals contributed much of their time and effort in helping to illustrate the book. Foremost in this was Barbara Corcoran who prepared many of the illustrations. Other contributing artists were Frank Dulfer, Joseph Kolicko, Cathy Guellnitz, Dennis Gloede and John Adamo. My sincere thanks to all.

Finally, I wish to thank those that did the "digging" without whose help this work would not be possible.

EDWARD J. LENIK
Historical Archaeologist
September 1977

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Preface:

Historical Archaeology is a journey of adventure that begins in the library and ends in the open air. Although most weekends spent in following archaeological trails never lead to worldshaking discoveries, more and more people are showing interest in our buried heritage. Our own inborn curiosity urges us to find out more about ourselves and our predecessors. We need to know who passed this way before us, who stayed on and how he or she prospered. In other words, we are in search of ourselves.

We must preserve our historical heritage. The preservation and study of the relics and places of our beginnings provides a "sense of having roots." We dig for knowledge, because knowledge itself *is* worth preserving.

Archaeological sites are natural resources — non-renewable cultural resources. If we do not preserve America's past now, there will be nothing left to enjoy in the future. Flooding, erosion, plowing, leveling, construction or other modifications of the land have always been capable of destroying information about the past. However, it was not until recently, when earth-moving machinery increased in size and capacity to dig deeper and faster, that the rate of destruction of archaeological sites became a really serious concern.

Salvage Archaeology

Construction programs which propose to slice through the earth in the interest of 20th century efficiency and progress are not designed to ponder over the middens of the past century. The increase in the rate and amount of land alteration, and the fact that there is often little time between the planning of the work and the accomplishment of the project, are the principal reasons for the development of Salvage Archaeology. Salvage archaeology is an attempt to gather as much information as possible from sites that are threatened with destruction. The need for an alert, aware, INFORMED public and a political atmosphere sympathetic to the needs of our cultural heritage are obvious. If irrevocable destruction is to be avoided, if salvage archaeology is to be given a sufficient opportunity, action must come early.

"Pot-Hunters"

Another type of destruction that is increasing at an alarming rate must also be mentioned. This is the problem of the relic collector. Just as lethal to an historic site as a bulldozer is the person who digs for objects rather than for information. Relic collecting, in and of itself, is not archaeology. An artifact torn from its context is meaningless. The pot-hunter and arrowhead collector who never reports his finds — "the dig, destroy and depart complex" — is as great a menace as some bottle collector whose sole concern is "the bottle." Of great concern, too, are the proliferating trade clubs, the "Artifacts Hunter's Associations" of treasure seekers armed with metal detectors.

One might be charitable and put such behavior down as being due to a lack of knowledge. Then public education becomes a function of the archaeologist, and seeking the active, responsible cooperation of the pot-

hunter becomes a project for the local society. The consuming public will necessarily need a source of information if the trade in plundered artifacts and fakery is not to triumph at the marketplace. Education at the lay level can serve both ends.

The Amateur Archaeologist

The term "amateur" is an unfortunate one, and archaic in this day and age. One is an archaeologist or one is not. The fact that one earns a living by digging archaeological sites does not make one a professional, anymore than the occasional excavation of sites makes one an amateur. The criteria for judgement is based upon one's professional attitude and the value of the work performed. We all have a responsibility to do good work.

Historical Archaeology needs people with many talents and skills. We have a responsibility to continually increase our knowledge and sharpen our skills. And once accumulated, we have an obilgation to promulgate that knowledge in a form that will interest others and enable them to benefit from our discoveries. The next few years offer the opportunity to engage the public interest on a large scale and to enable us to move ahead in seeking out and recording information relative to the history and prehistory of our country. The real purpose of this publication, then, is to attempt to bring together practical information so that the energies of the newly interested can be channeled, and their efforts directed to producing the most effective results.

Section 1: WHY

Historical Archaeology

Historical Archaeology is the study of the material remains of both the remote and recent past with respect to both archival documents and to the stratigraphy of the site in which those cultural remnants may be found.

Archaeology is more than a science, it is an art. The skill which the trained archaeologist brings to his task is the ability to study an artifact in relationship to other artifacts and their position in the ground. Excavating is a technique. The excavator is a technician who has mastered the art, and that "art" can be learned by anyone with common sense, self-discipline, and the ability to reason.

The archaeologist must be competent to take the ground apart in such a way that he can extract all the information concerning what happened, when, and to whom. He must be versed in the history of the period and the objects found in order to properly interpret the site which he is systematically destroying. Archaeology is, in a sense, a destructive process. The archaeologist only gets one opportunity to properly excavate a site and record the information.

Digging the documented past

Many people find it amusing that the techniques of archaeology should be employed on historical sites. Some people feel that historic sites are too recent and, therefore, we should rather be concerned with prehistory. It is too often assumed that everything we do is fully documented. This is not true because fire, flood, war, neglect and unthinking and deliberate destruction have caused great loss of records. The techniques of archaeology can usefully be applied to any period, no matter how recent.

Digging for details

Historical archaeology may be used to verify and expand written history. By digging we can learn more than is to be found in written records. Just because people CAN write is no sign that they will. Many details are often considered too trivial to be included in the written communique, small incidents are forgotten, the minutinae of daily living are simply not recorded. Such details are the facets of everyday life which, when rediscovered archaeologically, bring history to life.

Digging for accuracy

Digging provides confirmation and accurate information. Restoration projects can then be based on high standards of historical authenticity. Future land use can be planned so as not to disturb important historical remains, once their existence and extent has been determined by archaeology. While documentary references of local traditions may provide the general location of a site, traces may never have been noted on the ground. Digging can provide the evidence to verify tradition.

Preservation of Historical Sites

Historical archaeology is a recent development. Its really conspicuous growth started in the 1930's along with a rapid spread of interest in restoring and exhibiting historic structures, the most prominent example of which is Colonial Williamsburg.

The National Parks Service has been an important factor in the spread and development of historical archaeology. Today it is safeguarding and interpreting more than a hundred historical and archaeological areas. The work of the Service has prompted programs of local historical societies and non-profit corporations such as Cooperstown in New York and Sturbridge Village in Massachusetts. Other projects are constantly being undertaken by state, county and municipal agencies, often with the help of local Archaeological Societies.

In any field, growth comes through experience. The pioneers barge right ahead, learning as they go. Those who follow have the advantage that comes from their experiences.

Pioneers of Historical Archaeology

Virtually no one had interest in the archaeology of early European settlements until the late 19th century when a group in New York, led by William Louis Calver and Reginald Pelham Bolton, began to excavate colonial and revolutionary war sites in the vicinity of Manhattan. Calver and Bolton were active for over thirty years, their digs revealed the sites of five Revolutionary encampments. They dug into what had been the James Gordon Bennett estate and found literally hundreds of artifacts left by the British in their siege of Fort Washington in 1776. Material they unearthed in digs at Fort George, Fort Ticonderoga, West Point and Fort Haldiman on the St. Lawrence River is now a part of the New York Historical Society collection. These early explorations were completed none too soon, because now all of these sites in Manhattan have been virtually obliterated by real estate and industrial developments.

John D. Rockefeller, Jr. made the Colonial Williamsburg Restoration possible. Ivor Noel-Hume has been Director of Archaeology since 1957. Almost 400 buildings have been reconstructed on their original foundations which were uncovered by archaeologists. This work often required the prior removal of later structures. The town is now a living 18th century city. In the course of thirty years of excavation and study, Colonial Williamsburg has built up a collection of 18th century artifacts that is unrivaled anywhere.

Jamestown, Virginia is another fine example. The National Park Service has worked toward the preservation and interpretation of this settlement which was built in 1607. Digging at this site went forth sporadically from 1934 until 1954 when, for a two-year period, extensive excavations were carried out by Dr. John L. Cotter. Today, Jamestown is a popular tourist attraction. It features a demonstration or "live exhibit" of glassmaking which is carried on in a building that is representative of the original glasshouse, built near the excavated and stabilized ruins.

From 1947 to 1950, J. C. Harrington conducted the excavation of Fort Raleigh, North Carolina, the 16th century English settlement on the upper end of Roanoke Island, North Carolina. Harrington also worked at Jamestown. From material recovered there, he developed a system that is useful for dating clay tobacco pipestem fragments by measuring their bore diameters.

Roland Wells Robbins began his career in the early 1940's when he started a hobby of researching the lost facts of local history. The hobby soon became a full-time occupation and within a few years, and through intensive self-training, he established himself as one of the country's leading professional archaeologists. Beginning in 1948, the Saugus Ironworks excavation was his first major, and perhaps most famous, project. Considered the birthplace of the iron and steel industry, the site of the Saugus Ironworks Restoration in Massachusetts dates to 1650. Robbins has extensively developed the technique of using mechanical earth-moving equipment in archaeological work.

It is from the work of such pioneers that local historical societies can learn how to approach the study of sites in their own areas. Take advantage of their experience, first hand, by reading their own reports (see Bibliography). These men learned, by trial and error, how to research, how to dig, and how to report. It is by reading their trials that you now can avoid the same errors and perhaps make use of their "how-to" hints.

The role of an archaeologist

By now it should be evident that the archaeologist is something more than just a "digger." His role is, in a very real sense, similar to that of a detective. Through careful excavation, observation, and recording of the evidence in the ground, the archaeologist attempts to reconstruct previous events. Much like Sherlock Holmes, the archaeologist must use powers of observation and common sense along with the knowledge of history to find out what happened in the past.

Section 2: Back WHEN

Before you lift a shovel, it will be well to fully comprehend the 'historical' portion of the historical archaeologist label. It has been said that the historian works primarily with "words" and the archaeologist works primarily with "things." The historian is trained to seek out written documents covering the subject of his research, he or she must look over these documents, and must assess and weigh them for their validity and content accuracy with respect to the time and situation in which they were written.

The first duty of the archaeologist is to discover the material or artifactual evidence and ruins, verify them and secure their preservation. Then comes the task of studying, classifying, arranging and making the material ready for use. Finally he interprets his material and brings it into harmony with the recognized body of information regarding the past.

An historical archaeologist must know the basic techniques of both the historian and the archaeologist. To put it another way, historical archaeology is an integration of the basic techniques and methods of the historian with those

of the archaeologist. The successful integration of techniques and skills in any one individual is a matter of degree, not of kind.

In whatever way you became interested in historical archaeology you will, sooner or later, wish to concentrate on one particular site. Perhaps you might have read something that interested you in a specific area. In your travels, you may have passed, every so often, the ruins of something that leads you to wonder whether or not you can find out what it is or was. Or maybe you just want to discover something — anything; it is the activity that interests you. Whatever the reason, it is a good idea to work from the most general to the more detailed.

To better understand "your" site in broad terms, back up for the bigger picture. Just whose history do you plan to dig up?

The First Settlers

Let us take a brief look at some of the early cultures and theories regarding the settlement of the New World. This is prehistoric archaeology, rather than historic archaeology, because it is involved with people, the Indians, who had no written words.

Across the land bridge

Perhaps the most widely accepted theory concerning the route used by the indigenous peoples who came to the Americas is the Bering Strait Land Bridge which connected Siberia and Alaska. (Fig. 1). Early man probably began migrating, on foot, into the western hemisphere from Siberia between 40,000 and 25,000 years ago. The PaleoIndians crossed the land bridge in search of food, perhaps mammoth, caribou or musk ox, after the sea level was lowered during the late Pleistocene ice age. Although little has been found archaeologically to indicate camp sites, some artifacts found in Siberia resemble those found on early man sites in the western hemisphere. Once the glaciers began to retreat, man started to infiltrate the continent and by 9,000 B.C., early man reached the southern tip of South America.

Fig. 1

☐ *The probable outlines of the Bering Strait land bridge are shown during the last ice age when the sea fell 300 feet (medium gray) below present levels. The water locked up as ice in the glaciers allowed a bridge to emerge that was sometimes wider than Alaska itself.*

PaleoIndian

PaleoIndian complexes are often given the name of the geographical center where evidence is first found. The Clovis Point Complex, dating c. 11,300 years ago was once thought to be the oldest documented complex in North America. Today, however, there are strong suggestions of pre-Paleo cultures. Nonetheless, we presently know more about these Clovis or Clovis-like people who penetrated and settled in what was to become the United States. The remains of butchered animals from excavations at Clovis or Llano sites include mammouth, camel, giant bison, horse and ground sloth, among others. Many Clovis sites are "kill" sites where animals too large to be easily carried to camp were butchered. Fluted stone projectile points are the type of artifact found which identify this complex. (Fig. 2d, e, f).

Not quite so old, the Folsom Complex dates around 10,800 to 10,400 B.P. (before the present). The Folsom fluting technique is more sophisticated than the Clovis and generally produces longer flutes on carefully prepared stone points (Fig. 2a,b,c). The Folsom sites are more common to the southwest and consist of kill sites and workshops. Animal remains recovered from known Folsom sites include bison, deer, wolf, fox, antelope and rabbit.

PaleoIndian Complexes are also found in the Great Lakes area and in the northeast. Fluted points found in this area are more Clovis-like and only rarely like Folsom points, although other types — Cumberland, Dalton, Debert are also recognized.

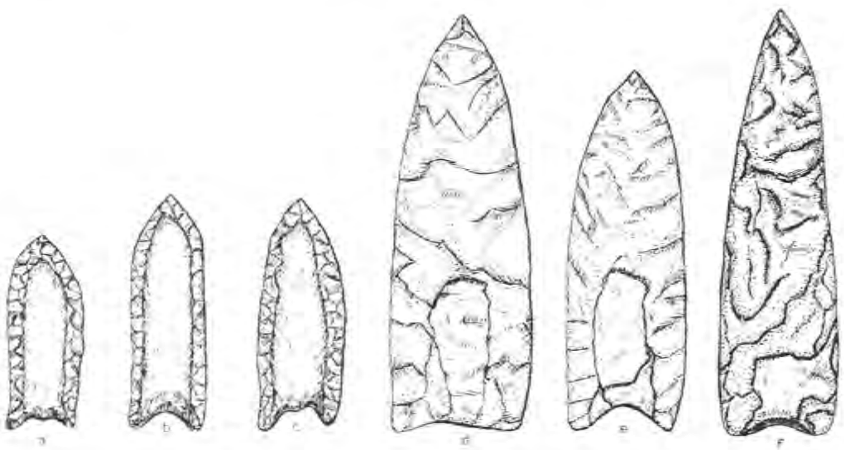


Fig. 2

Tools of the Early Hunters: Folsom points - a, b, c. Clovis points - d, e, f.

Alleged Early Atlantic Crossings

On the Atlantic side of both North and South America we have many speculations for early and late arrivals by sea. Early seafarers may have crossed the ocean to the western hemisphere utilizing ocean currents, both on accidental drift voyages and on deliberate journeys. Thor Heyerdahl, in his recent voyage of the Ra; tried to prove this theory. He tried to show that the early Egyptians using papyrus boats might have crossed the Atlantic Ocean, landing

and settling in Central America, explaining the white culture strain present in so much South and Central American early art and tradition.

It is common knowledge that there were high cultures in Central and South America prior to historic times. The Olmecs emerged as the major people in the area that is now eastern Mexico. The Maya occupied the Yucatan, Guatemala, El Salvador and Honduras. The Mixtecs and Zapotecs built on a grand scale in Oaxaca, and the Aztecs finally reigned supreme in what is today Mexico City. Similar events characterize Peru. Here the Inca held sway at the time of Pizarro, but they had been preceded by the Chimu and Nazca cultures and their antecedents.

Early Historic Voyages: Fact and fancy

There have long been various stories, oral and written, about early voyages to America. It is a field ready for archaeological confirmation or disproof. The next few years may hold quite a few answers in this area. That the Norsemen came is pretty well acknowledged. What is less certain is when they came.

Norsemen

Based on the Norse sagas, the landings of the Vikings have been variously placed in such areas as Providence, Rhode Island; Follins Pond, Cape Cod; Maine, and Nova Scotia among others. Archaeological investigations at L'anse au Meadow, Newfoundland, Canada definitely established the early presence of the Vikings long before Columbus. The 1963 discovery of a soapstone spinning tool which was unquestionably AD 1000 Norse confirmed this fact.

Phoenicians

It is believed by some that the Phoenicians made several voyages of discovery to the new world between 480 B.C. and 146 B.C. One theory is that they sought religious freedom and settled in North Salem, New Hampshire where they built the Mystery Hill "Caves." In Mechanicsburg, Pennsylvania hundreds of stones were found with alleged Phoenician characters.

Irish Monks

Another theory of discovery is that a harassed and disgusted band of Irish monks fled to America in the 10th century A.D. They also allegedly settled in North Salem, New Hampshire and built the Mystery Hill complex of stone structures. One should note, too, that there is some indication that the "caves" might have been built by Jonathan Pattee, a farmer, in the 19th century.

Portuguese

Joao Vaz Cortereal came to America on an expedition decreed by the king of Portugal in 1472 A.D. He visited Newfoundland and Labrador for his king. Joao's voyage to the new world was followed by those of his sons, Gasper and Miguel. In 1501, however, Gasper Cortereal was lost at sea and soon Miguel journeyed to America in 1502 in search of his lost brother Gaspar. In reference to this event, there is a carved rock in the Taunton River at Assonet Neck across from Dighton, Massachusetts on which it is said the name of Miguel Cortereal is carved.

Scots

Prince Henry Sinclair of Scotland is alleged to have explored the coast of Nova Scotia and New England in AD 1395. An effigy of a Scottish Knight is carved in stone at Westford, Massachusetts.

Strange Stone Structures

There is enough of this sort of speculation for local archaeological groups to do productive work. In the northeast, the New England Antiquities Research Association (NEARA) is a non-profit organization studying and investigating our historic and prehistoric past. This group is also investigating some structures made of unmortared stone. These are basically circular with inward sloping walls, and may have a flat portion of wall at the front and one or more flat roof slabs. A typical example of this structure called "beehives" is portrayed.

Photo 1

Underground stone chamber of "beehive" structure of dry stone masonry. Found throughout New England.

Box-type buildings of square or rectangular plan with vertical walls and two or more flat roof slabs are also found in the New England area. Some people suggest a bronze age origin for these structures. On the other hand, they may be Colonial root cellars or hideaways. Further inquiry and field work may one day solve this contradiction. Other very early signs of man left in this area might include carvings and inscriptions such as the handprint pecked in stone, found on Minisink Island, in the Delaware River in New Jersey and "Roman" inscriptions in York, Maine. Cairns (piles of rocks located in one area), dolmens (a large boulder supported by two or more stones) which may be worked in some fashion and might resemble faces or animals, and Monoliths (a single standing stone) may sometimes be found in groups or alignments.

Obviously Columbus did not "discover" an uninhabited continent, nor did the Founding Fathers land on a barren rock. This land had been populated for a good many millenia. Our history is indelibly written along our rivers and streams. By following them out the historian can sketch our more recent past, particularly in the Northeastern states.

The Indian lived and flourished along river banks. The archaeologist can specify for example, that the Lenni Lenape tribe lived, at least in part, on fish and mussels found along the Delaware River up until historic times. From written records and handed-down oral tradition, the historian knows that the

early explorers in search of riches, adventure, or the "Northwest Passage," followed our rivers and streams. Personal letters, diaries, sometimes photos and drawings, inform us that settlers planted their roots along the banks of the rivers where, in time, great cities grew and prospered. Archaeology can confirm this. One civilization followed another in settling along river banks.

Rivers are for Transportation and Communication

Rivers offered a smooth highway network of thousands of miles, and travel by boat was usually easy. Goods, articles of commerce, livestock and produce could be moved more easily and cheaply over water than over roadways. To the early settler, the river provided a quick communications link from the "frontier" areas to the civilized areas. The flowing waters, as they moved toward the sea, produced a favorable topography especially in the Northeast. The rivers cut into the terrain deeply, making easy gradients for the early roads, a factor of special importance in an age which preceded the railroad and the canal.

Photo 2

Rivers were extremely important in early American life. They provided power to run saw mills, gristmills and other industries. Rivers were also a source of food, potable water and a means of transportation and communication.

Many early maps show roads following along rivers. The cross-country road map was a map of the rivers and streams with trails to portage from one waterway to another. And wherever there was water, a transportation artery could be built. In the 18th and 19th centuries, canals were developed extensively throughout the northeastern United States.

Rivers are warehouses

Rivers are ecological resources that offer fish of all types, including shellfish, provide a home for waterfowl, act as a source of drinking water and for the irrigation of farms. Their banks afford good trapping for family food, as well as furs and pelts of beaver, muskrat, etc. The flat terraces along the banks of many rivers were used as farmlands for growing and cultivating food crops by prehistoric and historic people alike. Natural water resources used first by the individual Indian and/or early settler, and later by commercial interests, abound in the Northeast.

There were vast quantities of virgin timber that could be cut and easily transported. In some areas, rivers were the source of bog iron which was later used for the developing iron industry. The banks provided a source of clay for pottery and brick-making. The fast-flowing streams, as they carved out the valleys and ravines, exposed mineral deposits, such as iron ore and gold which were later mined.

Many forts were built along strategic river sites. Armies fought and traveled along the waterways. During the Revolution, the British attempted to split the colonies by conquering the Hudson River Valley. In order to defend this vital riverine communications network, vast military fortifications were built along its banks. There were several attempts to block the rivers by chain obstructions and chevaux-de-frise (large log cribs or boxes which were weighted down by stone). These had iron spars or picks imbedded in them pointing upward at a 45 degree angle and facing downstream. Army records being what they are, there is quite a wealth of written material available to the historian; both official and first hand reports in original sources. Much of this information is contradictory. This aspect of history is another opportunity for the historical archaeologist to dig up the decisive evidence.

Rivers provide power

Streams and rivers provided power. Water was necessary to operate waterwheels and turbines, which in turn powered bellows, trip hammers, and grindstones for our early industries. Rivers were frequently dammed to provide reservoirs of water for power purposes. As a result all of our early industries grew up along river banks.

When a trade is handed down from father to son, there is little need for much how-to-do-it writing. Consequently, one often has only the tools and the manufactured items to help understand a dying craft or industry. Any evidence the historical archaeologist can unearth to help to understand the workings of early industries is always welcome.

At the very least, rivers and streams provide their own natural values of scenic beauty in deep ravines, gorges and waterfalls, as well as in recreation such as swimming, fishing, boating. In earlier times, the rivers were also the bathtubs and sewerage disposals. Rivers certainly have a high historical value. Early settlers discovered our rivers and streams and settled there. They took advantage of the many uses described above. Interesting and varied commerce and industry took place in the river valleys. As archaeologists we must attempt

to preserve some segments of our historical industrial past. Properly organized, on a local level, both environmentalists and historical societies can once again restore our rivers to their former grandeur.

However, knee-deep in mud at the riverbank is not the starting place for the historical archaeologist, though he may easily wind up there. The local library is, or should be, the first stop.

Digging into the records

One digs into the records before digging into the ground; all historical archaeology must begin in the library where you examine all documentary sources that may relate to the site and its physical features.

Photo 3

Dig into the records before digging into the ground: Archival research turned up this sketch of a 19th century farmhouse which was built on the site of a blockhouse or fort, c. 1755.

The historical archaeologist, in his research activities, should start by making a background study of the historic site in which he is interested. Find out what other researchers have said about it, so that you can form a general understanding of the area. Collect every published reference to the site and the people connected with it. The library card catalogue should be examined thoroughly, and family histories, diaries, county and town histories and anything else that might prove useful should be scrutinized. Bibliographies and footnotes in these works often provide additional leads to other books and sources of information.

A word or suggestion to the person with little researching experience: Remember that librarians are trained to help you find the information you seek. Do not hesitate to ask for their help. Learning to use the card catalog effectively is one thing. Gaining access to restricted materials will require a bit more doing. The regulations governing the right of access to restricted materials vary with the library, of course. Public libraries may require only that you be an adult. Where private material is concerned, you'll have to operate under the restrictions imposed by the private collector and respect his rights to both property and privacy. Free access to any and all information is not a constitutional guarantee. When that information is contained in a personal diary, the going can be rough. When the information is a matter of public record, you'll usually find a prescribed method for gaining access through the proper channels. There are many sources that are open to you for investigation.

Historic research materials:

Land grants and deeds provide a chain of title, and often contain detailed information on buildings such as date of construction, materials used, and size and location of outbuildings and fences. Significant features on the land are sometimes mentioned too.

Land grants, deeds, fire insurance policies

Maps were used in early fire insurance policies to locate and measure the buildings insured. In some cases elevations and floor plans are given. Drawings and written descriptions were used to identify the properties. The importance of these to the archaeologist is obvious.

Daily life is pictured in valuable and fascinating court orders. People are in court for all sorts of reasons: arguments over property lines, collection of debts, and marital problems. Military records list those who served where and when and sometimes confirm age, schooling and relationship. Church vestry books contain data concerning construction of church buildings such as size and interior arrangements, building materials and contractors. Such sources may help to straighten out situations where, for example, a private home became known as a church or meeting house. Church registers list births, deaths, baptisms and marriages. Financial reports, where available, might indicate who was active in the church community over which period of time.

Graphic representations

Graphic representations are of value if they can be authenticated. Naturally, maps are extremely important in archaeological work. Photographs, prints and even drawings and paintings of buildings and surrounding areas may be helpful. Some primative painters were remarkably accurate in portraying buildings, livestock and household articles. Old photos and new ones of the area may be compared. Aerial photographs often expose features otherwise lost and unseen from the surface.

Personal papers, Business and Civil records

Accounts, diaries, letters and other things written at the time must always be judged by who wrote them and for what purpose. No two diaries, recording the same event, will report it in exactly the same light. The circumstances of the composition should always be considered.

Merchant's accounts are valuable to the archaeologist because they list articles purchased by individuals, and this information helps in dating and identifying artifacts. They reveal when certain types of merchandise were introduced. Merchant's inventories, invoices and orders can aid in the identification of artifacts. The business records of professional men (doctors and lawyers) may also shed light on the archaeological findings.

Birth, baptism, marriage and death records may have been kept officially. Wills are helpful in tracing land titles. They contain a great deal of data on fami-

ly relationships and information about land and buildings, and generally list considerable data about personal property. Inventories of personal estates usually contained in will books are especially valuable to the archaeologist. Because they list every movable piece of property a person had at the time of his death, as well as his occupation, the archaeologist has an idea of what he might expect to find in the dig. An inventory also gives a fairly good idea of the size of the house and number of outbuildings and their uses.

Periodicals

Local newspapers run eyewitness reports on such events as fires, flood damage, and real estate sales. Advertisements often provide interesting architectural details in the descriptions of houses for sale as well as a place to reproduce graphic records of what household items sold locally actually looked like.

Oral history

Legends and stories must be collected and recorded. Interview and listen to the recollections of older residents. Where possible, it may be advantageous to speak with a number of senior citizens. The reminiscences of one might arouse the memories of another and bring to light facts not otherwise available.

With such an array of possible sources of information, any form of research appears at first almost hopeless. The Archaeologist/Researcher must form some systematic plan and start reading. References should be checked whenever possible against the original documents. Printers frequently do make mistakes. Every historical archaeologist should make it a rule to go to the most original sources possible.

Bibliography

Wherever the search for original sources takes you, make sure you keep a record of it. In books, the title, author, date of publication, edition number and publisher is the bare minimum. In periodicals, note the volume and number as well as the date. Remember you are going to need some of this information when the final report writing date comes. You will need to be able to cite your references when it comes time to draw conclusions. Unfortunately, it is often impossible to know at the beginning which sources will need to be included in a report and bibliography you'll write later, but now is the time to provide for an orderly way of recording informational sources, whatever they may be.

The historian researches to gather information. He then sorts and synthesizes this information to come up with a feeling for the essence of a time and place, and perhaps the personalities involved. The archaeologist researches for detailed facts. He needs to know specifics, however unrelated they may seem, that will aid in conducting and evaluating his field work.

When you find a piece of useful information, you may wish to copy it. There are many copy reproducing methods available today to make exact copies of graphic material, but do get permission first. There are often restrictions on the further use of such reproduced materials. Sneaking in with your Minox and then later trying to explain how you happen to have that photograph in your report can get very sticky. Written permission, of course, is to be preferred. Although this sounds like a dreadful bore, it may become absolutely necessary.

How does documentary material affect the Historical Archaeologist?

The historical archaeologist on the scene of an excavation, needs to know the local materials available, such as names, locations and dates, in order to attempt any reconstruction of events. He must rely on local documents and sources which are frequently of far greater value then are academic histories and biographies. The archaeologist uses the results of research as a guide for his explorations, and as an aid in writing his final report.

You get a more complete and accurate picture of a site when certain historical facts are discovered and known by the archaeologist. In the excavations at Charlotteburg Middle Forge, an 18th century colonial ironworks in New Jersey, several important documents came to light during the research process. Numerous maps, letters, newspaper advertisements and reports gave a good picture of the life and times at Charlotteburg. Perhaps the most significant document was a report submitted by four appraisers to Governor William Franklin of New Jersey in 1769. This report shows the extent and nature of the ironworks at Charlotteburg. That portion of the document which specifically refers to Middle Forge reads as follows:

Sir,

In compliance with your Excellency's request communicated to us by letter of the 27th of June last, we proceeded on Monday the 2nd inst. to view the iron-works erected by Peter Hasenclever, Esq.; within this Province, and began with those of Charlottenburgh, on the west branch of the Pequanock River, which is the boundary between the counties of Morris and Bergen. We there found a very fine blast furnace erected in 1767, . . . On the same stream, about three miles lower, is a very fine forge and four fires, and two hammers for converting pig-iron into bar-iron, and is, according to the information we received from the overseer, and workmen, capable of making about 250 tons of bar-iron yearly, single handed, and from 300 to 350 ton double handed. The dam here is upwards of twenty feet high, and is remarkably substantial and well secured: Here are also the necessary coal-houses, dwelling-houses, store-houses, workshops, and stables. About a mile . . .

We are,
Your Excellency's most humble servants,
Stirling
James Grey
Theunis Dey, and
John Schuyler

Newark, July 8, 1769

With the above description in mind, the archaeologists uncovered the ruins of Middle Forge and accurately interpreted the archaeological evidence. Once again, it is easy to see why it is important to dig into the records before digging into the site.

Section 3: The nitty gritty, HOW to Dig.

Plan to avoid problems

Once you've looked up and read everything you can find, have a bearing on your site, and pin-pointed what is to be "your" dig in the larger picture, the next question is just, HOW does one dig? As with anything else, there is a right way and a wrong way to go about an excavation. The right way means simply using those techniques and methods that have thus far produced the best results for the most people. Of primary importance is the concept of orderliness and the use of a great deal of common sense.

Think out every recognizable problem before you dig, to eliminate unnecessary work and achieve your goal sooner. Make your plans on the basis of research and a thorough study of existing conditions at the site. Obviously, the study of a city lot on which a historic house is standing will differ from that of a country location, or one which has been radically changed through the years.

A sound plan will contribute enormously to an efficient project. Such a plan must present objectives, general time schedules, equipment needs, etc. Each activity should be described, and a course of action outlined for its accomplishment. For example: pre-excavation research, mapping, excavating, post-excavation work and publication of reports. A detailed example of the plan for a real dig should look something like this:

SAMPLE EXCAVATION PLAN

Site Name: Van Campen's Fort

Location: 400 yards west of the junction of the Old Mine Road and Van Campen's Brook in Pahaquarry Township, Warren County, N. J.

Objective: Excavate area around stone foundation which is reported to be that of a blockhouse of the French and Indian War Period. Attempt to verify local tradition that this is the site of Van Campen's Fort.

Field Director (name):____________________

Time Schedules:

1. Excavation begins June 1st
2. Excavation ends September 1st
3. Work Schedule: Saturdays, Sundays, and holidays from 8:00 A.M. to 5:00 P.M.

Activities:

1. Secure landowner permission
2. Documentary Research Committee (names): Preliminary Report due: May 15th
3. Field Survey
4. Mapping and layout of grid system: Completion date: by June 1st
5. Excavation Crew (names):____________________

6. Photographer (name): ______________________________
7. Recording by field director and excavation crew.
8. Laboratory Work
   A. Place where work will be performed.
   B. Person-in-charge
   C. Washing crew (names): ______________________________

   ____
   D. Cataloging and Restoration

Final Report:
1. Final report of Research Committee
2. Writing of report by field director
3. Publication of report

Site Map

The first thing you should do is to prepare a site map showing the geography and topography of the immediate area of your excavation. A topographical survey is extremely valuable, so you should get a surveyor to make one if at all possible. A contour map is always helpful as it may reveal the location of buried features and suggest the best place to start digging.

If you are unable to secure the services of a surveyor, you can still prepare a perfectly good map on your own. To do this, you should purchase a topographical map issued by the Geological Survey of the area in which your site is located. From this map make an enlarged sketch of the area surrounding your site. Include on sketch the contour lines, rivers, streams and other natural features plus the compass direction. Be sure to have a distance scale; for example, one inch on the map equals thirty feet on the ground.

An important item to include on your site map is a permanent location point such as a "bench mark" which is indicated by the initials B. M. on the topographical maps. If this is not available you must draw a local land boundary or road junction. This permanent or fixed point will enable you to relocate your site by measurements from these fixed points.

Photographs

Photographs of the site and every exposed feature should be made before any work is started. Photographs should be made every time any change is made, such as when the grid has been staked out, when the ground cover (shrubs or trees) is cleared, and daily during the excavation. Photos should be black and white in addition to color slides. Furthermore, if you expect to utilize this dig to encourage membership or promote funds for your organization, do not neglect to take a "human interest" type shot now and then. Local papers are not necessarily thrilled by your technically excellent shot of an old cannon ball, but let them see the shot of the college girl who dug it up and you just might get a story out of it.

Field Book

With your homework done, take a camera, your maps, and a transit or compass along and locate the site. Physically inspect the entire area. Secure a collection of artifacts by surface hunting, retaining all whole and broken pieces. Make a note of all surface features and structures in a permanent Field Book. A bound notebook of graph paper makes an excellent field book.

The site should be completely described in this book. This is the supervising archaeologist's record of the dig as it progresses, it describes the

stratigraphy and cites the exact positions where key artifacts are found. It includes sketches of significant artifacts and is also the place to record overall measurements of walls, foundations, brick sizes or other details.

Grid System

The link that puts your site in tune with your maps is the staking out of a grid system. The grid system enables the excavator to dig in a carefully controlled manner so that the recording of features can be easily and accurately accomplished. All your measurements will be based on the grid, therefore, it must be laid out accurately.

The use of a five-foot square as an excavating technique is an excellent procedure for many reasons. It is a practical and workable unit which can be utilized in training students and maintaining control over data in field situations. It enables the excavator to start and stop the digging at any time. It is probably the most feasible unit of excavation in terms of testing a site. It is an excellent technique for working on, and establishing, stratigraphic relationships over widely separated areas of an extensive site. It is an excellent technique for sampling deep or expansive sites. However, it is noted that the metric system is fast gaining acceptance and a 2-meter square will soon replace the 5-foot square, so Think Metric!

This technique, like any other, has its limitations. Certain field situations may dictate that features be excavated as units. For instance, at Fort Montgomery, Bear Mountain, New York, a well-preserved fireplace and hearth in an officer's commissary building was excavated as a unit. To dig this feature in terms of five-foot squares (or 2-meter squares) would have been too time consuming and impractical. In this situation, the five-foot square would obscure the total picture by breaking it up into numerous small units which might have been difficult to correlate. Since archaeological sites very in their nature, content and the configuration of their foundations, dumps, or other features, the archaeologist must use good judgement and always keep his excavation objectives clearly in mind.

You can place the grid wherever you like on a site, but once it is laid out and the digging has begun, you are locked into it. Try to lay out the grid to avoid trees, buildings, boulders or other obstructions which would prevent the permanent placement of stakes. A helpful technique is to first draw the grid lines out on thin tracing paper, at the same scale as your map, so that it can be moved about over the site map to determine the best possible position. Consider too, that spoil, backfill or waste soil storage is one of the primary problems of an excavation. Archaeological investigation involves digging holes in the ground and the result of digging is a pile of soil; physical material which occupies space and must be disposed of somewhere, preferably not on a spot under which a feature is likely to be found at a later date. It is very frustrating to be forced to shift waste material from one place to another in order to clear the site on which to continue a dig which is following a feature.

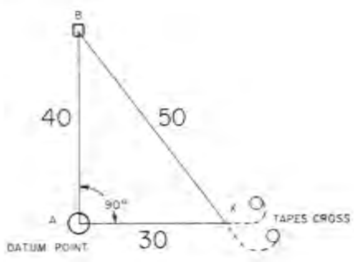
After you have completed drawing your site map and determined where you are going to dig, you are ready to establish a "base line" from which you will develop your five-foot or 2-meter grid plan. In deciding where to place the base line, keep in mind that you are going to build a grid that can be extended in all directions. It is best to run the base line in a due north-south direction. The base line must be related to some permanent point or mark called the "datum" point. This, in turn, must be related to the bench mark or other permanent mark used to locate your site on the map.

Datum Point and Triangulation

The datum point is the reference point to which all measurements, both horizontal and vertical, made during the excavation, will refer. You must, therefore, select some fairly permanent object such as a large boulder or natural bedrock. The location of your datum point, or base line can be made by triangulation with compass and a 100' steel tape. Triangulation is based upon the use of two known points to locate a third. Therefore, you should take measurements from two known points (bench marks) to the third.

Drive a wooden stake or iron spike into the ground that will become one end of your base line. Next, measure carefully from the datum point to this stake. This measurement is important because it permits you to relocate this point in the future if your stakes are removed or disturbed. Place one end of your steel tape over the spike and determine the position of the other end of the base line. Use your compass to check the N-S direction and place a second stake at the other end. Keep the steel tape stretched between the two spikes and then drive your remaining spikes into the ground at five-foot (or 2-meter) intervals. The need for accuracy must be stressed again. Be sure to keep your tape taut and level in order to make certain that measurements are made horizontally and not along the slope gradient.

The next step is to put in two lines at a 90 degree, or right angle to the base line. This can be done simply by using the geometric principle known as the 3-4-5 triangle. This will establish the sides of the grid extending at right angles to the base line. In other words, a triangle with sides equal to 3, 4 and 5 units (30, 40 and 50 feet, for example) will have a 90 degree angle between the shorter sides and opposite the longer side.



SITE LAYOUT

FIG. 3

Step 1, measure 40 feet along the base line which you have already established and staked out at five-foot intervals. Step 2, measure thirty feet from one end and step 3, fifty feet from the other end and the junction of these points will be in a line at an angle of 90 degrees from your base line. This line is then permanently established by driving stakes or iron spikes at five-foot intervals along its length. Repeat this process to give you the other half of your rectangle. Once again, drive your stakes in at five-foot intervals both N-S and E-W. This rectangle, which is divided into a checkerboard of five-foot squares, can be extended to any desired length.

Heavy duty twine or string is very helpful in laying out spikes in a straight line. The string also gives the excavator a good visual picture of the five-foot unit he will be digging. The layout of the grid and the numbering of each five-foot square is shown on the following diagram:

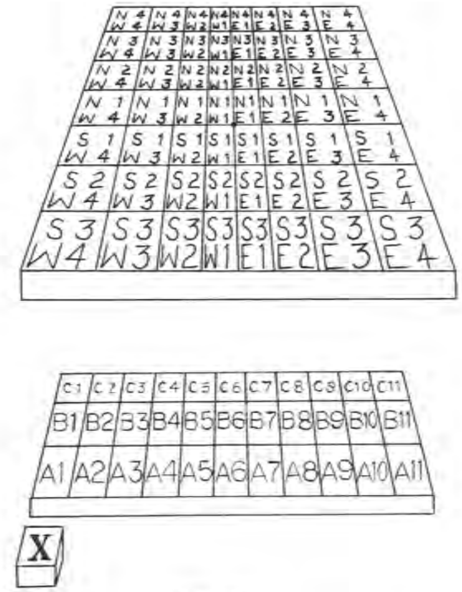


Fig. 4

Two examples of a simplified grid system used as an aid in mapping and a method of recording the location of features and artifacts.

Drawing the grid map

The next thing to do is to draw a duplicate of the grid on paper so that each feature and important artifact can be plotted on it, in its correct position. This grid plan must be drawn on heavy paper or cardboard as it will be used in the field. The location of natural features that happen to be present within your grid must be plotted on the map before you start to excavate.

Taking elevations

Before proceeding with the excavation, another important item must be determined and recorded — the vertical or topographical relationship at each stake of the grid. The existing surface of the earth is not level and there may be a rise or depression between stakes. This must be measured and recorded.

The elevation of each stake with respect to the datum point is determined. An arbitrary height of 100 feet is assigned to the ground level at the *base* of your datum point. The ground level at the base of the stakes in the grid system is then determined by means of a line or string, a carpenter's or string level, and a ruler. It is helpful, and easier, to establish the datum point at a higher elevation then the grid. It is then a simple matter to measure to the first stake and if the ground level at the base of the stake is ½ foot below that at the datum point, then the ground level at this point is 99.5 feet.

The process is repeated at each stake of your grid. The elevations at each point should be recorded in your field book and on your grid drawing as well. Make sure all people working the dig understand the grid system and can correlate their notes, drawings, and artifact recording to it, and that the necessary supplies are at hand for them to do so. A site map, suitably protected by a plastic covering, kept at the site for easy reference is not a bad idea for an amateur group working informally.

How much digging?

There are a number of approaches that may be taken to excavation. Which is the most reasonable in a particular situation depends first on the end result desired. Is this site to be built over, displayed, or backfilled when it has given up its secrets? How much time is there, and what work force is available, have a bearing on it too, particularly where the dig is a project of a local historical or archaeological society rather than an ongoing inquiry sponsored by some well funded foundation. The possible choices are many.

A comprehensive excavation entails exposing all structural remains. Practically everything is removed from the site except original construction features such as pavements, steps, walls, and footings. Each part is identified and each period of construction must be identified as it is encountered and its date is established. The soil disposal problem in this operation will be a major concern because of the large amount of earth which must be removed. Unless the site is to be backfilled, temporary protection from the elements for structural features must be considered and provided as required.

Test pits

When the location of features is known or strongly indicated, the digging of test pits is a quick and economical archaeological investigation method. A series of pits is often sufficient in itself to indicate the extent, date and former occupations of a site. A test pit is often dug in an area away from the site so the normal conditions of the soil on the site can be determined. Test pits are usually five feet by five feet and spaced to expose anticipated remains. Dig from the surface down, layer by layer, to undisturbed soil or until a foundation or other feature is uncovered.

Robbins test pit pattern

Test pits may be dug in a pattern as suggested by documentary evidence pertaining to building locations, by the probable presence of structures found, by probing, or in a pattern suggested by site considerations. Roland W. Robbins, professional historical archaeologist, has developed a technique for digging test pits according to a grid plan. The Robbins test pit technique is to dig, for example, fifty 2-foot square test pits, distributed on a 10-foot pattern.

Cross trenching

Cross trenching is most adaptable to a vacant site on which the locations of previous occupancies are widely scattered or not known. The direction in which cross trenches should be run is determined by the probable orientation of the remains. Obviously, they should intersect the remains. Normally, the two-foot width is used, and digging is continued downward until structural remains are uncovered or sterile soil is reached. The distance between trenches varies, depending on the site, on the size of the structure, and on the required thoroughness.

Record balks

Record balks should be maintained at several locations at the site. These are unexcavated sections, usually about two feet thick which reveal the stratigraphy of the undisturbed earth on the site and serve as a check for the

archaeologist and as an index to occupational levels. They should be preserved as long as possible for future reference and study.

Tools you will need

When the site is staked out and you are fired with ambition to dig, what next? What tools do you need? Those which most historical archaeologists find useful are: probe rod, soil probe, pruners or root cutters, spade, shovel, trowel, pocket knife or artist's spatula and brush, dust pan and whisk broom, GI entrenching tool, sifter, 100 foot tape (steel), six-foot folding rule, compass, wired grid frame for recording plan view of squares, string or carpenter's level (an aid for recording vertical dimensions).

Probing

Probing is a widely used first step, even before locating the grid. A pointed iron rod is used to reveal (hopefully) the approximate or probable location of structural remains which have disappeared from the surface. When the probe comes in contact with an object harder then soil — like stone, rock, brick, or pipe, it will be apparent to the prober and he should make a note of it.

The probe rod is a steel rod ⅝" in diameter, five feet long, pointed at one end and having a handle at the other. The way to use it is to grip the handle with two hands and plunge the rod into the earth. Do not exert strength but widen the puncture by reaming instead. The circular motion of the probe rod opens up the hole for probing deeper. The technique of plunging and reaming will drive the steel rod to its full length until it strikes an impenetrable object like a stone wall. Once the rod has reamed an opening, you then put your weight into driving the point deeper. Experience will teach you to tell one foreign body from another and to make a reasonably close guess as to what you may have struck.

The lines and areas probed, the depth of the penetrations and the apparent stone or masonry encountered should be recorded. When all productive probing has been done, a pattern of sub-surface conditions may emerge from the plotting of the probe notes.

Strata

Looking at the earth the other way — as a stratified profile or slice through the soil — rather than a look from the top, reveals that the ground is made up of a series of layers, most of which are created by natural agencies but others which have been deposited by man. Soil layers are not always neat, flat and easily identifiable slices. *The last layer that has been deposited must be the first to be taken out.* The excavator must learn to read the layers of earth through which he cuts as if they were the pages of a book. The strata are normally differentiated by variations in color, substance or content. The success of historical archaeology depends on the correct interpretation of the artifacts in relationship to the soil layers in which they are found.

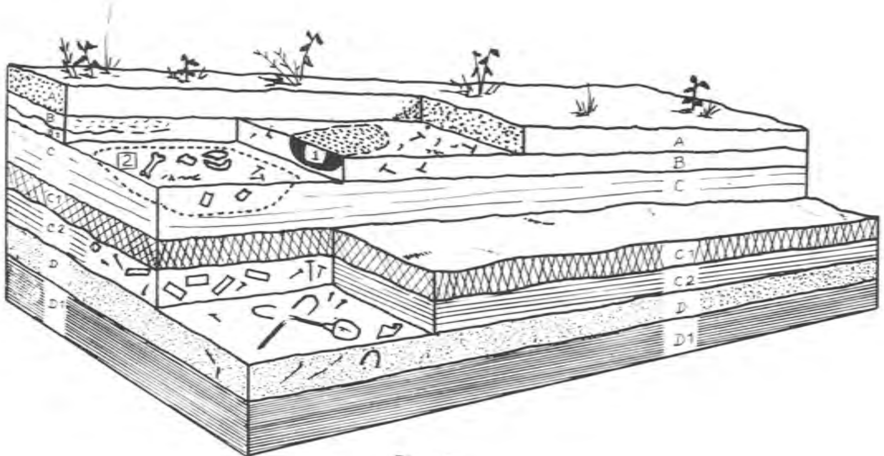


Fig. 5

Schematic drawing showing the relationship of one soil layer to another, or stratigraphy. The correct interpretation of artifacts and features in relation to the soil layers in which they are found is important in dating a site.

Soil probe

For determining stratigraphy in some soils a "soil probe" is quick and effective. This is a steel rod similar to the probe rod described above, except that it has a deep groove or channel running along its length. Plunge it straight in, as deep as possible. Twist it in order to lodge soil in the groove. Remove the rod from the earth carefully. The soil in the groove will give the stratigraphy of the area. The soil probe rod is only effective in fine grained soils. If small stones become ledged in the groove, it will not be useful.

There are two basic principles of archaeology. If soil layer A covers, or is on top of soil layer B, then B was deposited first and followed later by A. Each layer of soil is dated to a time after that of manufacture of the most recent artifact found in it. That is to say, a stratigraphic layer may be no older than the most recent artifact in it. This is known as "terminous post quem", or a date after which the layer was deposited. In other words, one could find a cup made in 1893 buried in garbage deposited in 1922, but one would not find a 1933 World's Fair keepsake in a layer of earth deposited under a layer of ash from the great Chicago fire.

The art of digging

What makes digging an art is the fact that the levels are not level. Some levels are tipped. Sometimes dumps make bumps. Then there are interruptions. Man-made walls and natural obstacles like boulders deposited at one time, and finally covered later. Disturbances such as pits, post holes and trenches caused by man or animal digging down into a previous layer, in turn filling up the hole by accident or design at a later time.

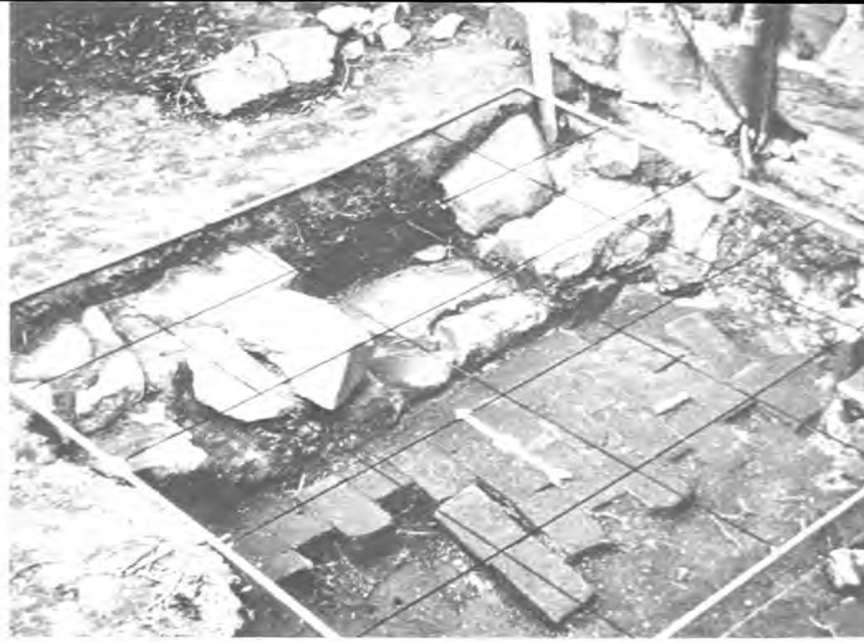


Photo 4

Recording features in excavated 5-foot square is facilitated by use of portable grid.

Photo 5

Domestic trash areas reveal evidence of food supplies and eating habits. Note remains of cow horn and jaw.

You excavate the five-foot square by going down soil layer by soil layer. Normally, the topsoil layer comes out first. Pruners or root cutters should be used to cut rooted vegetation. Frequently, there is the temptation to simply pull out the small roots by hand. The danger of pulling out roots is obvious — you can tear out and destroy the stratigraphic levels. To determine what kind of stratigraphy is present in the five-foot square, you should dig a small test hole approximately 2′ x 2′ in one corner. The test cut is taken down to the top of the next stratigraphic level so you know what to look for. Once the level has been established, it should be removed as a unit.

A long or short handled shovel with a broad, squared blade is an excellent tool for shaving the top of soil levels. This is often called schnitting or skimming. A spade with a round or pointed blade is useful for cutting through sod. Use a GI entrenching tool for pulling through rubble.

The trowel is the excavator's principal tool. This is a diamond shaped, flat bladed mason's trowel with the blade and shank welded into one. Grip the trowel firmly and use it with a sideways scraping motion toward the body. The point of the trowel should rarely be used. A downward stabbing motion should never be employed unless you are going through and clearing a sterile layer. You can detect changes in soil structures by feel or touch. You can even detect differences through the sound of the scraping blade.

For fine work the trowel is replaced by a pocket knife, artist's spatula, or palette knife used in conjunction with soft bristled paint brushes to clear away loose soil.

When the dirt has been loosened, it should be swept up, using the dust pan and whisk broom, and then dumped into a bucket or soil-carrying box. The key to successful digging is cleanliness. Unless the square is kept absolutely clean it will be impossible to interpret the evidence.

Photo 6

Excavation of 19th century coal shed at Van Duyne House site. Note careful use of trowels, brushes and dust pans. A measuring scale is also used in photographing.

Sifting

The loosened soil is brought to the sifter where it is placed through a screen. The sifting screen is a rectangular wooden frame with either ¼ inch or ½ inch hardware cloth wire mesh stretched underneath and attached securely. There are rocker type sifters as well as the stationary frame type, but either way the idea is to work the loose material over so that the artifacts are left on the screen where they may easily be picked up. The danger is that tiny pieces may fall through unnoticed. Be alert when breaking up lumps of earth so nothing is missed.

Sifting is done layer by layer in each square so it is possible to tell where any recovered artifact was dug from.

Label the layers

Each soil layer is given a number or letter for identification purposes. All the artifacts found in a given layer are placed in paper bags, the bags are marked with the site name, square number, soil layer, date and the name of the excavator. Fragile objects should be wrapped in cotton and placed in plastic boxes.

Having peeled off one soil layer, you proceed to the next. When peeling the bottom of a layer away it is frequently difficult to be sure if the artifacts are actually in that stratum or in the top of the one beneath it. When in doubt, always put the *transitional objects* with the layer above. An earlier artifact in a later context will not make a difference, but a later fragment put into an earlier level can ruin the chronology of a site.

Digging is only half the on-site work. Under some adverse conditions, the sifting and record-keeping can be equally difficult, but both are necessary.

Records are essential

Record keeping is essential during all phases of the excavation. You never have "enough" information about the site, artifacts, soil levels or ground plans. Records must be kept through field notes, drawings, maps of site locations, grid sheets and photographs.

Every excavator must completely record all information in each five-foot square dug on a recording sheet similar to the one shown. A clipboard is a very useful item as an aid to recording in the field.

Square Sheet Plan

The Plan View of the square should be completed first. The grid frame is placed over the excavated square to facilitate drawing. The recording sheets must all be oriented in the same direction with North at the top. All structures, features and artifacts as they have been revealed by excavation must be drawn to scale on the sheet. The depth from the top of the ground to the bottom of the excavation should be recorded at each corner.

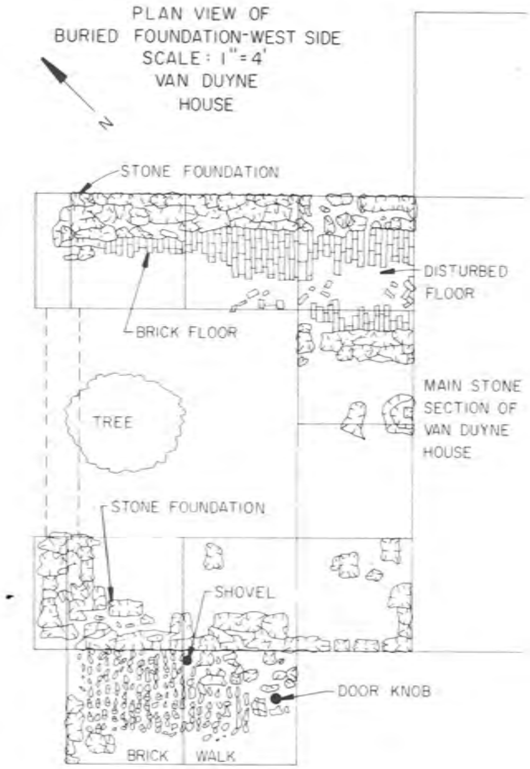


Fig. 6
Recorded archaeological features and artifacts on a plan view drawing.

Section Drawing or profile

A profile drawing is made next. A profile simply means a scaled drawing of the vertical face of an excavated area. The profile drawing is made to illustrate the relationship between the various soil layers through which the excavator has dug. One of these should be made for every five-foot square that is excavated.

The method of doing a profile drawing is fairly easy. A string is stretched across the top of the vertical area to be drawn, and secured by spikes. This string is then made level by means of a carpenter's level or string level in order to provide an arbitrary reference point for measurement and drawing.

A series of vertical measurements are then made at convenient horizontal distances along the string, upward and downward, to each of the soil layers and to features such as walls. The measurements are noted on the square sheet profile along the datum string. All the separate points are then joined to outline the layers, walls or other features visible in the face of the excavated section. It is important to carefully describe and identify each soil layer in your notes. This should be done on both the excavator's square sheet and in the field director's notebook. Be sure to show the profile drawing's compass orientation and position in the square, such as drawn from "west to east" at location of "2.0 south."

Photo 7
Excavation of stratigraphic soil layers at Van Duyne House site, Wayne, N. J.

Filled in cellar of 18th century tavern showing deposited soil and trash layers. One foot wide control balks maintained between each square.
Photo 8

Recording position of artifacts

It is important to note and sketch the position of artifacts as they are uncovered within the square. However, this can present some problems, particularly if you are digging a trash or dumping area. The number of artifacts found in a trash area can be quite significant. Thus it is virtually impossible to record the exact position of each pottery sherd, piece of broken glass, bone, or other items. Common sense must be the guide in this situation and the excavator should consult with the field director to decide on a course of action.

It must be stressed again that all artifacts must be bagged and segregated by soil layer. The bag must be clearly marked with the square number and identification of the layer from which the contents were recovered.

The "notes" section of the excavator's square sheet should contain as much information as possible in order to clarify and present a complete picture of the excavated area. Careful observation is the keynote here. Finally, the excavator should present his impression or conclusions, but these should be carefully worded such as, "soil layer 3 is reddish in color and appears to have been burned or subjected to heat."

At the end of each day's work, the field director must collect all square sheets and artifact bags. These are checked for completeness and then brought to the archaeological laboratory for processing and analysis. It is important that a square sheet be drawn and prepared for every excavated square.

Site Protection

Temporary protection from the elements should be provided for all features and structures. Long-buried brick deteriorates rapidly when exposed to the weather. Therefore, it should be kept covered at all times. Backfilling with earth is recommended if no further work is to be done. Mortar will also disintegrate soon after exposure. Also stabilize walls with wooden braces or backfilled earth. While excavating perishable features, protect them at the end of each day's work (for example, exposed wood should be covered with wet paper towels, canvas, and light covering of earth). Temporary shelters utilizing plastic sheeting can also be set up. The site should be immediately backfilled if no restoration or interpretative work is to follow.

On site care of artifacts

Care of artifacts begins at the site. Proper bagging and identification is the minimum treatment. It is also important to be prepared to handle material that decomposes rapidly on exposure to air, such as wood, leather, textiles, bones and certain metals. Have some material ready at the site for the preservation of deteriorating artifacts such as white shellac in alcohol, Krylon spray, tissues, cotton and brushes. Fragile artifacts such as pewter buttons or spoons should be wrapped in cotton and placed in a plastic box before being placed in the artifact bag. The white shellac in alcohol, together with the tissues, can be used to solidify items such as cloth so that they can be easily removed from the field and taken to the archaeological laboratory. However, shellac should not be used on wet or damp objects. A mixture of Elmer's Glue thinned with water is extremely useful for preserving wet objects.

Section 4: WHICH places should be dug up and what will you find there?

Now that you have learned something about HOW to dig, it may be well to backtrack a bit and see WHICH places you need to dig, if indeed digging is needed at all. The first place to look for a record of human society is, of course, the homes in which the people lived; however, some domestic sites, where the house is still standing, may not necessitate any excavation. What do existing houses have to do with historical archaeology? Architectural antiquities are one thing, digging up domestic sites is something else. Preservation of information may take many forms; the Historical Archaeologist must be flexible.

Architecture

Architectural history is a subject that deserves a book by itself, with particular emphasis on domestic architectural examples. Once the first winter was over, Americans tended to build for posterity. Some examples of each style have survived, and good records, in drawings and photographs, exist to detail other houses. We have a good deal of information concerning what was being built in a given area at a given time. Whether or not a particular ruins would exactly duplicate any known example is always debatable, and should be considered when assigning priorities to excavation and preservation work. One cannot undertake much along these lines without some general overall picture of the history of houses in the area. It is advantageous to know what details are common, what plan features were repeated, and what materials were most often used.

There are many specialized books available for various styles of architecture in different sections of the country that you'll find in the library both under "Architecture" and "History" headings . These will give you a good general background on the type of building that may confront you. It would be well to become familiar with these first, before attempting to interpret old photographs and plans that may be applicable to your specific site.

In recent years, old houses have increasingly engaged the interest of architectural historians and scholars in many fields. There is also more individual interest today in converting and restoring antique houses to personal use. Public agencies, as well as private individuals, are now working hard to save and preserve many old houses from destruction. For example, Independence National Historic Park in Philadelphia, contains one of the greatest concentrations of historic buildings and sites in the United States.

Old homes record human society

We cannot hope to save every architectural fragment from the past, nor would this be desirable, but historic restoration, preservation, and reconstruction have become important elements in urban design. The oldtime craftsman who hewed the timbers and set the stones of old houses, knew well that they were building for posterity as well as for the generation of their day. The craftsmen are gone, but their handiwork remains as one of our cherished possessions, a link with our own and our country's past.

We find in comon, everyday houses surviving from the past, evidence of the lives that were lived in them, of local customs, of economic conditions and much else. Social and economic historians look to the buildings to help describe the activities they were designed to house, and to relate periods of intense building activity to the opportunities for the accumulation of capital. Historical buildings tell us of a particular cultural heritage evident in the flavor of the architecture, or of an individual working with tools, building his own "dream house." Sociologists, in surveying individual communities, discover that the buildings of the people and the way they were erected, ranked with their churches and forms of religious observance in expressing their social organization. We also learn of the different people who used the structure through time, altering its appearance in one way or another to keep in style or to satisfy individual needs and fancies.

Primative houses

Architectural styles begin with the simplest primative dwellings of the American colonists. Conical huts of branches, rushes and turf often served as temporary shelters, perpetuating types current in England. The early houses at Plymouth, Massachusetts were built of hewn planks. Log houses were brought to America by those people in whose native land they were a customary form of dwelling, primarily the Swedes and Finns who settled along the Delaware in 1638. Log houses were soon adopted by the English colonists elsewhere because their method of construction was well suited to pioneer conditions in the new, heavily forested continent.

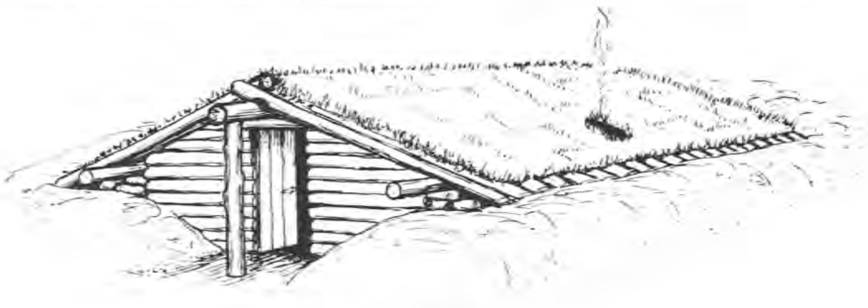


Fig. 7

Reconstruction of primitive sod house c. 1650 excavated at Spirit Pond, Maine.

Shapes of houses varied as lives of people varied.

The shapes of houses built in this country run the gamut from such simple rude huts for wintering the first season on the frontier, to large, comfortable mansion types for the well-to-do accommodating not only family, but visitors and house servants as well.

One could go on and on through Gothic, Victorian, and other house types, but the point that should be made is that a great variety of stylistic detail has been used in domestic architecture in this country. One must know the local history well enough to know about when a particular style was "in" in that particular community. The entire house structure must be considered with respect to known examples from the same period in the same area. One needs to study the regional and stylistic architectural books that apply to a given area at a particular time.

In the earliest days, households were self-sufficient. The cottage-craft weaver clothed her own family; every home had a candle mold and a soap kettle; each farmer acted as his own butcher. Then the village evolved, and it too was self-sufficient, with one person taking on the more developed and more specialized method of doing a task that had previously been done in each individual home, or not done at all.

When the households were self-sufficient, you simply worked where you lived. House and farm and shop were all together. First, specialized crafts came into being, then specialized places, so that today the specialized "sites" exist. The smithy, the pottery, the cooperage shop, the chandlers, and other crafts are included in the restored early villages usually as recognizable adjuncts to individual homes. The mark of the individual artisan on his products may or may not be recognizable today. The tools he used may or may not be found at the site. Yet, the remains of the place where he worked are apt to be very interesting.

With more complicated industry, economical production came to require more manpower. Two or more men had to team up to do a job for the rest of the community or, with improved transportation, for a larger area. Now we find sites with no residence attached — the industrial area was born.

Today we live in a nation that takes pride in its technological supremacy and, for this reason, the history of American technology is worthy of our attention. Actually, industrial sites are important on two counts; first, they provide insight to what went on at a particular spot at a particular time; second, they provide a source of datable artifacts that can be related to other sites where similar artifacts may be found.

Mills

Very often, the more efficient harnessing of waterpower is the deciding factor. Corn ground to flour in a tree stump mortar by the family using a stone or wooden pestle, becomes cornmeal from the mill in a village situation. Down at the river, even the smallest community might have its own mills for flour, linseed oil, cider, salt, flax, tobacco, grain and so on. Old time mills did many jobs. Water-powered mill wheels made axes, barrel staves, pottery, printed calico, and did hundreds of other things.

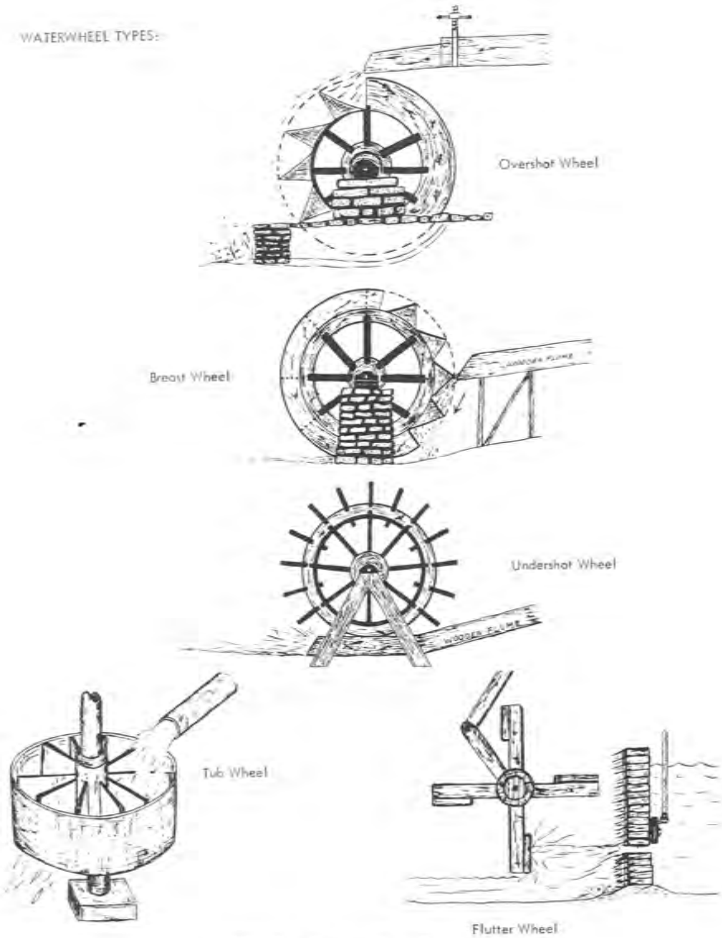
Early mills were usually built on streams to utilize the water power and, to some degree, to take advantage of water transportation. The town mill was always a center where people came with their produce, therefore, roads and bridges were soon built to the mills. Many towns grew up around several mills. They grew and prospered because of their water powered mills. Often, two mills would be built at a single dam, one on each side of the stream, or one mill might be placed downstream from another on the same side. In the case of large rivers there might be up to six mills drawing water from one dam.

The millpond

When you look at an old mill site today, you will usually note the pitifully small flow of water and wonder how a mill could have operated there. In earlier days the forests and swamps acted as great sponges retaining the rainfall and letting it run off gradually. Today, the land with much of its surface laid bare or paved, lets the rain rush off in sudden floods followed by periods of little, if any, stream flow. The cutting off of the forests and increased drainage, cultivation, and urban development has greatly changed the flow of many of our steams. Normally, some sort of a dam was built to consolidate or increase the amount of waterfall at a mill site. This dam automatically created a millpond or reservoir which could store part of the stream flow, and allow it to be drawn as desired.

Waterwheel types

To utilize water as power, a mill needed some sort of wheel affixed to a shaft to be turned. Waterwheels were built in many sizes and variations and were used according to location and type of waterflow.



Undershot wheel

The undershot wheel was used in fast running streams or close to a natural waterfall. It had a horizontal shaft and buckets around its periphery. The wheel turned by the stream's speed and was about 30% efficient.

Overshot wheel

Downstream, in slower waterways, a dam could be built and a raised wooden sluiceway would carry water to the wheel. The moving water spilled over the top of the overshot waterwheel so that its horizontal shaft was turned by the weight of the water falling in the buckets. This was considered the most powerful type of waterwheel and was about 75% efficient.

Breast wheel

The breast wheel took its power from the middle or breast section. A high breast wheel received power from above the height of the axle, while a low breast wheel was fed from below axle-height. Located near a dam, this type of wheel was turned by a mass of water released through a lock and gate in the dam. It had a horizontal shaft and buckets and was about 65% efficient.

Tub wheel

Usually located on an all-year waterfall, the tub wheel was an open, horizontal wheel which transmitted power by means of a vertical shaft. Around this shaft of wood was a set number of flat or slightly curved wooden paddles, against which a jet of water was directed. Sometimes the blades were in a shroud of wooden staves and iron hoops. Hence the name "tub wheel." In later days, both blades and shroud were made of iron. The result was an inexpensive wheel of poor efficiency, but of great simplicity. Ultimately, this developed into the modern water turbine.

Turbine

The metal turbine, which is a wheel housed underwater, replaced the wood waterwheel because it could operate under the level of winter's ice and was less subject to freezing. It had a vertical shaft and the turbine could be located on any dammed stream.

Bucket wheel

One other type of wheel should be mentioned, though it was not used for power. The bucket wheel lifted water in pots, from swift streams to a sluiceway where it could be directed to irrigate elevated farmland.

Waterwheels have turned ancient machinery, opened canal locks, lifted canal boats, and done hundreds of other strange jobs. In farmhouses, waterwheels have furnished the power for butter churning, operated spinning wheels and looms and rocked the baby's cradle.

Photo 9

Cut and dressed stone encountered along river bank in course of field survey. Note laid up stone work on right indicating buried remains of mill building.

Power transmission

Waterwheels, regardless of type, revolved very slowly, while millstones or other equipment required greater speed. Gearing was used to provide the additional speed. Made almost entirely of wood, the gears were easy to construct and to maintain, and wooden gear teeth meshing with wooden gear teeth furnished quiet and efficient power transmission. Iron "gudgeons", (short shafts inserted in the ends of wooden shafts), furnished the axles while wooden wheels studded with hardwood teeth formed the gears. Iron hoops and strapping reinforced both shaft and wheel.

The machinery of the old village mill could be built with nothing but a few of the common hand tools of the day (axe, saw, chisel, plane, auger and mallet). When a tooth wore out or broke, it was a simple matter to shape up a new one and wedge it in place.

Around the middle of the 19th century, cast iron machinery had become readily available and relatively cheap. Iron turbines, iron pulleys and shafts, and leather belts started to replace the earlier wooden machinery, but because of low cost and ease of repair, wooden machinery still continued in use.

Millstones

No matter where you travel in America the chances are good that you will find millstones. Most gristmills have long disappeared, but their indestructible grinding stones have remained. The grist mill was the link between farm and industry. The miller was a price setter, buyer, seller, and often, banker and lawyer. He was America's first captain of industry. The miller's earnings were primarily tolls collected for milling. However, cash was seldom used, so the miller took a portion of the grain that he milled as payment for his services. He could then sell the excess (beyond his own needs) profitably.

Mortar and pestle

The grist mill was actually a rather late development of the food processing procedure. The Indians used stone mortars and pestles for grinding and crushing. In the early decades of our country's history the colonists were also using tree trunk mortars and long, double-ended pestles as "pounders."

Sapling mill

Around 1650, some colonists employed the "sapling mill." A weighted stone used as a pounder was tied to a young sapling or tree, with the spring of the sapling used to lift the stone repeatedly and a stump serving as a mortar.

Around 1700 we saw the development of the plumping mill, the first type of mill in America. It was a water powered pestle which had no wheel or complicated machinery. Used for grinding corn and mashing nuts, it worked by letting a stream of water fill a box on one end of a beam until the box became so heavy it tipped itself, like a seesaw. The stone on the other end of the beam lifted and fell into a hollowed stump mortar.

The round millstone was first used in the "quern" or quern mill which was turned by hand. Powered millstones first used horses or other animals harnessed to a turning shaft. The draft animal, sometimes blindfolded, walked around in a circle. Later, water power utilizing one of the waterwheel types just described was substituted for the animal.

Millstones came in pairs and every village had one or more pairs. In the early days, the millstones were large, five feet or more in diameter, and were

usually made of local stone. The upper stone had to be nicely balanced although the grain itself tended to keep it parallel with the lower stone which was bedded flat in the floor of the mill. The upper stone was revolved by the machinery of the mill. The face of each millstone was dressed with cut grooves called "furrows" because they resembled plowed farmland. The plain surface of the stone was called the "land." The upper millstone was carried on and driven by a vertical shaft (wooden in the early days) ending in a stout iron rod which revolved in a bearing set in the eye of the lower millstone. The entire weight of the upper stone was carried by the vertical shaft down to a step bearing at its bottom which could be adjusted vertically to increase or decrease the space between the stones and so alter the resulting fineness of the meal to be ground.

Millstones working

As the upper stone revolved, the edges of the opposing furrows met like blades on a pair of scissors and sheared open the hard outer husk of the grain, tearing it to pieces while scraping out and pulverizing its cereal content. The grain was fed in at a hole 8" or 10" in diameter called the eye, in the upper millstone. The ground grain, now called meal, emerged at, and spilled off, the edge of the stone. The millstones operated inside a wooden casing which retained the meal as it collected and guided it to fall down a chute into a bin. The meal contained both husks and flour, and further processing was necessary to remove the bran. With cornmeal, this processing was usually done by sifting through a mechanically operated agitated wire sieve.

The average small mill could probably grind at a rate of about four bushels of grain an hour. Differently cut millstones made various consistencies of flour, or they ground different kinds of products. Farmers often waited for the mill to change to certain favorite millstone dresses, and millers had special days for milling produce in season. This basic type of millstone and its associated parts were also used for grinding many other materials such as drugs and spices, chocolate, pigments, and even gunpowder.

The sawmill

The sawmill was quite different from the gristmill in its machinery as well as its final product. Housed in a long, narrow building, there was a track of two wooden rails down the center along which slid the carriage holding the log to be sawed. The saw itself was near the middle of the mill.

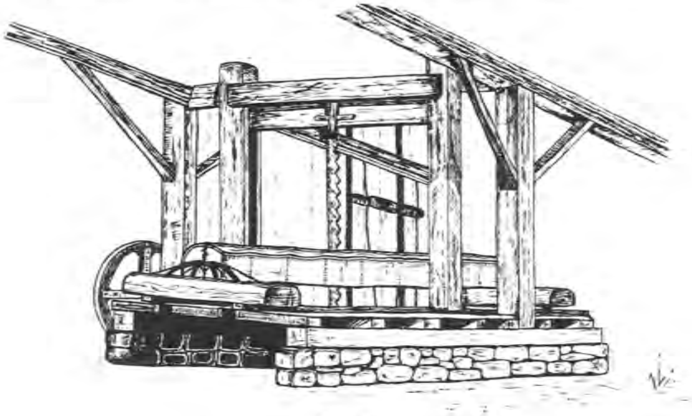


Fig. 9

Cut-away view of up-and-down sawmill.

Six feet long, and having straight steel with coarse teeth, the saw was stretched tight in a wooden frame which slid up and down between two "fender posts" grooved to receive the saw frame. Directly below the saw was the waterwheel which drove the saw.

Frame saw operation

A special form of undershot wheel, the flutter wheel, consists of a stout log, approximately 15" in diameter, carrying a number of flat board blades 6" to 8" wide arranged around the log on short stubby spokes. The water was thrown against the lower boards in a long narrow jet extending the full length of the blades. This was a "fast" wheel that did not require gearing to operate the saw, which would slide up and down about 120 times a minute. The flutter wheel, while inefficient, was simple and cheap to build. One type had a stout iron pin centered in it to act as a bearing. At the other end there was a second axle which also extended on into a crack. A long slender piece of wood, the pitman, connected this crank with the bottom of the saw frame. For every revolution of the waterwheel, the saw went up and down once.

The log carriage worked in conjunction with the saw. The underside of one of the two timbers forming the log carriage had a series of teeth studded along its length, staggered alternately so that they straddled the track rail on which the timber slid, thus keeping the timber always on the track. A wooden shaft extended across the rails underneath and a small wooden gear on the shaft meshed with the teeth on the bottom of the carriage. Revolving the shaft propelled the carriage. On the other end of the shaft, which was located near the saw, was a large gear wheel with teeth on its side, and around it, an iron hoop cut with a large number of ratchet teeth called the rack wheel. Finally, there was a long stick, the "hand" or "feed" pole so mounted that every time the saw frame went up and down, the stick moved forward and back. The end of the stick had an iron piece which rested on the notched rim of the rack wheel. Thus, every time the saw moved up, the feed pole pushed the rack wheel a few notches ahead and the log carriage and saw log were moved a slight distance forward toward the blade. The carriage was returned to the starting position when the log was sawn using a shaft, gear and tub wheel.

The circular saw started to appear around 1840 to 1850, along with pulleys, belts, and slower wheels.

Fulling mills

In the textile industry, the process of fulling employed in the manufacturing of woolen goods was accomplished with water power. Fulling is a process of cleansing, scouring, and pressing woven woolen goods together to make them stronger, firmer and more compact. The main technique in this process is the beating which removes grease and oils from the fibers and felts them into a denser compact mass. The process shrinks the cloth into as little as half its former length and requires some 48 to 65 hours to complete.

The fulling stocks consisted essentially of a wooden tub into which was placed a length of cloth, some water and detergents, such as Fuller's earth or some kind of soap. Two wooden mallets, raised and allowed to fall by means of a waterwheel, pounded the cloth. Kept constantly in motion, the entire length of cloth received a thorough drubbing. After treatment in the stocks, the cloth was removed and stretched out to dry. Once dry, it might be further processed by having the nap raised by stroking with teasels, a kind of burr, and then sheared smooth with special heavy shears. The fuller often engaged in dyeing cloth as well, and by the first quarter of the 19th century, he might also have a

power driven wool carding machine. This shop would appear in the records as a "wool factory."

A waterwheel driven mill, forerunner of industry, might also be a Nailery (for making cut nails), an Oil Mill (pressing flaxseed into linseed oil), a Paper Mill, a Spice or Snuff Mill, a Carding and Spinning Mill, or a Bark Mill (grinding the bark of trees to be used in tanning).

Archaeological clues to early mills

The archaeological remains of early mills will usually consist of some portion of the building foundations. For example, look for the remains of cut and dressed stones which were used in the foundations. You should also be able to find surface evidence of dams, raceways, and wheel pits which will give you the basic location and layout of the mill itself. Frequently, you may find some of the tools and equipment used in a mill such as grindstones or millstones, or some remains of their products such as sawdust from a sawmill, nails from a nailery, or charcoal from a powder mill.

Photo 10

A skeleton in the forest: Ruins of 50 foot diameter waterwheel used to operate blast furnace bellows.

The Europe from which the early settlers left was already into the industrial state and, consequently, the immigrants often brought with them the traditions of industries practiced in their homeland. Some differences between one country and another's traditions would, therefore, be imported too. The English and Germans both made some glass. The details differ. Only by digging can we tell which strain was at work where in this country. Also, some tempering of the imported technique would occur, making the study of a given industry as practiced here, unique in many instances. The pioneers didn't write it all down. They were too busy doing it to bother. Father taught son by example. It was a learn-by-doing education and often the only way for the archaeologist or historian to find out what was learned is to seek out the remains of what was done, and the tools and equipment with which it was done. On a manufacturing site, we must understand the processes involved and be able to identify both the features and the products.

Ironmaking

The bloomery, for instance, is an ancient ironmaking technique that should be studied. It was a primitive process that persisted right up until the 19th century, simply because it was simple, and easy to make iron in this way. It required little capital investment and no elaborate equipment. Consequently, many people tried to get into this type of business. A large number of bloomeries and forges sprang up in the northeast with almost every stream harnessed for its water power. Waterwheel driven bellows and a drop hammer were usually employed. Iron manufacturing had a tremendous lure. Fortunes could be made easily and quickly and a few ironmasters prospered; however, most fell on hard times. History has shown that it was only during times of war that these enterprises flourished economically as the demand increased for cannons, ammunition, and other military hardware. We study bloomery sites because of their environmental, economic and cultural impact.

Bloomery sites

The bloomery was a simple hearth on which chunks of iron ore were heated with charcoal in a blast of air. At the beginning, we might speculate that early man built a campfire within a circle of stones. One day, by chance, the stones he used happened to be iron ore and, among the hot charcoal embers, he noticed a strange looking thing — a stone that could be bent. Man had discovered iron. The early American bloomery was not much of an improvement. The blast of air might be no more than the prevailing wind on a hilltop. Later, bellows would be used. That is a bag made from an animal skin between two hinged boards which could be worked to produce a blast of air. As the carbon of the charcoal reacted with the iron ore, metallic iron was produced. This was a spongy mass mixed with partly fused slag and earthy matter. The pasty mass was dragged out from the hearth and hammered to consolidate it and squeeze out the foreign matter. The "improvement" was to do this by harnessing water power to drive a larger bellows and operate a simple drop hammer. Not a very efficient process, the bloomery produced only a few pounds of iron per day.

Blast furnace

The blast furnace was an indirect method of producing iron more efficiently. The blast furnace can be described simply as a truncated pyramid of stone and brick, usually about 25 feet square at the bottom and about 30 feet in height. Usually located at the foot of a hillside, a bridge or loading platform was built from a point part way up the hill across to the top of the furnace stack. Across this bridge the workers carried baskets or moved pushcarts of raw materials — ore, limestone flux, and charcoal — and emptied them down the open stack of the furnace. This is known as the "charging" process.

The egg-shaped interior of the furnace, known as the "bosh", was lined with sandstone or slate to withstand the intense heat generated when the furnace was operating. The furnace was started by filling it with charcoal and lighting a fire at the tunnel mouth. When the fire had burned almost to the bottom, the bosh was again filled with charcoal, and this time it burned upward to the top. At that point, progressive layers of ore, flux and charcoal were added and the air blast started. The iron soon trickled to the bottom, or hearth, of the furnace and the slag floated on top.

The furnace had two or more arched openings at ground level. One of these was known as the bellows arch. The "blast" or forced stream of air which

intensified burning, was supplied by two or more large bellows operated alternately by cams on revolving shafts (a great timber beam fitted with protruding iron shoes). These shafts, in turn, were powered by waterwheels. The blast of air entered the furnace through a pipe called the "tuyere." This was the operation of the bellows room. Naturally, a good sized stream or river nearby was necessary to supply the power for the waterwheels.

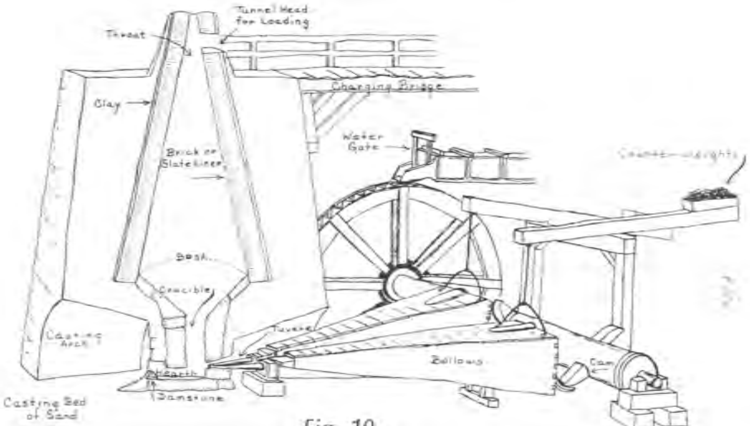


Fig. 10

Typical colonial blast furnace used in smelting iron ore.

Casting house

At right angles to the bellows room was the casting house. In the casting arch, the molten iron and slag was drawn off from the crucible. The floor of the casting room was sand with a channel scored into it running away from the hearth. From both sides of the main channel there was a series of smaller channels. When the tapping hole in the casting arch was opened, the molten iron flowed forth. The workmen skillfully guided it into all the troughs. The pattern formed by the casting bed resembled the outline of a mother pig feeding her sucklings. Thus, ironmakers used the term "pigs" to describe iron cast in this fashion.

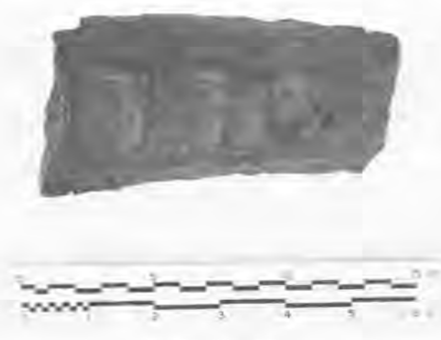


Photo 11

Fragment of pig iron with date "1770". Recovered from excavations at Charlotteburg Middle Force, c. 1765-1776, N. J.

Refining forge

The problem at this point was how to remove the unwanted carbon from the pig iron. The iron was remelted in a "finery" forge on a charcoal hearth in an air blast. This resulted in a spongy mass of wrought iron which was worked under a drop-hammer to remove the slag.

Chafery forge

A finery with its charcoal hearths, water powered bellows, and drop-hammer, forged the resulting iron into a "bloom." This was later formed into an "ancony" or dumbbell shaped bar with the ends bigger then the middle. The product of the finery was only an intermediate step, and the bloom or ancony was reheated in a separate charcoal hearth called the "chafery," and forged down to a finished bar. The big hammer used to forge the iron weighed about 500 pounds. It was mounted on a beam about 8 to 10 feet long and was raised by a cam driven by a waterwheel.

In contemporary accounts, the word "forge" was used to describe the whole installation for converting pig iron to wrought iron, and the hearths were referred to as "fires." The blast furnace, finery, and chafery were often at some distance from one another. This was because of the limited water power available at any one point. The finery and chafery buildings or forge were long, low sheds with several small chimneys over the various fires flanked by three or more turning waterwheels, each about ten feet in diameter, which powered the bellows and hammer.

Rolling and Slitting

Wrought iron was rolled into plates in rolling mills consisting of water driven rollers positioned one above the other. The plate so produced might be further processed in a slitting mill. In this, the plate was passed between rollers made up of cutting discs spaced at suitable intervals. The result was to slit the plate into narrow strips which were used to make, for example, nails.

What to look for

The archaeological remains of a blast furnace are likely to consist of the trunk of the furnace. The hearth, crucible, tuyere, and casting arches will usually be partly discernible, and the stone foundations of the casting shed will probably survive. In addition, you should expect to find some remains of the waterwheels. Large quantities of slag will be found, along with some pieces of pig iron and hollow ware, such as kettles or firebacks.

Be sure to thoroughly research the records on ironwork sites. This will give you clues as to what to expect, how large and diverse a complex it is, what other structures were there, and what products were made. The remains of forge building foundations are likely to be found, along with sections of the hearths, hammer sites, or anvil bases, plus quantities of slag, pig iron and bar iron.

Ceramics

Pottery, as a diagnostic artifact, is most important to the archaeologist. Understanding the basics of the craft will aid in evaluating the remaining evidence of the industry site. Pottery or ceramics is another industry that leaves "tracks" and is of special importance because of the diagnostic use of the end products.

All clays are made up of alumina, silica, and water, and unrefined clays also contain various other substances that are classified as impurities. When clays

are mixed with water they become plastic and can be manipulated into any desired shape. If an object made of wet clay is dried and heated to proper temperature, the clay loses its plasticity and becomes rigid. The art of shaping, decorating and firing clay objects is called ceramics, a term which also applies to the objects themselves. Ceramics can be categorized by paste, by glaze, and by decoration. These qualities can be determined for prehistoric Indian potsherds, as well as for early manufactured examples. The usefulness of pottery as a diagnostic artifact must not be underrated.

Photo 12

Spanish olive jar from 18th century context partially restored.

Photo 13

Fragments of spanish olive jar in-situ.

In very simple terms, here is what happens in the manufacture of a ceramic object. Clay is mixed with water and thoroughly blended to form a plastic mass. The mass is shaped to the desired form by hand, in a mold, on a wheel, or by some other combination of manipulative methods. Most of the added water is allowed to evaporate at more or less normal temperatures. The thoroughly dried clay object is then heated in a kiln where the following sequence takes place. Any remaining moisture that may still be is driven off in combination with the silica, and alumina in the clay is driven off by the heat. Some of the substances in the clay melt and fuse together (silica and fluxes combine in the same chemical reaction by which glass is made). Other substances remain unchanged. When the object is cooled, the melted portion solidifies into a glassy matrix which binds together the unmelted particles so that the rigid form of the ceramic object is retained. In general, the higher the firing temperatures, the greater the fusion and the harder the ware, depending on fluxes in the paste. Thus, the composition of the clay, as well as the intensity and duration of firing, affects the pastes of various kinds of ceramics. A glaze is simply a coating of glass applied to the surface of the ceramic object which fuses to the clay by firing in a kiln.

So, what would you find where the potter worked? The aboriginal American needed only a clay bed and perhaps a smoothing stone to make a pot, a wrapped paddle or a sharp stick to decorate it, and a firepit. In a small, early pottery, one might find a box or bin for storage, a wire and slab for cutting and wedging, and perhaps, the remains of a kick wheel for wheel thrown pieces. The kiln would probably be a separate building, resembling a heavy-walled outdoor oven more than anything else. One would also expect to find sherds of misfired pots and possible containers for mixing glazes in. There could be templates in the more sophisticated shop and, possibly, molds. In a china factory, of course, there would be even a greater degree of mechanization.

Glassmaking

The glass industry is another where there should be evidence of factory activities, as well as artifacts, that could help date the place where the artifacts are found. Glass was imported to the early colonies and the first successful manufacturing venture did not start in this country until 1739.

Hand blown, or free blown, glass manufacturing techniques were in common use to 1860. On such glass the surfaces are smooth and shiny and are without impressed designs or letters. Any designs may be cut, engraved or etched after the glass has cooled and decorative globs may be added. The bases of products made by this method have a spot of rough glass in the center called the pontil mark, and bottles made this way are frequently lopsided.

Mold blown, or blown-in-mold ware, builds on this technique. The gather of molten glass is inserted into the mold and blown to impress the pattern into the glass, after which it is removed and blown to full size. There are no mold marks on this "pattern molded and expanded" ware and the curvature of the inner surface is a positive image of the curvature of the outer surface. This method was common from 1800, but had practically disappeared by 1850.

On full size contact molds, an impressed design on the outside has a negative image on the inside.

Windowglass: Crown method

Window glass was made in several ways. The first, the crown method, required a rapid rotation of the pontil after the glass bubble was blown, then the

blowpipe was removed and the bubble reheated. Continuous rotation causes the bubble to open into a large circular sheet from which panes were then cut. The bull's-eye pontil mark is one characteristic of such glass; variations in thickness another, and in large sheets or lights, the curved distortion lines can be seen when viewed in oblique light.

The cylinder method of making sheet glass began by blowing a large bubble of glass which was then elongated into a cylinder by swinging. The ends of the cylinder were cut off and a length-wise cut was made. Reheated, the glass fell open into a flat piece. Distortion waves were straight; however it is possible to detect them on larger sherds.

Plate glass

Plate glass was made by the casting method where molten glass was poured into a sand covered table and rolled out evenly. Once ground and polished, it became transparent but expensive. Clear and true, it was seldom used for anything except small mirrors.

A glass manufacturing establishment might be confirmed if you find a lot of broken glass, quantities of scum or "gall," and, of course, molds, blowpipes, and other tools.

Excavating an industrial site

Faced with the prospect of confirming research with field work on an industrial site, one may profit by example. For instance, salvage archaeology was conducted at the site of the Booth Brothers Knife Factory near Stockholm, New Jersey. Located in the highlands of northern New Jersey, on a main route between Port Jervis and Newark, this factory produced folding knives from 1889 to 1903 when the company moved to another location.

Early in 1968, the imminent destruction of the site from dualization of New Jersey Highway 23, prompted members of the local historical society to conduct the salvage project on weekends until the construction forced an end to their work. The salvage work included excavation in a dump along the base of a dam, and the digging of test pits at each corner of the foundation to define the building's perimeter.

The historical background of the site included primary data such as photographs, industrial directions and oral history. Together with the artifacts found at the site, the historical society published a complete report of the excavation. This report formed a basis for expanded study of the factory's historic environment, including the village of Stockholm, with insights into the factory location, its social significance to the community and its actual influence on local development.

The pocket knife was a symbol of American 19th century culture, representing the youthful ideal of individualism and hard work. The archaeological excavations and the publishing of the Booth Brothers Knife Factory report are an excellent source of further study of an industry in a rural community of this period.

If it's not a home or farmstead and no product appears to have been made there, what is it? Plenty of other sites exist, and common sense and good homework will probably tip you off as to what they are. High on the list of well documented sites are the military fortifications.

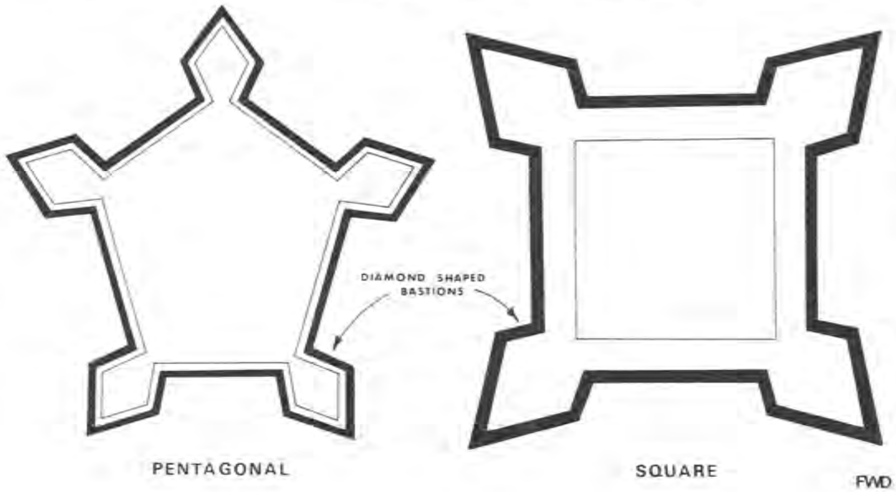
Military Fortifications

There are numerous examples of permanent fortifications already known in North America. For example, from the 16th century, we have Fort Raleigh, c. 1585, on Roanoke Island, North Carolina. Castillo de San Marcos, in St. Augustine, Florida, is the oldest existing masonry fort in the United States, built in the late 1600's. 18th century examples abound. Fortress Louisbourg, Nova Scotia, Canada, was a French outpost on the Atlantic coast. In 1720 work began on the defenses, and a sizeable town was built within its walls. Fort Michilimackinac was located on the south side of Mackinac Strait which separates lower and upper Michigan. Built by the French in 1715, it was continuously occupied until 1761 when the British gained control of Canada. They remained at the fort until 1781, after which it was abandoned. Fort St. Frederick in New York, at the head of Lake Champlain, was built by the French in 1731 and destroyed in 1759. Fort Crown Point, at Crown Point, New York, was built by the English in 1759. Fort Montgomery, Bear Mountain, New York, was built by the Americans in March of 1776 and destroyed by the British in October, 1777. Fort Ligonier was built by the English in 1758 along the Loyalhanna Creek at Ligonier, Westmoreland County, Pennsylvania. A defensive outpost against the French and Indians, it was decommissioned in 1776 and rapidly fell into ruin.

Forts: basic plans

The majority of American forts, from the 16th to the early 19th century, were built as earthworks or stockades, or both. The basic plan was square or pentagonal with diamond shaped bastions projecting from the corners. The interiors of the bastions were filled to create a solid platform on which cannon could be mounted. Ammunition and artillery were hauled up by means of ramps. Entrances to such permanent fortifications were generally through the straight sections of the wall.

Basic Plan of Fortifications



Earthworks

In earthwork type of forts, the defenses consisted of a deep ditch from the back of which rose a steep bank known as the glacis. On top of this was the parapet wall which contained the gun embrasures. Behind the parapet the high bank was stepped so that the defenders could stand and fire over the top.

Stockades

Stockades were always built in ditches because the large vertical logs were hard to handle; they had to be positioned snugly against each other. The ditches were sloped on one side and vertical on the other so that the logs could be slipped into position and then pushed up until they rested against the face. The bottoms of such stockade timbers may be preserved in a moist retaining ditch. In areas where no timbers survive, the patterns of ditch fill and post molds may still be discernible. Some of your very best preservation is in dry areas - v.q. the Pueblos.

Powder magazines

Beside the defenses, powder magazines are the only other fort structures that are peculiarly military. They were usually built below ground and were often approached by subterranean passages which served as rails along which powder barrels were rolled. No iron was ever allowed in the vicinity of stored gunpowder for fear of a spark. The size and depth of the magazine depended on the nature of the terrain, the sub-soil and the expected permanence of the fort.

Excavations at Fort Montgomery, Bear Mountain, New York, uncovered the remains of a powder magazine built by the colonial troops in 1776. This measured 34 feet by 28 feet on the exterior with an inner chamber of 12 feet by 18 feet. The walls which were 8 feet thick, were built as two separate mortared walls with dry splintered rock fill in between. This powder magazine had a brick arch 3.8 feet thick, covered with sandy yellow soil.

In its "pristine condition," it had a gabled shingle roof that was indicated by the quantity, type, and location of nails found in the excavation. The floor had been laid with boards raised on sleepers. The magazine was destroyed by the British in 1777.

Anyone undertaking the excavation of a military site should have a fundamental knowledge of building construction methods and a basic understanding of standard military fortifications. Once again, dig into the records before digging into the ground. Those investigating military sites have much source material available to them.

Defenses

The defenses of a fort present new problems to the archaeologist. Walls may be thick and honeycombed with arches, chambers, and tunnels which make it difficult to tie them into a grid pattern. Earthworks or palisaded defenses can be studied well in cross-section. Test cuts can be made through the defenses on the surveyed grid lines. Profile sections should be drawn and photographed. If the fort had a perimeter ditch it should be excavated in its entirety, particularly if the defenses had been attacked. Finally, an area excavation should be undertaken in the entrance of the fort in the hope of locating gateposts and determining the amount of traffic.

Permanent military fortifications saw many changes in occupancy. Regiments came and went and some forts were captured and recaptured. To all intents and purposes they are domestic sites having the same complicated archaeological stratigraphy. Interiors should be carefully excavated by the grid method. Stratigraphy can become extremely complicated, particularly if the fort has been destroyed. The excavation of the North Redoubt and Grand Battery at Fort Montgomery, Bear Mountain, New York, presented just such a problem. It has already been noted that the fort was destroyed by the British who both burned and dismantled it. Soil levels were mixed, often producing "false" levels and making it difficult to find and follow the original surface. Only by very careful attention to detail, by taking down one layer at a time and carefully recording everything, can such involved digs be sufficiently well documented to be useful in substantiating your conclusions.

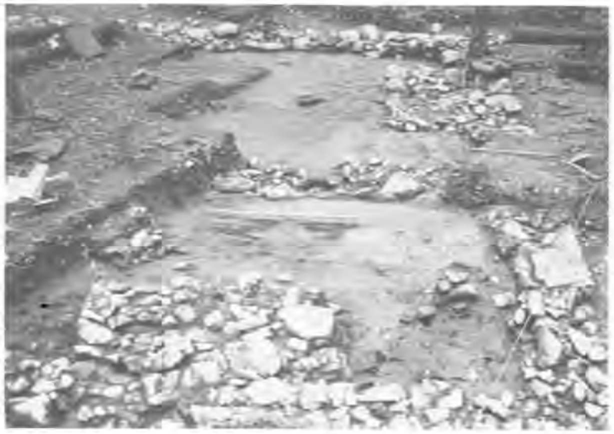


Photo 14

Excavation of military storehouse at Fort Montgomery Bear Mountain, N. Y. reveals evidence of foundation walls, fireplace platforms and burned timbers.

Photo 15

Remains of fireplace and brick hearth in Officer's Commissary Building, Fort Montgomery, Bear Mountain, N. Y. Note stone in center which was used as an andiron.

Battlefield sites are something else again. There is no meaningful stratigraphy as far as the battle is concerned. The salvage of relics is the primary concern. The preservation of finds from such areas should be given considerable attention.

Military Huts

Aside from the defense areas of the forts, there were the living areas to be considered. Huts built by men in military service were military adaptations of contemporary frontier log houses reflecting regional differences in construction. The Connecticut soldier built his fireplace and chimney according to the New England practice, using large quantities of stone. The Pennsylvanian made his with little or no stone, according to evidence from Valley Forge. Throughout the Revolutionary War, regiments and smaller units tended to be formed from men who came from the same geographical area, and who incorporated regional features into their hut building.

During the Revolutionary War, before troops moved onto the ground to be occupied, quartermasters frequently went ahead and marked out the lines on which huts were to be erected. At Morristown, Washington's orders specified that huts be arranged on strictly straight lines. Huts "the least out of line" would be pulled down and rebuilt in their proper places. The dimensions were to be held to 14 to 16 feet, but the fireplace within the hut could be placed wherever the occupants wanted it.

The first step in building a soldier's hut was to level the ground. The encampment at Morristown, New Jersey shows evidence that leveling was accomplished by digging deeply into the hillside and by placing stones on the lower side and then filling-over the area.

Once the ground was level, four sill logs were laid on the ground to form the base and outline of the hut. These logs were also leveled and then the four sides of the log hut were raised to the roof line. The walls were built about seven feet high with provisions or openings for a doorway and fireplace. The doors of Revolutionary War huts were made of split-oak slabs which swung on wooden or leather hinges. Iron hinges were simply not available.

Chimneys were composed of stone as high as the eaves and finished with sticks and clay. Fireplaces and hearths were built of stone and varied greatly in width and depth. At times, however, stonework was not used in the floor of the hearth. One of the more interesting and important archaeological findings concerning huts was the complete lack of uniformity in chimney locations.

When the side walls of the hut reached their proper height, the log gable ends were added. Straight poles were then laid across each gable end log, drawing in gradually to the ridge pole. Finally, the roof was covered with split slab shingles weighted down with poles or stones. Another common form of roof covering was thatching, using boughs, straw, or leaves.

Soldier's huts were built to accommodate twelve men and were probably fitted with four triple deck bunks. Windows varied in size and placement and lacked frames and glass. They were probably covered with blankets.

The final task in building the hut was to fill the spaces between the wall logs. This "chinking" was done by stuffing in a mixture of clay and small stones. Mud, grass, or straw was also frequently used.

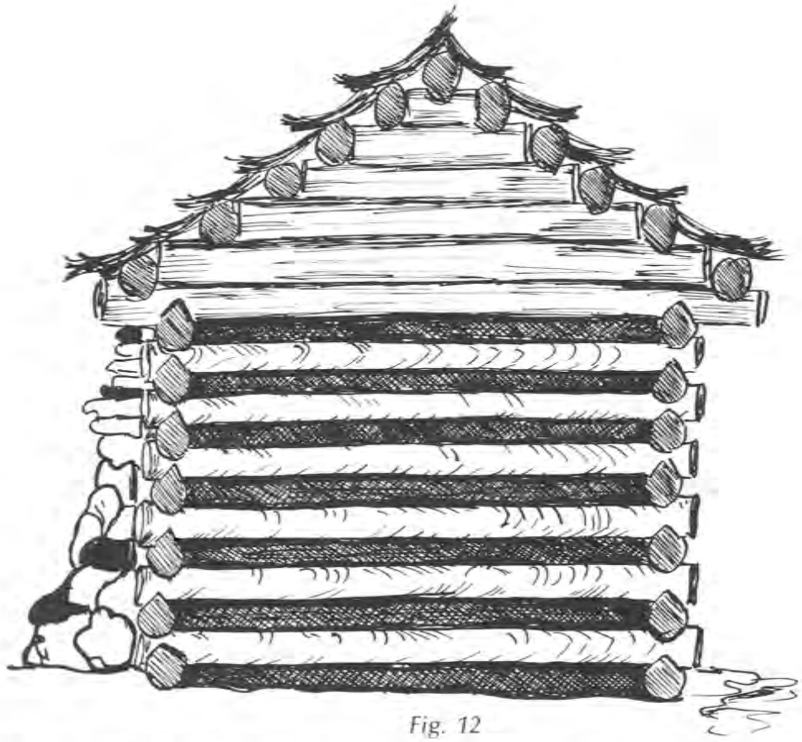


Fig. 12

A military hut of the Revolutionary War. Trees, twigs, bark, mud, clay and stone were the raw materials used in construction. The felling axe was usually the only tool used.

In any military encampment the chances are good that you will find certain elements repeated from one hut to the next while other features may vary. It must be borne in mind that huts were built to meet a temporary need for shelter, and that they were generally used for only a short time; hence there is no great accumulation of debris and no evident stratification. Because such structures were usually built under adverse conditions, foundations, footings, or extensive preparation of the ground before building are not apparent, or nonexistent on the average hut site.

A soldier's hut left such a slight trace that, in most cases, any evidence of its existence would be destroyed by normal cultivation. Fortunately, many Revolutionary War encampments were built on hilly, rocky terrain which has never been cultivated. However, under these conditions you are dealing almost exclusively with wooded areas. The usual indications of such a site are a small area which has been leveled or cleared of small, loose stones, and a low mound of stones which represents a tumbled fireplace at one edge of the leveled area. Sites located in the flatter areas of the encampment are more difficult to see, as erosion and soil creep tend to obliterate any trace which ever existed.

The first step in excavating a military hut is to rake away all accumulated leaves. This will help define the area before any actual digging is begun. Many

hut sites are so shallow that this raking will disclose parts of the hut floor and possibly some artifacts, such as bone scrap, glass fragments etc., which may be just under the leaf mold. The shallowness of hut sites cannot be too strongly emphasized. All traces of a bygone hut can be removed by inexperienced persons in the process of preparing the site for excavation. In many instances the removal of four inches of earth surface will destroy the evidence.

The term "hut floor" means the leveled ground surface which represents the interior living area of the hut. At Valley Forge, some huts had floors of clay carried in to make a better surface. At Morristown, the floors had been cleared of the shallow deposit of loose top soil and were compacted by use, and contained small artifacts, bone, charcoal, and ash tamped into their surface. The floor level should be established and cleared in its entirety by following it to its wall lines. Look carefully for slight traces of log sill mold. Evidence of the mold lines of floor sweepings will give you indications of doorway positions. In sweeping the floors toward the door there was a buildup of bone, charcoal and other hut debris where the door sill blocked its exit. The fireplace should also be carefully excavated by trowel with all earth sifted.

Evidences of construction will be found in the same way as on domestic sites. For example, the location of nails may be plotted where the wood has rotted away, looking for evidence of leather hinges at the doors when no iron hinges are found, accounting for a very few similarly sized stones within the hut perimeter (roof weights), photographing every slightest trace of post mold to compare with each location mentioned in written history. Researching the site thoroughly and familiarizing one's self with the methods and means used elsewhere by the same army will help even more.

Architectural Remains

Whatever tribulations your site may have suffered you'll hear the voice of the past from the ground as clearly as from the standing structure. History lives forever! When the building is gone, archaeology can tell us how the structure was built, and something about the kinds of people who used the building. Only by constantly checking back into your research material can you hope to learn about the architectural remains. Only by accurate recording can this information be preserved for future reference.

The object of nearly every historical archaeological project is first to locate the building, because this is the axis around which human activity rotates. Buildings come in all sizes and shapes but to the archaeologist they have certain things in common—

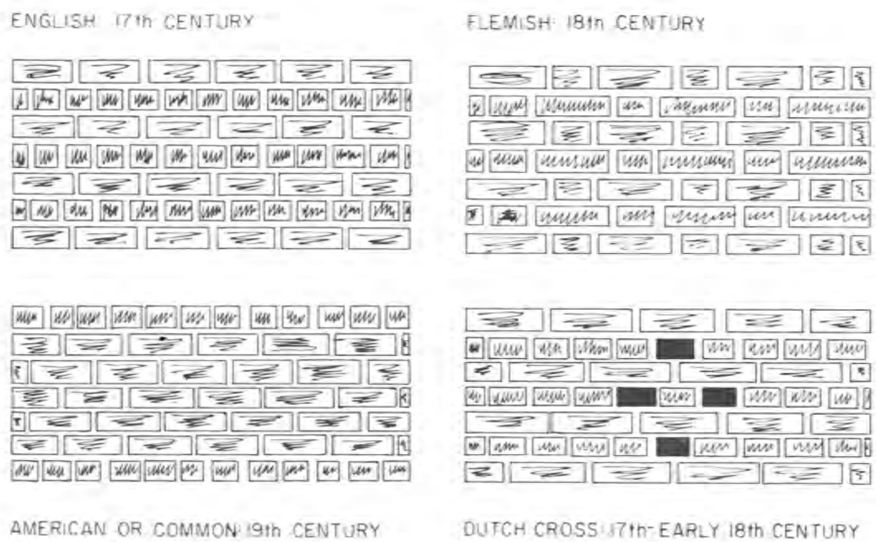
FOUNDATIONS: Foundations underlie all principal walls of a building. Masonry piers may be used to support the sills upon which the walls are built, but wooden posts or piles sometimes performed this function. Foundations can be built as an integral part of the structure, and some structures have continuous footings and foundation walls. However, every building is in contact with the earth, and it is from this point of contact that we can determine much about the structure which may no longer be existing above it. For example, a builder's trench, dug to seat the foundations, can often tell us much about the birth, life and death of a building.

Generally speaking, building materials are long lasting and can often be used to date a building. While the examples that follow are primarily from the Northeastern states, similar data can be gathered from the reader's own area.

Building materials: bricks

Most of the bricks used in this country were made in this country. Very few were imported. The style of brick laying is perhaps the most respected criterion for dating old buildings, but such criterion should be used with care. Bricks were joined by mortar in a variety of ways. The three mortar joints diagrammed below show the most common methods.

BRICK BONDING



Flemish or Dutch brick is yellow in color, generally very hard, and measures 7⅛" x 3¼" x 1⅛." They occur on American sites of the 17th century. In England there were a number of statutes regulating the dimensions of bricks. In Colonial America, the sizes of molds varied, and so did the amount of shrinkage caused by the use of different clays. Large irregular bricks are likely to be older than smaller, neater varieties.

An American laying brick is about 8" x 4" x 2." If the exposed face of the brick is 2" x 4" the brick has been set as a "header." If what you see is a 2" x 8" face, the brick is a "stretcher." If you are looking at a 4" x 8" face, the brick is a "flatter," frequently found in sidewalks, but almost never in wall construction. A design pattern is called a "bond." Any horizontal row of bricks is called a "course."

Brick bonds

English bond foundations, generally used in the 17th century, have alternating courses of headers and stretchers. Flemish bond has the headers and stretchers alternating in each course. Typical of the 18th century, this bond was frequently laid up on top of a foundation wall set in English bond. Where the headers occur only every 5th or 6th course, the bond is called American or common. The stretcher courses (the horizontal rows in between) were laid so as to break the joints. Running bond was made up entirely of stretchers. In

Dutch Cross bond, alternate courses of headers and stretchers were used, but instead of being placed one above the other, as in English bond, they broke the joints.

Mortar joints

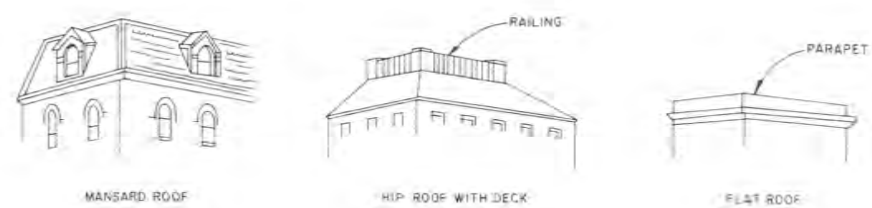
The earliest mortar joints were marked with a scored line running both horizontally and vertically. These are generally attributed to the colonial period. The straight sloping joint can belong to any period. This was created simply by running the tip of the trowel along the mortar joint. Favored by many masons, the joint was designed to shed water quickly. The "V" shaped joint, according to Noel-Hume, seems to be a genuine product of the post colonial years. However, at Fort Montgomery (1776-1777), Bear Mountain, New York, "V" shaped mortar joints were found on the stone building foundations. "V" shaped mortar joints were also found on many pre-revolutionary houses in southern New York and northern New Jersey.

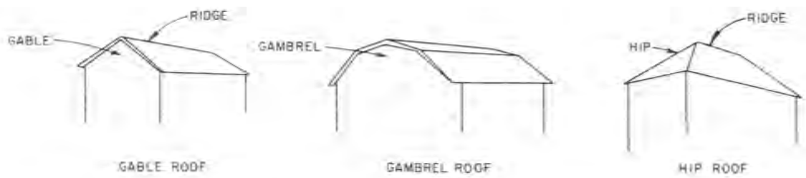
Foundations

The use of certain building materials can often suggest or confirm structural methods. A brick foundation can divulge, with reasonable certainty, the maximum height of the structure. For example, a one-brick foundation could support a frame house of no more than a story-and-a-half. A foundation of a brick-and-a-half (1'-1" thick) could carry a two-story frame house with no basement or a small brick building. A two-brick (1'-6" thick) foundation would take a story-and-a-half brick house with a basement. A foundation of two-and-one-half bricks (2' thick) or more would support a two-story brick building with a basement. Similar thickness-to-height-support ratios exist for other materials as well.

Special shapes in stock materials can also be informative. For instance, bricks molded, or ground so that one side slanted at a 45° angle, can suggest that the building had a water table or a chimney with haunches. Colonial builders made use of elaborately molded and fluted bricks, the discovery of which can be a strong clue to the quality of the building. In the 17th century, the heavy timber framing was often filled with brick nogging. It can be deduced that bricks were used in this way if the mortar adhering to their ends bears the impression of the wood grain against which they had abutted. Brick gutters were sometimes laid along the rain/drip fall lines. A shallow trough running along two sides of a house indicates a gambrel or an "A" roof, while a hipped roof would require a gutter trough on all four sides.

ROOF STYLES





One of the most easily identified features on a house is the roof. Therefore, it is important to get the terminology straight.

Shed roof

One roof plane at a slight or greater pitch will shed water, snow, or provide more interior space in chicken coop or outhouse.

Gable roof

A gable roof is one where two sloped or pitched roof areas meet at a ridge parallel to the two opposite house walls.

Gable end

The "gable end" is the name for the triangular piece of wall at the end of such a roof.

Hip roof

The hipped roof form was adopted in America just before 1700. Fully half of the more important colonial houses of the 18th century had the hip roof. Depending on the proportions of the building, the hip roof has four sides which rise to a ridge or to a point.

Gambrel roof

The gambrel roof has a double slope on each side of the ridge. In some areas, such as those settled by the Dutch, English or Swedes, the gambrel roof was a matter of tradition. It achieved further popularity throughout the colonies for the simple reason that it provided extra upstairs accommodations at little added cost.

Dutch (Flemish) Gambrel roof

The most attractive gambrel of all is the type found principally on the one and one half story houses of Long Island, New York and northern New Jersey, and commonly attributed to the Dutch. The house style is popularly called Dutch Colonial.

Mansard roof

The mansard roof has double sloped roof on all four sides of the building. These meet at the top in a flat or hipped area.

Roofing and siding

Roofing and siding requiring comparatively large amounts of material, generally reflect a local enterprise. Where the finished product required both a source of raw material and ready labor for processing, the product does not generally travel far. For example, you don't find many slate roofs in Arizona.

In the northeast, many homes were shingled with pine, either square-cut or rounded. Nail holes towards the top edge will indicate nails used to hold the shingle to the sheathing. Flat clay tiles, 10" x 6" and rectangular in shape, were used on quality buildings in the 17th century. The pantile (ogee — archaeological term referring to molding consisting of two curves somewhat like an "S") became increasingly popular in the 18th and 19th century. Again, the drip lines will give clues to the shape and jut of the destroyed roof. Siding might consist of split shingles or sawn clapboards. Shingles can be split by hand, but clapboards usually imply a sawmill in operation somewhere fairly close by.

Lath

Laths were hand split or riven until about 1820. Riven laths were occasionally made and used after the introduction of sawed laths. Lathes, may not date a house as having been built before 1820, but sawed laths will, if original, date the house as having been built after that time.

Plaster

Interior plaster may reveal the sequence of paint or whitewash on one side, and on the other the nature of the walls to which it had been attached. Some variations in composition may also be observable. Plaster may contain more or less builder's lime, and be reinforced with any number of odds and ends, such as straw or animal hair.

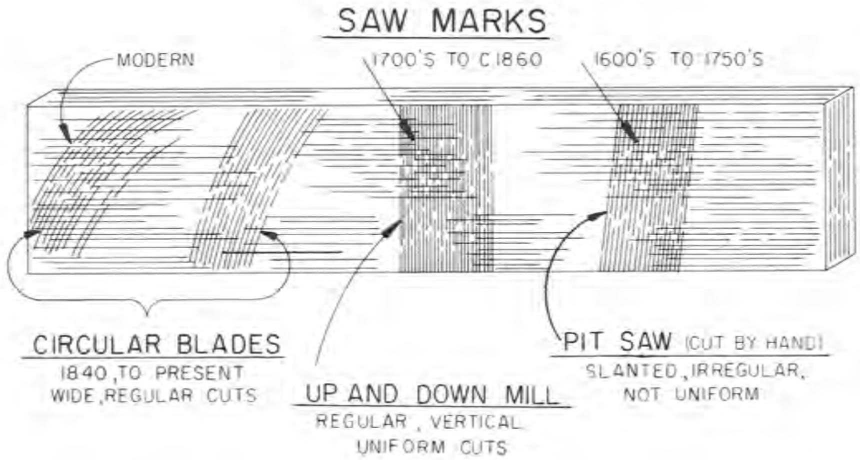
Paint and wallpaper

Paint layers can be removed one by one to determine the colors that had been used, and this, in turn can give some idea of the length of time that the wall had stood. Wallpaper has been around for a long time, and the same layer-by-layer removal holds true. Different papers may be identified by different manufacturer's records.

Evidence

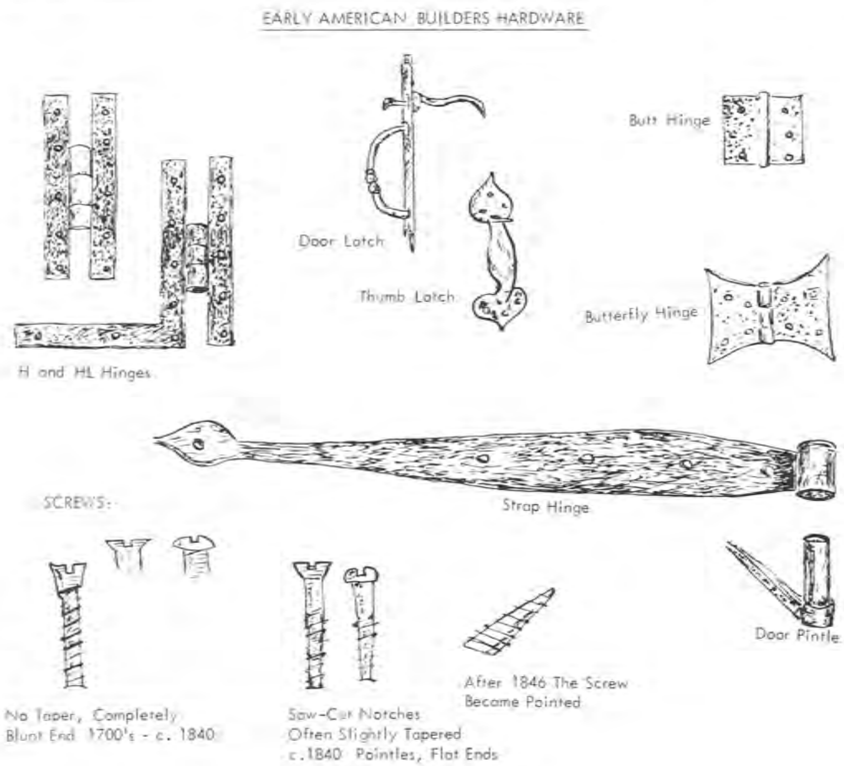
When a house was deliberately dismantled, the plaster and lath were thrown out of any available window or door. Traces of these piles can be sometimes found outside the foundations. By careful scraping during excavation, the traces of lath and plaster piles will reveal the openings they came from. Watch urban renewal or renovation work going on now. You'll soon realize how much stuff comes out of the shell. You may be able to determine the relative age of the different parts of a house by comparing the number of coats of paint or whitewash.

Saw cuts (kerf marks) on wood can tell the type of saw used to make the cut. The three diagrams show (1) a whip or pit saw kerf typical of the 18th century, (2) mill or sash dating from the early 19th century and (3) circular saw kerf from the 1850's and after.



Building hardware

Metal remains may outline wood. Where nothing but brick foundations and some metal scraps remain, a few clues may still be found. Builder's hardware generally followed fairly well-documented usage. The Plate on hardware will give you some idea of classification possibilities, again typical of the Northeast.



Wrought iron house door hinges were common until late 18th century. They were of two basic types. The strap hinges consisted of a long strap bolted, riveted or nailed with clenched nails against the door. A bent, closed hook at the open end turned on a hook or pintel mounted to the door frame. During the same period H and HL wrought hinges were used on interior house doors, until 1776, after which they continued on outer doors and shutters until c. 1850-60 and on barns until 1900. These types were cut from heavy sheet iron and fastened against the face of the door and frame with screws or clenched nails. Cast iron butt hinges date from after 1775. Comparatively small and compact, these book-shaped hinges are mortised into the edges, not set on the face of door and jamb. They came into use quickly because they were cheap and superior.

Pointed screws can also date a house. The first pointed screws were patented on August 20, 1846.

Nails

Handwrought nails were common in the 17th, 18th and early 19th centuries. However, no method of dating handwrought nails has been developed. Made by individuals, they were apt to vary considerably. There was no National Bureau of Standards with which to comply. Some generalities are summarized on the drawing: "Nails." Later, machine made nails, in a variety of shapes, had special uses that may clue you onto the type of building you're dealing with.

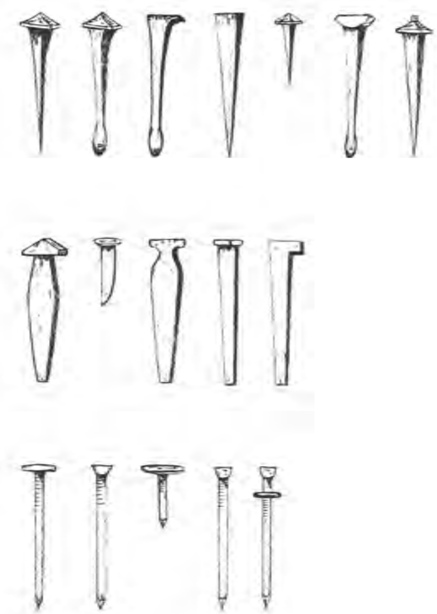


Fig. 17

Nail types and chronology:
Handwrought - 17th, 18th, and early 19th centuries
Machine Cut - 1790's to present
Wire - c. 1850's to present

Generally, the shanks taper on both faces. The iron fibers run lengthwise. They lacked uniformity, especially on the heads which varied according to the purpose for which they were to be used. The "rose head" was the most common. It had five hammered facets spreading out and down from a central point. "L-headed" were used as trim and flooring nails. "T-head" were also used on floors, had a flat disc head hammered over on opposite sides of the shaft.

First produced about 1790, machine cut nails were sliced by machine from sheet iron. At first the head was shaped individually by hammering. About 1815 the head was also made by machine and the nail slightly waisted below it. That characteristic disappeared by c. 1830. The 1790 to 1820 varieties were cut in such a way that the slices caused two diagonal corners to be burred out in opposite directions. By 1830 the cutting angle had changed and the burring occurred in the same direction at both ends of one face. A further dating clue is that, prior to c. 1830, the iron fibers ran crosswise to the nail's length or shank, causing them to snap if clinched. Thereafter the fibers ran lengthwise. The thickness tapered on one face only.

Wire nails date from around the 1850's to the present. The products at first were small brads but by the last quarter of the 19th century, regular sizes were being produced. Round shafted steel wire is very smooth. Nails are probably the most common artifact found on historical sites. They are identified at 4d, 5d, 8d, (four penny, five penny, eight penny, etc.), a survival from the middle ages when they were classified by the cost per hundred. As the pennyweight increases the size of the nail increases.

Recording Archaeological Finds

Architectural history lives in debris. Where a building is to come down, sample saving is possible. Such pieces should be saved for further study and reconstruction. An architectural study collection should be created and utilized for educational and reference purposes. Collect wallpaper samples, lath, plaster, trim, moldings, etc. and note provenience of all items.

Much of the source information for such specialized architectural books comes from an orderly recording of specifications on various houses. A system of recording was devised under WPA and a good amount of work was done then and since using this same system. In addition to the drawings and photographs that may be available, there is access to original records maintained by the Historical American Building Survey (HABS) in Washington, D. C.

There are hundreds of urban renewal programs in the United States. Many make little or no provisions for archaeological and historical salvage work. Even though buildings cannot be saved, they will not be lost forever if someone accurately records them.

To build up a store of information on historical buildings, it is necessary to use an organized system of recording. Each sheet of paper used in any aspect of the recording should have the following heading:

SUBJECT: (floor plan? horizontal measurements? note, what is being recorded.)
ADDRESS: (location of building)
ROOM #: (Key the number to drawn plan)
DATE: (of recording)

In all drawings, cardinal directions and scale must be indicated. If the drawing is not to scale, it should be so marked. Use a medium weight drawing pencil.

To transcribe measurements, a plan view of the structure and grounds should be sketched first, in proportion. Put the outside horizontal measurements on this sketch. Measure the outside openings of doors and windows in position. Use a fifty-foot and one hundred foot steel tape that is graduated in feet and tenths of feet.

Next make a floor plan of the building showing the relation of one room to another. Give each room a number for identification purposes. Mark doors and windows on the sketch. Conventional symbols and what they indicate for sketch plans are shown here:

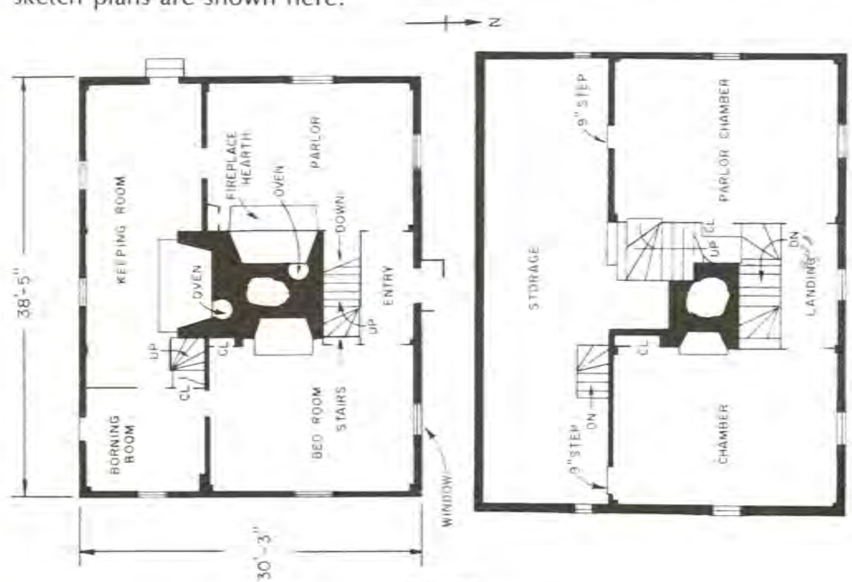


Fig. 18

First and second floor plans of early American saltbox house.

Where possible, inside horizontal measurements can be taken and indicated on the house floor plan. Otherwise, a floor plan at a larger scale for each room should be drawn. Measure from one corner to each consecutive feature and the wall space between them. Horizontal measurements of any wall should be taken at the same height so far as is practicable all around the room. A measurement taken for a doorway is the distance between jambs; for windows, measure the distance between the vertical sides of the window frame. Measure total wall thickness at door and window openings, disregarding the casings. On stairways and fireplaces and/or chimneys, locate from some wall or feature you are pretty sure will continue to the next floor so that the relationship of one floor to the next is not miscalculated. Finally, materials used in the construction of the walls should be noted.

Taking vertical measurements inside and out requires a bit more imagination. It is best to write a brief description of the main features of each wall. To help clarify complicated wall features, make drawings for vertical or horizontal measurements. Inside measurements are made from the floor to the ceiling. Outside wall heights are recorded from under eaves or top of the walls to the present grade or surface around the house. Measure attic and ceiling features next. Make a drawing and write descriptions as necessary. Note the type of material used in ceiling construction as well as the kind, size, direction and number of joists and other boards. Note nail types and sizes. Make drawings, photos and descriptions of the roof members and their articulation to the walls.

The second phase of recording can be done when destruction begins. Additional internal features, not normally visible, should be recorded to complete the notes. Even if the sketch is not drawn accurately to scale, but is a true view of the features encountered, and the dimensions indicated have been carefully taken and recorded, a scale drawing can be made from the information at a later date.

Photographs are a very significant medium of recording. Good photos, carefully labeled, and where helpful, keyed to floor plan or elevation drawing, are indispensable for clearing up questions about appearance or details of a building. Use black and white film. If possible, shots should be taken squarely, facing the subject to avoid distortion. Ideally, each photo should include a door, window corner or other recognizable feature so that it can be easily identified. Each structure should be photographed from all sides for the record, if nothing else. Get detail photos of trim, balconies and other special features. Photograph the setting or environment of the house, including yards and outbuildings. Photograph inside features also; windows, floors, fireplaces, lintels, hardware, built-ins, and so on.

Photograph not only the front stoop but the brick walk pattern; not only the doorway and threshold but a typical shot of the floorboards, the wainscot as well as the detail of base and chair rail, the roof texture as well as the ridge and eave details. If your survey is a team project, never forget the importance of on the job communication. Informal groups can often waste a lot of time and effort through needless duplication of effort simply because person B didn't know person A had already photographed the fireplace up, down, and sideways. A little organization of the project beforehand can assure proper coverage where constant supervision is not possible.

Whether it is a farmhouse, a factory, or a fort, you still need to research first. Seek out all information bearing on what you might find. Excavate carefully to see what you do find, identify and record it, bag the artifacts you uncover and retain for further study, recording and eventual use in publishing the story of your site.

Section 5: WHAT to do with WHAT you find

Handling the artifacts

Here you are, back from the site, with bags of artifacts, some of which are identified in a general way and hopefully preserved enough to be moved. Now it is necessary to find out what you've found. The photographs are developed and the daily records and artifact and feature lists which you made up as the dig progressed are at hand. The mud and the dust are wiped off those papers and they are as legible as they are ever going to be.

While the people who made those records at the dig are still around, get at the reports and the artifacts. Many groups fall apart once the dig is completed, or when the ground is frozen. The backup work is just not that interesting to the active members who did the digging. Find the people to whom orderliness is a way of life, and try to get them interested in the artifact cleaning and cataloging, the data processing, and the photo-drawing integration.

The first problem may well be handling the artifacts. Everyone will be anxious to see what was dug up, but if it isn't cataloged now, chances are it never will be. Moreover, you stand a good chance of getting the provenience of the artifacts mixed up. But before the artifacts can be properly numbered, they do usually need to be cleaned.

Cataloging

The minimum treatment for most recovered artifacts should be washing with warm water and mild soap. The items should then be allowed to dry at room temperature. All artifacts should be marked with permanent India ink to indicate site, square number and soil layer. Items of particular importance, of which a sufficient number of fragments have been found, such as pottery and glassware, should be restored; that is, pieced together to form a complete item. Some chemical cleaners are very effective for removing rust and other corrosion from artifacts. However, they must be handled with extreme care.

Preservatives

Acetone and Duco Cement solution is very effective and highly recommended as a preservative. It should be mixed in the proportion of four parts acetone with one part Duco Cement and can be successfully applied to all types of artifacts. A mixture of white glue and water (ratio of 1 to 5) is an excellent preservative for bone or moist material since it is mixable with the water which may yet remain in the artifact.

Once the artifacts are labeled and listed, you will probably want to photograph some of them. You'll certainly want to study and, perhaps, display them.

If your site has been a home, the artifacts are apt to be one-of-a-kind items, perhaps easily recognizable because you found the same items in the house next door. The broad axe, the hoe, the candle mold, and so on have been illustrated in other publications, and you already have a good idea of what the item you have in hand really is. Now you can compare it with similar items shown elsewhere and see what more can be learned concerning it. Your finds are most likely tools of farm, craft and industry.

Hand tools

No houses were built without tools. No land was cleared, no soil tilled without tools. Both the marks of their use and the tools themselves can serve to date sites; they are datable "artifacts."

Most tools used in America before about 1830 were made to order by local smiths or cutlers. They varied in size, shape and workmanship according to the taste of the purchaser and skill of the maker. Generally, they were rather basic types, in some instances made by the individual for his own use.

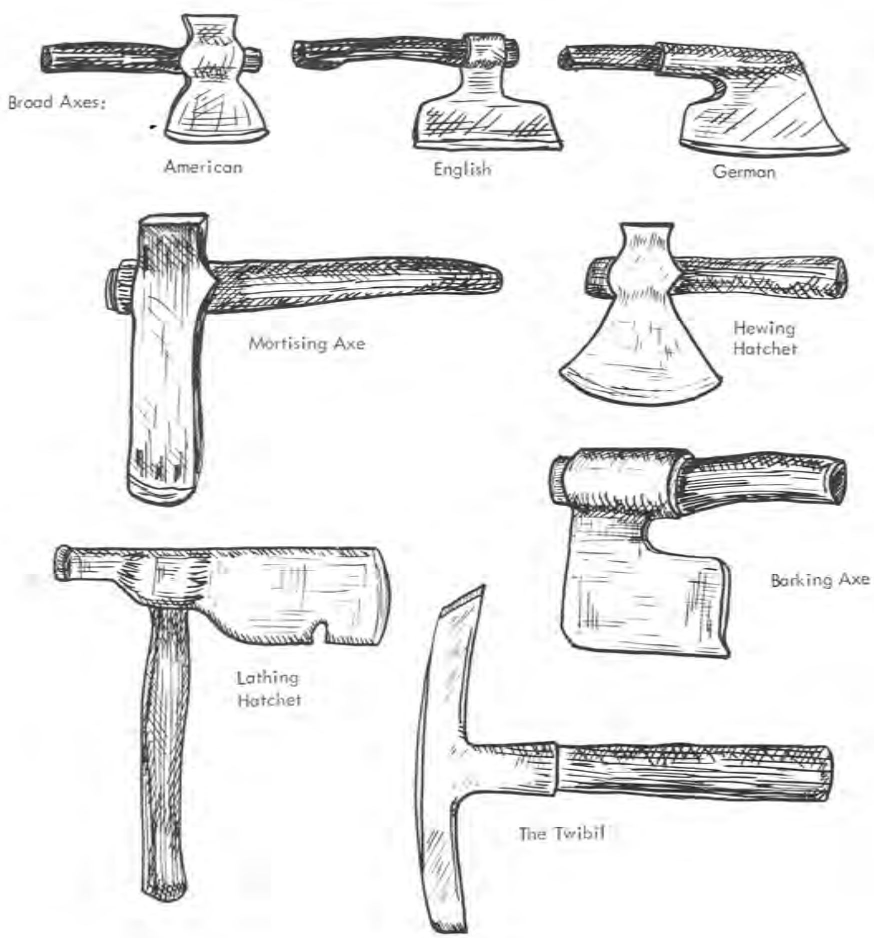
During the next twenty years, 1830 to 1850, handmade tools continued to predominate, but tools for which there was a large and steady demand, such as axes and adzes, were increasingly factory-forged. The decade between 1850 and 1860 saw one of the great industrial and technical upswings in the United

States. The Civil War period was marked by a great increase in mass production and standardization, and represented a turning point in American tool manufacture and design.

In 1870, as compared with 1860, the design of tools was greatly enhanced. Handmade implements began to disappear. Wooden handles, formerly made and fitted by individual owners, were now made by machine and became fancier, more curved and more ornamental. The fine quality of tools continued to increase during the 1870's through improved facilities in light molding, grinding and forging. The artistic element became more prominent. The excesses of the Victorian age were reflected in most commonplace articles. By 1885, axe and adze handles had become almost too curved, but by the 1900's they came back to more standard designs.

Woodworking tools belonging to the axe family are among the most popular found in museums, yet they are the least understood and the most poorly interpreted.

AXES AND HATCHETS



Axes

Tools of the axe family have the following in common: a single cutting edge which is an integral part of the tool. Most types are of European origin, where they were used as a splitting tool. In use this tool was guided and controlled by the hand only. An axe consists of a head made of iron, steel, or both. This is fitted and wedged to a wooden handle or "helve." The opening for the handle is called the "eye" and separates the blade or "bit" from the "poll."

Felling axe

The primary purpose of the felling axe is cutting down trees. It is designed for two handed use, cutting cross grain and is always sharpened as a knife edge, bevelled equally on both faces. The axes brought by the early settlers were European types. The blade was long, up to 8", and its edges non-parallel. There was no poll, but merely an iron band to form the eye. These axes were highly desirable to the Indians and proved an ideal item for barter, becoming know as "trade axes."

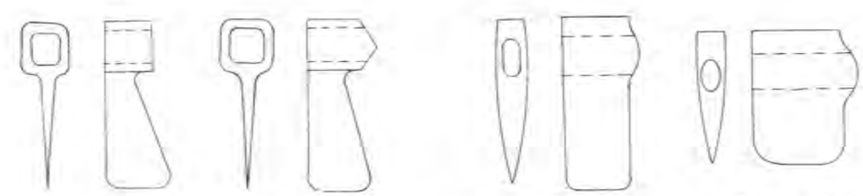
Forging the axe

Axe heads were forged by blacksmiths in two ways. A single piece of iron was folded around an iron handle-form and its ends were then welded to the steel cutting edge inset. The second method was to have two separate pieces of iron shaped to fit together around the handle-form. These were welded on *both* sides of it with the steel insert on the blade side.

American felling axe

The development of, and changes in, the American felling axe resulted in a heavier, almost square shaped head by 1775. Up to around 1700 the bit was long and there was no poll. By 1725 pointed or curved eye tabs were added. By 1750 the bit had become more rectangular and a little shorter with some increase in the poll area. By 1775 the poll had become quite heavy.

DEVELOPMENT AND CHANGES IN THE AMERICAN FELLING AXE



UP TO CA. 1700, LONG BIT, NO POLL. — BY 1725, POINTED OR CURVED, EYE TABS ADDED. — BY 1750, RECTANGULAR SHAPE, SHORTER BIT, SOME POLL. — BY 1775, SHORT BIT, ALMOST SQUARE SHAPE, HEAVY POLL.

The felling axe requires a long handle. Those imported from Europe were straight, but American woodsmen gradually carved their own in the more functional curved shape. The curved shape has been commercially available since about 1850.

Broad axe: American, English, German

The function of the broad axe was to hew or form the straight, flat surfaces of beams. They are designed to cut along the grain to smooth off a wide swath at each stroke. For this purpose the heads are at least twice the size and weight of the felling axes. There are three major types of chisel edged broad axes: the American, which has a poll; the English which doesn't; and the German style in a goose wing shape. The broad axe has a short, bent handle protruding outward from the side of the axe head with the bevel or chisel slant on the same side.

Squaring or hewing

To use the broad axe for squaring or hewing, a line indicating the plane of the desired cut is snapped onto the log with a chalk line. Notches are carefully cut to this depth at intervals along the log using the felling axe. This is called "scoring." The log is supported at a convenient height above the ground and held securely. In cutting, both hands are always used with a short stroke being most effective.

A second form of broad axe is the knife edged broad axe. This axe is beveled on both sides of the cutting edge. Equipped with a long handle, and adapted for cutting on either side, this axe became highly useful with the advent of railroads.

Mortising axe

The mortising axe has a long, narrow, snout-like bit designed to hew out rough, large, square holes for tenons. Mortise axes were like chisels and were pounded on their heads.

Barking axe

The bark or barking axe was a thin-bladed, short handled tool used with one hand. It was used for removing bark from trees. The axe first severed the bark transversely around the log at four-foot intervals, then split it longitudinally for removal in large sheets. The barking axe was also used for shaping trees for masts and spars in shipbuilding as well as for procuring bark for tanneries.

Twibil

The twibil is, as it says, two-bills or bits. Both are chisel sharpened, one cutting edge is parallel to the handle, the other at right angles to it. It was used for two-handed, short stroke chipping out of mortises.

If you look at the twibil, you'll see one bit is like a hatchet or axe, parallel to the handle. The other, at right angles to the handle, is like an adze.

Adze

An adze is a freely swung planing tool with thin blade whose cutting edge is transverse to the handle. Generally, the blade is curved toward the user but, straight or curved, it is beveled from the top of the blade. The long-handled adze is used with short strokes parallel to the grain, along a path between the man's feet. The long-handled, heavy headed adze with straight, flat cutting edge was a carpenter's or shipbuilder's tool, adapted for smoothing uneven surfaces as on a floor plank or beam. The adze does on a larger, somewhat rougher scale, what we would do now with a plane or with a powered pointer.

Lathing hatchet

A hatchet is a small, lightweight, short handled axe for one handed swinging. Some specialized hatchets include the lathing hatchet for cutting length, splitting or shaping, and using the poll for nailing laths. It has a flat or slightly rounded far edge, permitting nailing of laths close to corners and ceilings

without interference from the blade. The round poll is adapted to driving nails. There is a tapered "V" slot or slot-shaped notch for nail pulling located on the near edge of the blade which is usually a short one, 3" or less on the cutting edge.

Shingling hatchet

The shingling hatchet is used for notching and breaking, splitting, shaping, and nailing wooden shakes or shingles. It is quite similar to the lathing hatchet. It has a long nail-driving poll and a nail-pulling notch. The cutting edge is longer, some 4" or more. A flared bit extends beyond the poll and is balanced over it. Shingles or shakes can be cut off in one stroke.

Hewing hatchet

Smaller or lighter, but still resembling the broad axe, a carpenter's hewing hatchet usually has one flat face, a relatively long cutting edge and an offset eye. The bit is chisel edged and, generally, there is a rectangular poll. Such hatchets were used for shaping.

Many other carpenter tools would have been found in any home or on any farm. These tools for building and repairing frequently turn up on archaeological sites.

Wedges and froes

To split wood in order to make shingles, laths, staves and clapboards, the builder would use a knife-type wedge called a frow. The frow was struck with a short maul and could easily split a block of wood.

Iron wedge

Logs, however, could not be split with the frow. For this type of work, a far stronger tool was needed, namely, the iron wedge. These ancient tools, made by the local blacksmith, were used by the early settlers to split logs for house timbers and for rails and posts.

Drawknife

The drawknife is a blade having a handle at each end at right angles to the blade. It was used to taper the sides of shingles and to rough-trim paneling and the edges of floorboards. The drawknife was a highly popular tool and many of these antique tools are found.

Chisels

Many kinds of chisels were employed by the builder or farmer. The chisel did a great many jobs. One special use was to cut the wood and enlarge two auger holes to make a mortise. Most of these tools had wooden handles and were designed to be struck with a mallet. However, there were also large paring chisels designed to be used with two hands like a plane.

Saws

Two basic types of saws were in use during the first American settlements, the frame saw and the open saw. The open saw is virtually identical to the modern type. It had a handle like that of a knife and was often long enough to be used with two hands.

The frame saw was the most popular with early Americans. It had a wooden frame and required only the narrowest blade. It was truly "an extension of the craftsman's hand." He could cut straight or around corners with it and always see where the blade was going.

Large saws with teeth raked to cut downward did most of the earliest plank-sawing. Both open and framed types were used from trestles and in pits. The open type was the more recent and was used until the late 1800's. The marks of the open pit saw are slanted (diagonal cuts or strokes) and can be easily distinguished on wooden timbers.

Hammers

Early American hammers came in a variety of types and sizes. The early craftsman knew that how you hit, and what you hit with, made a big difference in the job being done right. There were claw hammers, bricklayer's hammers, tack hammers, riveting and saw hammers and so forth. Each hammer hit a special kind of blow to do the special job the craftsman needed done.

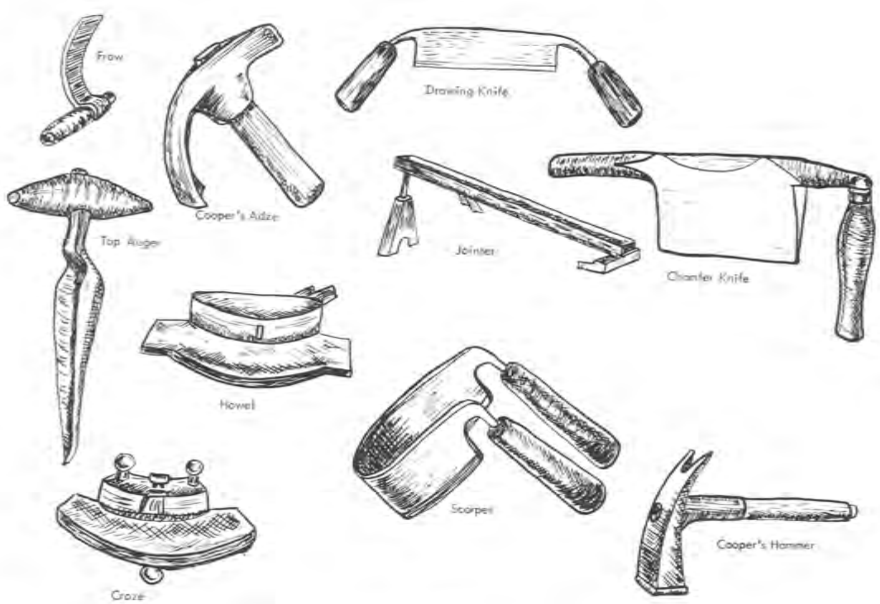
Early nail hammers were not plentiful, due to the widespread practice of using wooden mallets to drive in wooden nails. Iron hammers were used only for metal nails and these occasionally turn up at archaeological sites.

Farm tools

The excavation of a farm house, barn or country dwelling often yields a variety of farm tools, both whole and fragmentary. These farm tools can give the archaeologist an indication of the type and extent of activity performed at the site.

Hoe blades, fragments of rakes and pitchforks, plows, spades, sickles, scythes and iron handles are frequently recovered. Their location in relation to structures or other features must be carefully recorded by the archaeologist. These tools add to the picture of daily life at the site being excavated.

COOPER'S TOOLS.



Frow

Making barrels was a specialized trade, and one in demand very early in the American colonies. The cooper's tools were, for the most part, specialized versions of carpentry tools, adapted to the making of wooden barrels. For instance, the curved frow, used for cleaving or riving staves, is very similar to the frow used for making shingles and shakes. The introduction of the curved element imparts a curve to the staves. Both tools have a sharp edge, wedge-shaped blade, and a handle set in the plane of the blade and at right angles to its length. They are both used in the same manner as a chisel with the handle at one side.

Cooper's adze

The cooper's adze is a small one-hand adze used for hewing down barrel staves, with the characteristic curved, transversely set bit and poll.

Jointer

The jointer is actually a plane 5' 6" long, the lower end of which rests on the ground, while the upper end is supported by a prop. The inclined sole of the plane is presented upwards and the staves jointed upon it to produce the proper bevel on their edges.

Scorper

The scorper is a one handled circular iron knife, tanged at right angles to its handle, or it may also consist of an open circle with two handles. It is used for shaving the joints between freshly set staves to a level, inside barrels, tubs, etc.

Howel

The howel is a plane with a convex sole, used for smoothing the inside of barrels and casks, making the smooth circle at the croze, and cutting the chamfer on the inside of the chine.

Chamfer knife

Chamfer knife is a blade having a handle at each end, one in the same plane as the blade and the other at right angles to it. It is used for cutting the chamfer on the inside of the "chine," the rim of a cask formed by the ends of the staves.

Croze

The croze is a tool used for making the grooves for the heads of the casks after the ends of the staves have been leveled. The head of the croze is nearly semi-circular and ends in two handles. The stem is secured by a wedge and the cutter is composed of three or four saw-teeth, closely followed by a hooked router which sweeps out the bottom of the groove.

Tap auger (taper auger or tap borer)

The tap auger is a tapering half-funnel-shaped boring tool, with a sharpened edge, cross handle and gimlet point used for cutting spigot or bung holes. The one-handled type is approximately 7" long while the two-handed type runs 2' or more.

The blacksmith and his tools:

Another collection of tools that would indicate a specific craftsman's shop might be those associated with the smithy. Iron while it is hot, is capable of being stretched out, pounded together, rolled and twisted. Pieces of iron can be worked together into one piece, welded and perfectly joined. The blacksmith had the honor of being one of the indispensable workmen in the progress of human culture from the earliest times.

When America was settled, blacksmiths were among the first workshops. Supplies of iron ore and wood for charcoal were plentiful. In each locality, the blacksmiths naturally employed the designs and ornamental motifs used in their mother countries. Invention in ornament is slow and the rigors of early American life emphasized the need for strictly functional designs. The blacksmith always had a long list of farm and shop tools, small arms, hardware, nails, clocks, etc. to be made or repaired. In the middle of the 1800's the blacksmith began taking over the farrier's work of horseshoeing. Until then, the farrier was a veteranarian too.

Blacksmith tool design has not changed very much except for the hazelwood withes that held all upper tools such as chisels and swages.

Anvils

Early anvils were nearly square on top with nail making hollows in the corners called nail headers. By 1740 they had become more rectangular, with a horn. Around 1800 the rectangular anvil had both a horn and a heel.

Hammers

Sledge hammers weighing around ten pounds were used. The cross peen hammer had a flat face for forging while the rounded wedge of the peen was used for increasing the width of the mass of metal. There were also swage hammers which were used for farming and shaping iron.

Rounding tools include the swages. Here the top tool is held by a withe of wetted hazel rods. The bottom tool went into the anvil. There was also a spring swage.

Cutting and drawing tools

Cutting and drawing tools include the hardy, a pointy gadget that fits into the anvil and presents its edge upwards for cutting. The fuller fits into a hole in the anvil for drawing the heated metal down to a smaller size. Chisels also were used.

Tongs

Iron has to be hot to be worked. Obviously one needs something long-handled to hold it with. Very specialized tongs were the answer and included flat bit, crook bit, hammer tongs, hoop tongs and round and square bitted tongs. A nail header, approximately 7" long, was a sort of die into which the pointed end of the nail rod, cut by a hardy, was put.

Blacksmiths were aboard the first ships to the New World. Their skills were needed for repairing their ships and for building new homes. Every town had its blacksmith. The farmer needed him to repair wagons and plows and to shoe horses and oxen. The housewife needed him for her pots, kettles and fireplace tools. Every house and barn needed nails, bolts, hinges and latches. But with the perfection of the steel-making process, the development of the factory system and the invention of the automobile, the blacksmith became almost obsolete except as a farrier — a shoer of horses.

Farrier's tools included hoof knives, pincers, farrier's long and short chisels, and a butteris or hoof parer.

The advantage to the historical archaeologist in knowing about early tools is simple: find one specialized tool and you'd be inclined to look for more that relates to it, suggesting that the original owner worked at the particular craft indicated. Finding written material indicating the presence of a particular craftsman, one might logically expect to uncover artifacts substantiating the existence of such a shop.

Educationally, the understanding of the uses for specific and specialized hand tools makes easier the understanding of the next step in the growth of a particular industry — industrialization. For instance, barrel making became a mechanized mill industry after 1815. An understanding of the hand process of barrel making should make it easier to recognize and evaluate the historical and archaeological evidences for a mechanized operation.

Diagnostic artifacts

Many industrial sites are of value in two ways: as the source of manufacture of datable items found elsewhere, as well as historical sites in themselves. Sites bearing pottery offer some of the foremost historically diagnostic artifacts for the archaeologist. The ceramics used in North America were from Europe or the Orient, or were derived from European models, if one is considering manufactured pieces.

Ceramic Artifacts

As far as the artifacts go, ceramics can be categorized first by paste. Earthenware is permeable, opaque, porous paste with small proportions of fused material. Soft in varying degrees, it has a rough fracture when broken and sticks to the tongue.

Stoneware

Stoneware is impermeable, opaque, slick paste with medium to large proportions of fused material, grayish or brownish in color, and non-porous, impervious to liquids.

Porcelain

Porcelain is impermeable, translucent, slick paste with a large proportion of fused material. It is naturally of a whitish color, but may be stained many colors by mineral oxides. There are two basic types, namely a hard paste made from a mixture of china clay (Kaolin) and china rock (petunse) which is resistant to a file and shows a conchoidal or shell-like fracture. Soft paste, or artificial porcelain, was originally ground glass stiffened with white clay. It can be marked with a file and, when chipped, the body is granular.

Glazes

There are various types of glazes. Most varieties of glaze are applied by brushing, dipping, pouring and spraying. They can be translucent, opaque, or colored. Glazes may be applied by coating the object with ground glass prior to firing.

Photo 16

Reconstructed English cup of lead glazed slip decorated earthenware, c. 1776-1777.

Glazes seal the surface of porous earthenware, rendering it smooth, shiny, hard, and watertight. When glaze is applied to stoneware or porcelain, it does not make the vessel watertight, since both of these wares are impermeable already, but it does serve to enhance its appearance and to make for cleanliness. There are many ways in which ceramics can be decorated too. A combination of these variables — paste, glaze, and decoration — is used to classify ceramic artifacts. The advantage, of course, is being able to narrow down the date of a particular excavation by finding such an easily dated item, whether imported or of domestic manufacture.

Clay tobacco pipes

Another imported clay product that is beautifully suited to dating historical sites is the clay tobacco pipe.

Photo 17

Two-piece iron mold used in making clay tobacco pipes.

Photo 18

Clay tobacco pipes dating to the late 19th century. Note effigy pipe at top left which is smoked with a reed stem.

Photo 19.

Clay tobacco pipes of the 18th and 19th centuries. Top to bottom:

1. *Pipe with style number, name of maker, and place of manufacture molded on stem c. 1835.*
2. *Black pipe of French origin c. 1835.*
3. *English pipe with "RT" molded on side of bowl c. 1770.*
4. *English pipe c. 1776.*

The Indians developed the habit of smoking tobacco. This practice became fashionable in England in the 1570's and by the early 17th century the clay pipe was common. The shape of the pipe bowl underwent an easily recognizable evolution that had begun before the start of the 17th century and continued through the 19th. The pipes were manufactured, imported, smoked and thrown away, all within approximately a year or two. They were extremely cheap and thus available to all economic levels of colonial society. They were expendable, much like cigarettes, but fortunately, vastly more durable. Thus their fragments survived in the ground in great quantities.

Pipestem fragments

The tobacco pipe fulfills the archaeological requirements of datable evolution and short life. In recent years, a great deal of attention has been given to the measurement of clay pipestem fragments as a means of dating excavated sites of the 17th and 18th centuries. Two systems of statistically dating stem fragments, based upon the measurement of their bore diameters, have been developed by J.C. Harrington in 1954 and Maxwell and Binford in 1961. The continued application of the Harrington-Binford system by archaeologists has clearly demonstrated its value to historical archaeological studies.

BINFORD FORMULA

$$Y = 1931.85 - 38.26\ X$$

Y is the date of the deposit and X is the average stem bore diameter expressed in sixty-fourths of an inch. For example, for a group of stem fragments the following result might be obtained:

Diam. of Bore	*No. of Stem Fragments*
4/64 in.	29
5/64 in.	235
6/64 in.	4
Total =	268

$$\text{Average Bore Diameter, } X = \frac{(4 \times 29) + (5 \times 235) + (6 \times 4)}{268}$$

$$= 4.91$$

$$Y = 1931.85 - (38.26 \times 4.91) = 1744$$

DATING PIPESTEM FRAGMENTS

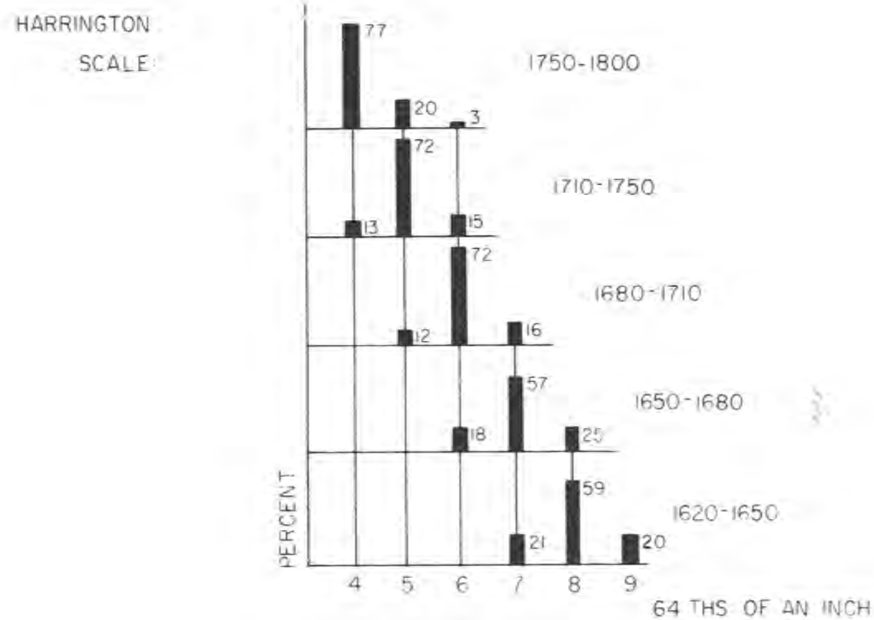


CHART SHOWING VARIATIONS IN HOLE DIAMETERS THROUGH THE STEMS OF CLAY TOBACCO PIPES

The first requirement in the application of the Harrington-Binford system is the measuring of quantities of stem fragments from excavated sites. In taking the measurements, the archaeologist employs a set of graded drill bits containing six drills in 1/64 inch increments; that is, from 4/64ths to 9/64ths of an inch. The object, of course, is to determine the size of the stem bore by inserting the drill bits until one sees which one fits, a tedious and time consuming process.

Faced with the prospect of measuring several thousand stem fragments from excavations, I sought out a better and quicker way. The answer proved to be a "step gauge" made from a piece of stainless steel rod 7" long and ¼" in diameter. The gauge incorporated the graded drills into one tool. With this tool a stem fragment can be measured easily and quickly. The gauge is pushed into the pipestem hole as far as it will go, until it is stopped on one of the stair risers. The diameter of the bore is taken as the size of the last step. One is apt to encounter other similar situations where statistical analysis of a large number of like pieces will stimulate the invention of some means to more easily accomplish the task.

To consider and analyze what you've found, you'll need to be familiar with published works in the field. You should review the field reports of comparable digs to see if identification of comparable finds has been made, and the specialty books that give the typology of the artifact being considered.

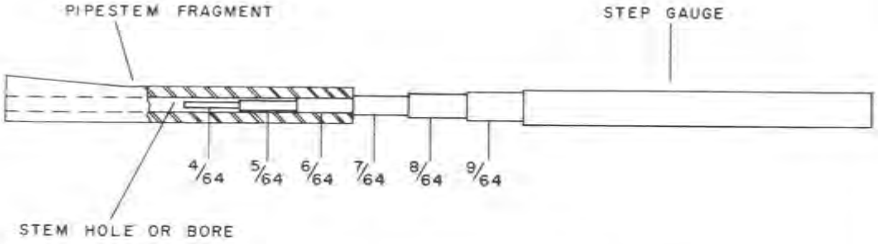
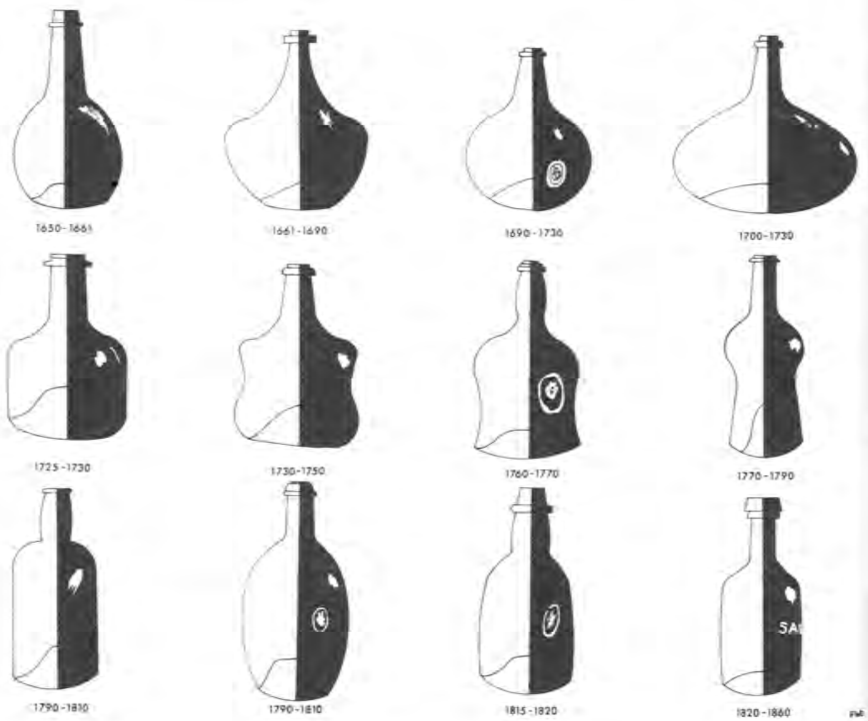


Fig. 24

Step gauge tool for measuring clay tobacco pipe stem bore diameters.



The glass industry is another one where the nature of the artifacts makes them of diagnostic value.

Bottles

Glass bottles for the easy packaging of all sorts of liquid necessaries were an early need. The one-piece dip mold was the usual method from 1790 at least until 1810. Only the body was formed in the mold (by blowing) with hand finished shoulders, neck and mouth. There is a horizontal mold mark at the start of the shoulder.

Three-part mold

Around 1810 a three-part bottle mold was developed with the lip hand finished throughout the 19th century. Here, there is a horizontal mold line, but it is lower on the body and two vertical mold lines appear above it, disappearing on the upper part of the neck, due to reheating for hand finishing of the lip.

Two-piece mold

The two-piece bottle mold began to replace the three-piece mold between 1840 and 1850. The lip is still finished later so the two vertical mold lines running up from the base disappear on the upper neck.

The snap case, introduced around 1857, replaced the pontil rod for holding bottles while the neck and lip were finished, so there is no pontil mark on the bottom.

The first lettered panel bottle appeared about 1867. Most often used for patent medicines, these square or rectangular bottles have recessed panels on one or more sides with raised letters giving name of contents and state of manufacturer. The chilled iron mold, introduced in 1870, gave a smooth exterior surface to the bottle.

Bottle stoppers or closures

Before 1850, cork was used to stopper or close bottles. Various patents covered different alternatives, both here and abroad. Some of the most notable include the internal glass ball stopper, patented in England by Hiram Cobb in 1860 and in the United States in 1873. The Hutchison stopper consisted of an internal rubber gasket and a wire loop, and was patented in 1872 or 1879. (To open a bottle so stoppered, the iron wire loop was struck sharply, driving the stopper into the bottle. The resulting sound gave rise to the term "pop" bottles.) The lightning stopper for jars and bottles had an iron ball and lever and was patented in Europe in 1875 and in the United States in 1882. The crown cap (the familiar metal crimped crown cap) was patented in 1892. Many other specific designs of closures for jars, as well as bottles, can be identified by comparing your find with illustrated books giving, in more complete detail, the various patent information.

Bottle making machines

The late 1800's saw many industrial innovations, among them the development of a semi-automatic bottle machine in 1881. Bottles produced by this machine will have mold lines running up to the lip, but not on top of the rough lip. It was not until 1903 that the fully automatic Owens bottle machine was patented by Michael Owens, producing bottles with continuous molds lines all the way up the sides and onto the top of the lip.

Pressed glass

Not as quickly used and discarded as bottles perhaps, is pressed glass, identified by the sharply defined impressed patterns on the exterior and smooth inner surface left by the plunger used to press the glass into the mold. A pressing machine was patented in 1827. Piece molds are used so the glass has narrow, sharply ridged mold marks. Before 1850, the glass has a grainy finish and the background is usually stippled. Later, pressed glass was fire polished and the stippling was eliminated; the smooth reflective finish being more desirable. Styles, dates and places of manufacture are pretty well documented in various specialized publications for assigning dates to any pressed glass pieces you may find.

Spoons

Spoons are another typical artifact presenting much the same aspects. Both the silverware sources and the field reports would have something to say about them. In earlier times the spoons were the product of an individual craftsman who may or may not have left his initials somewhere on the back of the handle. They might be pewter or silver at an early age, more likely silver or silver plate later. Cast commemorative 'memory' spoons offer great resources for dating after about 1800 and are readily identified by comparing with plates in catalogs of old spoons. Only by accurately describing and drawing your finds can you contribute to the growing wealth of knowledge about such things.

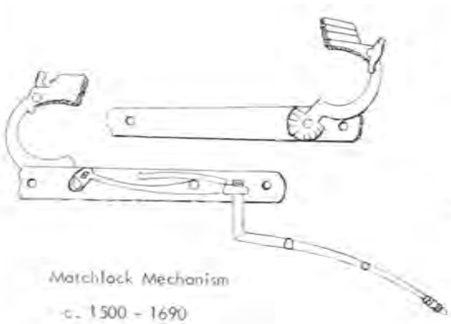
A glance at almost any publication of the Victorian age will give you a quick clue to the speed with which new industrial developments took place. The heyday of inventiveness ran amuck, folding furniture, prefab houses, cast iron store fronts, indoor plumbing, more highly mechanized hardware devices, improved lighting, cooking, and heating devices, improvements and stylistic changes in textile manufacture, a more quickly changing style scene, all combined to present a more highly specialized type of manufacturing with accompanying proliferation of specialized tooling.

This should be a field of extreme interest to the historical archaeologist. Tracing the patents on molded plywood, tracking the corn husker to its rudimentary beginnings, establishing a house date from sliding door hardware patented in 1883, or a barn from knot castings patented in 1863, determining the source of a coat rack from comparing its design to a catalog of 1891, all become part of the industrial history of this country. These items are documented in the patent office, and the period advertising and catalogs are lifeless and meaningless, until someone wants to restore a historic landmark home in the proper style.

The closer in time to the present one is, in considering manufactured items, the greater the chance of finding printed records confirming product sources. There is a special interest group, The Early American Industries Association, that can also be of help in this respect.

Military artifacts

On military sites, that peculiar lump of rusted metal may well be part of a gun as gunlocks are frequent finds on such sites.

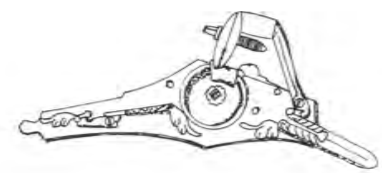


Matchlock Mechanism

c. 1500 - 1690

Dog Lock

c. 1620 - 1670



Wheel Lock

c. 1600 - 1650

Snaphaunce Lock

c. 1610 - 1660

Flintlock Mechanism

c. 1630 - 1830

Matchlock

The matchlock was the simplest of all locks in the American colonies. It continued in general use here until the end of the 17th century and was the standard infantry arm of the British until 1690.

The most obvious feature of the matchlock is a bifurcated arm attached toward the right end of the straight, ruler like lock plate, the head of the arm often shaped like a snake's head, called serpentine. This part gripped the burning, saltpetre-soaked match.

When the lever or trigger was pulled it swung down into the priming pan (the lid of which was previously opened manually to reveal the powder). The earliest form of matchlock was operated by a lever attached directly to the interior moving arm (sear) of the lock. Common in the 17th century, the improved matchlock had a trigger separate from the sear which was protected by a guard attached to the wooden stock. The matchlock musket or arquebus was an extremely heavy and clumsy weapon which could be dangerous to friend or foe, and the constantly burning match revealed the soldier's position and was liable to ignite the powder prematurely.

Wheellock

The wheellock was the first big improvement in the musket lock. It works on the same principal as a cigarette lighter. A revolving, serrated wheel, strikes sparks from a piece of pyrite into the pan. A thick, "V" shaped mainspring was linked to the wheel by a small chain. When the lock was wound up, the mainspring was compressed and the chain wrapped around the spindle. Releasing the spring pulled the chain, which rotated the wheel. At the same time the pyrites, gripped in a small vise called the dog head, was thrust down onto the moving wheel. The resultant sparks poured down into the pan atop the wheel.

Wheellocks did not have a long popularity and are unlikely to be found in archaeological sites later than the mid 17th century. They are easily identified by the circular housing for the wheel in the midsection of the plate, but most have lost their dogheads.

Snaphaunce lock

Used mostly in the 17th century, the Snaphaunce lock had a flint held in a cock. This was struck against a steel, or battery, that was separate from the pan cover. The obvious characteristics are its battery, an arm-supported, rectangular piece of steel anchored toward the right end of the plate. To the left is a trough shaped pan having a circular end plate. The cock is generally "S" shaped with a small tail at the lower end. In front of the forward curve of the "S" is a mallet-shaped block known as a buffer.

Dog lock

Developed in 1620, the Dog Lock was the first single action flintlock. It coupled the steel with the pan cover, known as a frizzen. A latch was anchored behind the cock to hook over its tail and prevent accidental discharge. The name "dog lock" derives from this safety catch, which was known as a dog. The earliest dog locks, 1630-50, had long plates, but later forms were shorter. The shaped cock became solid in the lower curve, with a notch cut into the back edge into which the dog engaged. Popular principally from 1625 to 1670, the dog was abandoned in favor of a notch in the tumbler between sear and mainspring.

Flintlock

The dog lock's successor, the half-cockable flintlock, did not become common in England until the last quarter of the 17th century, but once accepted, became the standard weapon until the 2nd quarter of the 19th century in both England and America. As a general rule, English flintlocks had slightly convex plates before 1750 after which flat plates with beveled edges became more common. Between 1690 and 1740 the rear section of the plate was slightly down-curved, resembling the end of a banana, while by 1750 the lower edge of the plate had become virtually straight.

Evolutionary design changes such as these are perhaps best seen in comparable drawings, available in such published accounts as are listed in the bibliography. Other bits of musket hardware went through similar evolutionary changes. Thimbles, or pipes, attached to the underside of the barrel stock to hold the rammer, changed style as did the escutcheon plates mounted on the stocks of Brown Bess muskets, between butt and breech until 1775. Side plates and trigger guards also went through similar design alterations, datable from known examples illustrated in various sources.

Marks

Similar to hall-marks on china and silver, view and proof marks on English musket barrels are helpful dating guides. Musket locks were also marked.

Bullets, Lead balls and Molds

There was only one type of bullet used in America during the colonial period, and this is the round leadball. Various sizes were made by the gun owner who considered a bullet mold part of his kit. 17th century English bullet molds were generally of iron, shaped like a pair of scissors or nut crackers making only one ball at a time. They were often fitted with a pivoting knife that

trimmed off the waste lead or sprue that extended up through the pouring hole. Some molds were designed to make up to a dozen balls of different sizes at one time, though 17th century examples had thin leaves and produced only smaller ball sizes. In the 18th century this mold type became general, made of brass and much thicker. When the leaves were closed, the lead flowed easily along a rectangular channel at the top and into each of the holes. When opened, the balls remained linked together by stalks springing out from the sprue-like pigs. These sprue strips are frequently found in excavations. Molds of stone (steatite) and pottery were also used, hinged by means of pegs held in wooden grips.

Lead bullets in unusual forms are sometimes found as they were quartered or partly halved for a more devastating effect. Some had nails driven into them for the same reason while others were flattened for use as dice, weights, sinkers, etc.

Bayonets

The rusty remains of various types of bayonets may also be found. Dating them is determined by such things as length of shank and blade, depth of socket, style or type of locking method, cross section of blade, and the presence or lack of the guard or block at the junction of blade and shank. British, German and French-made bayonets, as well as American-made examples, are found in and around military sites in the Northeastern states. Brief comparative data is given in the table in the appendix.

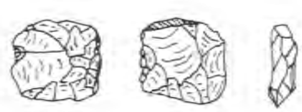
Gun flints

Gunflints can be identified by material as well as shape. The earliest in the Northeast occur in Indian sites characterizing the period from 1630 to 1675. They were copies of European flints made in local materials. The Nordic flint of Jutland, a mottled chalk flint, was one of the materials used for European flints. They were bifacially flaked by percussion chipping in square to rectangular and pillow shapes. The Dutch wedge-shaped flints first appeared here perhaps as early as 1650, but became obsolete by 1770. The wedge-shaped flint is struck from a pebble, and shows traces of the cobble rind.

FOUR STAGES IN THE EVOLUTION OF GUNFLINTS

Stage 1: 1630 - 1675

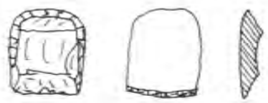
Nordic



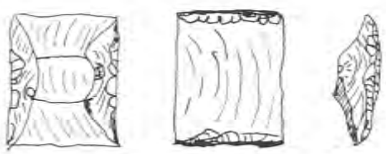
Seneca Indian

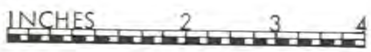
Stage 2: Wedge-Shaped Dutch Gunflints 1650 – 1770

Stage 3: French Blade Type 1740 – 1800's



Stage 4: British Gunflints – 19th Century





The French blade flint was not an ordinary article of commerce until later than 1740 and was the only type made by 1775. They were made from straight strap-like flakes called blades, 5" to 7" long, producing a highly standardized form, in large quantity with the least waste. Each blade was snapped into four or five pieces, the broken ends then shaped and blunted by a dulling vertical percussion retouch. Yellow in color, the French flints have a waxy lustre and are quite transparent. On Revolutionary sites, we find practically only French blade flints.

British flints of the 19th century used a glassy black Brandon flint. They were double-edged and the demicones of percussion characterized the British gun flint.

Flint grips

Flints were inserted into the cock grip with either base or face upward, held with a strip of leather or lead. Frequently found on archaeological sites, rectangular strips of lead about 1" x 1½" with one or two scored lines running down one side can be identified as flint grips.

Buttons

Though by no means limited to military sites, buttons are often another diagnostic artifact well covered in special publications. On a military site, moldering piles of metallic remains may well turn out to be buttons, particularly useful in sketching missing dates. While in the early days there were no directives stating the design, numbering system, or lettering a military button should have, certain styles were generally followed.

Fig. 28

"USA" buttons of the American Army during the Revolutionary War. These are the most common type found at military sites of this period.

The buttons of the private soldiers of the Continental Army were made of pewter or lead cast in molds. Unfinished specimens are recovered from refuse pits showing they were made in the military camp. Crude when compared to the coin-like precision which characterized the die work of the British 18th century buttons they are, nevertheless, recognizable. American officers had buttons of elegant design and workmanship, often with wood back and probably of French origin. Regimental buttons can be identified (see bibliography) and the movement of troops confirmed. British army buttons of the Revolutionary War exhibit excellent workmanship. When found in-situ they too are a record of the itineraries of the regiments which their numerals represent.

While this by no means exhausts the list of artifacts one might find in digging an historical site, it will give the reader some notion of the variety of materials he will have to deal with, the number of sources with which he should become familiar, and the need to carefully preserve all information as to where exactly each find was made. Only by accurately describing and illustrating your finds can you contribute to the growing wealth of knowledge about this country's past.

Study and use

Once catalogued, identified, and numbered, certain studies can be made, utilizing the artifacts found. Statistical data can be produced where that seems reasonable, and where pieces were found, restoration may be indicated. The mounting and filing, particularly of perishable samples such as architectural debris, should be considered now too. If a local museum is involved, you may wish to give some thought to reviewing the care being given other items donated for preservation. Additional photographs and, perhaps drawings, can also be made, in anticipation of the final report.

Section 6: SO WHAT

The artifacts are cataloged, the raw information noted down, and conclusions are discussed freely among the members of your local group. However, the knowledge gained from your dig will not be preserved if the final step is not taken: *Writing the final report.*

The archaeological report

The final archaeological report may be a group project or a one person undertaking, but whichever, it is the necessary step that makes all the digging worthwhile. The record keeping and artifact cleaning, cataloging and photographing done so far are all brought together in permanent form in the final report. It should start at the beginning with evidence leading to the selection of the site. The introduction should also include credits to informants, helpers, owners, and others who were involved. Any non-historical facts of interest (such as a shopping mall will be built there and that's why all the rush) should be mentioned.

The report proper might follow the general outline given here:

I. Site
Locate the site on a topographic map.
Describe site in general terms.
Specify location of actual dig.

II. History
Write a documentary history of the site.
Cite your written sources.
Track down and authenticate verbal history.

III. Methods
Indicate excavation procedures.
Summarize manner of taking records, of marking site, etc.

IV. Factual statement covering the activity.
State clearly what you found.
Clarify, with diagram, stratigraphy of site and outline of building(s).
Describe physical remains with words, photos, diagrams and drawings.

Artifacts found should be listed and described.
Photograph or draw some of the important artifacts for the report.

V. Comparisons
Compare your site with similar ones dug elsewhere or known from references which you cite.

VI. Conclusions
On the basis of the evidence uncovered, the research you have made, and the references you have found, you hold certain truths to be so: State them clearly, with the backup information, as your reasoned findings.

VII. Bibliography
You will want to include a bibliography in your final report, properly locating the written information you've relied on. This is the place to list correctly those books and documents you noted down when you first read them.

After you have the final report written and the artifacts duly filed away; then what? Information not made available is information wasted, so you set about getting the report published. Perhaps the local Historical Society has a publication fund. Perhaps your group is a member of a State group that has a newsletter or periodical that will publish your report. If you are going into publications as a means of raising money, chances are you'd best forget it. The vanity press is expensive. Your final report will not make the best seller's list and will probably have appeal to a small audience. You can run off 100 copies offset from a cleanly typed report for about seven cents a page, or Zerox it for about ten cents a page. Price the publication so it pays for itself and you rotate your group's publishing fund. Publish on subscription and you may get enough money ahead of time to pay the printer.

On the mechanics of publishing, sit down with the printer first, before you get too far along. Determine the most appropriate page size, and bear that in mind when assigning illustrations a place in the published version, both photo enlargements and diagrams. A local printer who does some catalog work photo-offset is likely to be the most helpful, and probably the most economical, if you feel your report is of sufficient interest to warrant printing 500 to 1,000 copies, to sell for under ten dollars. Note that these are generalities, and only by discussing the various possibilities in your own group with the resources of your own community and printer can you work out the most reasonable way to get the report published.

Displaying the artifacts

A published report is one way to disseminate information about what you've dug up. Properly displaying the artifacts in the local museum is another way to reach your audience. How you dug what you found can be shown with labeled, mounted photos like those in your report. The actual photos of the site can be shown in relation to the drawing of the site made for the report. The recovered artifacts can be displayed, along with an informative label.

Depending on what is to happen at the site, you may (1) have to hire a bulldozer to fill it back up, (2) be able to stabilize it so it can be toured as an active dig or, (3) in the case of a historic building or other historic landmark, you may secure state or national status for further preservation, so that it can be kept as an example from the past.

Trends in historical archaeology: Education and preservation.

Is there a future for the past? While we noted in the introduction that the speed of destruction is rapid, the interest in conservation is growing too. If you own land, you can determine whether there are any sites on your property. If any disturbances become necessary, notify as soon as possible, the nearest individual or agency trained to recover the threatened information. If you own a business affecting land, you can take the same steps. Support for preservation and restoration is increasing.

The support of an educated public is needed. College courses in historical archaeology are increasing in number with each academic year. Some adult school and continuing education programs now provide courses in historical archaeology. The work of serious and informed non-professionals is becoming recognized and very much appreciated. People are taking a more active interest in their past. Memberships of archaeological and historical societies are growing. More and more of these groups are providing training and an opportunity to dig.

Your local community may look to its local society for leadership in preservation and dissemination of information. It may be well to see if your society, and hopefully its associated museum, is fulfilling the needs of the community. Is it a repository of local memorabilia? What does the stuff do, just sit there? Can it be used in the education of the public at large, and in the schools particularly, as a source of specialized information of all sorts? Can you use your particular dig and its final report as a means of making your local museum more effective?

A museum is not only to collect and protect artifacts but to display, and through display, to enlighten the public. A display makes more sense if it can somehow be related to the public's interest. Therefore, with this in mind, it is important that we take a look at the need for the treatment, preservation and restoration of artifacts.

Treating and preserving the artifacts

The keystone of a good cleaning or preservation project is caution. That is, to be absolutely sure that you have correctly identified the material with which you are working. Furthermore, a basic decision must be made in regard to how far one should go in cleaning and preserving artifacts.

Basically, the archaeologist is concerned only with enough cleaning to observe the artifact, record trademarks and perhaps take photographs for publication. Often, this objective results in incomplete cleaning and no concern with preservation. The museum curator or preparator, on the other hand, is concerned with the aesthetics of an artifact, and long range preservation may be secondary. Therefore, a system of cleaning and preservation must take into account all three considerations: the observations of the archaeologist, the aesthetic appearance of the object, and the ideal preservation of the object for future generations.

The minimum treatment for each recovered artifact should be washing with warm water and mild soap. In dealing with iron objects, superficial corrosion or rust can be removed manually by gentle tapping or wire brushing. Depending upon the material with which you are working, alcohol and acetone are good liquid cleaning agents. Alcohol may be useful on wood and

glass items, and acetone on bone, shell, and copper. The items should be thoroughly dry before applying any preservatives.

A solution of acetone and Duco Cement is very effective and highly recommended as a preservative. This mixture should contain four parts acetone and one part Duco cement forming a clear solution. It can be successfully applied to all types of dry artifacts. Another useful preservative is Elmer's (white) glue mixed with water. This is particularly useful on objects of bone, leather and wood especially when they may still be moisture laden.

Consideration must also be given to the mending and restoration of pottery. In rebuilding a ceramic object, the basic steps to follow should be these:

1. Build up the object (e.g., jug, cup etc.) from the base to the mouth using Duco cement. This material holds best on porous surfaces. If it sets improperly or you wish to make a change, the Duco may be softened or dissolved with acetone. For glass or porcelain, use an epoxy glue.
2. Carefully fit and glue in place all available pieces.
3. Holes in the object (because of missing pieces) can be filled in to give you a completely restored vessel.
4. The holes to be filled are first backed with overlapping strips of sturdy brown paper glued together to create the interior of the vessel.
5. Liquid plaster of paris is then poured into the hole and smoothed as it sets to fit the exterior curve. Extraneous plaster must be removed.
6. Seal the plaster surface with a good coat of shellac. Finally, paint the surface to match the color of your object.

What good are the artifacts after the final report is written? The artifact remains an unending future research source, contributing new information and developing new significance undreamed of when the report was written. In museums it is of lasting importance to document archaeological objects to provide authenticity to museum exhibits, and for educational use in American studies. Beyond its strictly archaeological meanings, the artifact communicates human ideas, creativity, and feelings. It forms cultural data which, like a book, can be read and reread. It should, therefore, be preserved for future scholarly and scientific reference.

We decided at the beginning of this book that we dig for knowledge because knowledge is worth preserving, and because archaeological sites are non-renewable natural resources. The community looks to the local society for leadership in this area. Community action may well become a necessity, even as an informed public is a necessity. Is your group ready to accept the challenge to begin serious, meaningful archaeology?

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