THE 1972 EXCAVATIONS OF THE
MARKET SHOALS TOWER, KINGSTON

by

Donald A. Harris

April 1972

NATIONAL AND HISTORIC PARKS BRANCH

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
REPORT ON THE 1972 ARCHAEOLOGICAL EXCAVATIONS
OF THE MARKET SHOALS TOWER,
KINGSTON, ONTARIO

by DONALD A. HARRIS
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Figure 1. The Shoals Martello Tower from the west, 1971, Kingston, Ontario. (16H-202 M).
ABSTRACT

Archaeological excavations were conducted on the Market Shoals Martello Tower during the month of February, 1972. These excavations uncovered the ground floor of the tower and exposed the #1 ordnance room, #2 ordnance room, the powder magazine, the barracks store and the commissariat. Most of the structural material remaining in these rooms was flooring. Sections of the second level were also excavated including one window, the roof of the powder magazine, the boiler and the vault above the #2 ordnance store. A latrine was excavated on the gun platform and a small quantity of mid-19th century artifacts was collected from the site.
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PREFACE

The Shoals Martello Tower which stands in the harbour at Kingston, Ontario was the object of a cleaning contract let during the winter of 1972. As the cleaning of the interior of the tower progressed there arose some question as to whether or not it would be feasible to conduct archaeological research on the site. The tower which had had two interior levels was partially filled with pigeon dung and other debris, and there was a question as to whether or not any remaining flooring could sustain the cleaning. In an attempt to answer these questions the author of this report was directed to Kingston on the 11th of February. As a result of that visit to the site, it was decided that archaeological research was necessary, if the fullest amount of information concerning the construction of the structure, especially the flooring, was to be retained.

On the 15th of February I returned to the site to observe the cleaning operation and in conjunction with Mr. Gerry Crockett from the Technical Services Branch of the Dept. of Indian Affairs & Northern Development, recorded structural features as they were exposed. This system proved
impractical from the standpoint of information retrieval and on the 17th of February the contract for the cleaning operation was terminated. On the 18th of February a new contract, no. CR71-200, was instituted between the previous contractor and the Department of Indian Affairs and Northern Development. This new contract put the archaeologist in charge of the work and it remained in force until the work was completed on the 1st of March, 1972. The total time spent on the site was thirteen days, and this report is a presentation of the findings of that project.

I would like to thank Mr. Gerry Crockett for his assistance and for copies of all his sketches and drawings. I would also like to thank Mr. Graham Barkley of the Central Regional Office of the National Parks Branch for all of the arrangements he was able to make facilitating the smooth operation of the research. Finally, I would like to thank Mr. Armand Leduc, superintendent of the cleaning operation for all of the co-operation and assistance he provided.
INTRODUCTION

The Shoals Tower is located 100 yd. offshore in Kingston Harbour at Latitude 76°28'43" W., Longitude 44°13'44" N. The tower stands between the Government Wharf and Swift's Wharf at the foot of Brock Street and directly in front of the Kingston City Hall. Built on a shoal, the water depth in the immediate vicinity of the tower ranges from 2 ft. to 9 ft. During the winter the tower is accessible by an ice bridge, but during the rest of the year it can only be reached by boat. Adjacent to the tower is a breakwater which creates a small boat basin to the west.

The tower (Fig. 2) was constructed of hewn limestone on an ovoid plan to a height of 45 ft. The long axis of this oval, oriented north and south, is 59 ft. and the short axis is 54 ft. The southern section of the structure's wall is five feet thicker than the other sides. This additional thickness was a result of the need for greater protection from that quarter or to provide the space needed for a staircase, or both. Inside the tower, however, the plan is circular with a radius of 20 ft.

This tower was the only one of the four that was constructed on a circular plan. The other three were
Figure 2. The Kingston Market Shoals Tower in plan and elevation. A. Elevation of the tower from progress report in 1847. B. Plan of the ground floor. C. Plan of the second level most of which was devoted to barracks space. D. Terrepleine or gunplatform. (Public Archives of Canada.)
built on octagonal bases that merged into circular plans at the tops of the towers (Lavell 1936: 163). At the bases of these other towers small caponiers opened onto a moat to further protect them, but this defence was not necessary at the Shoals Tower.
HISTORICAL BACKGROUND

A detailed historical account of Kingston Harbour, the Martello Tower and their relationships to the St. Lawrence River is being prepared by Mr. Ivan Sanders of the Historical Research Section of the National Historic Sites Service, however the historical information presented here will provide the reader with some perspective of the site.

The history of the Martello Tower revolves around the history of Kingston and its importance as a key strategic position in controlling the flow of maritime traffic moving from the St. Lawrence to the Great Lakes. The French were early in recognizing this position for its military importance and in 1673 constructed Fort Frontenac on the western bank of the Cataraqui River where it flows into the lake. This position was held by the French until 1758 when it was captured by a British force led by Colonel Bradstreet. The British garrisoned Kingston until 1870 when they, along with all Imperial garrisons, were recalled from British North America (Stanley 1954: 21).

The termination of the American Revolution converted a section of the St. Lawrence River into an international boundary, creating further problems with which the British
had to cope. The hostilities between Canada and the United States again flared up in 1812 re-emphasizing the need to fortify Kingston against possible attack. In 1813 the first Fort Henry was erected. The disadvantages of using the St. Lawrence River as the only means of water communication between Upper and Lower Canada were also realized and in 1826 Colonel By was commissioned to construct the Rideau Canal. This canal, designed primarily for martial reasons, needed to be defended and as a result plans were drawn up in 1829 to erect a system of fortification, consisting primarily of a strengthened Fort Henry and several outlying, auxilliary fortifications. Work proceeded slowly on Fort Henry and no progress was really made toward the completion of the auxilliary works. This situation changed, however, as tensions between the two countries heightened with the adoption of the "Fifty-Four Forty or Fight" slogan of the 1844 American Presidential election campaign. With the election of James Polk and the Democratic party, Britain began to prepare for war with the United States. This preparation did not go unnoticed by the editors of the Kingston Argus who stated in January, 1846, "It is not for Oregon we shall have to contend, if contend we must. The blood of the yeomanry of Canada which may be spilled in defence of their homes will attest their abhorrence of the tyranny of Democracy. Britain seeks no war with
America-Canada seeks none. But let us imitate Britain and PREPARE FOR WAR as the surest means of securing PEACE."

The threat was sufficient enough to incite immediate action on the part of the Master-General of the Ordinance and Board and plans were quickly drawn up for the construction of four Martello Towers (exclusive of the two at Fort Henry) for the defence of Kingston Harbour (Fig. 3). The first of these contracts was let on the 30th of January of 1846 for the construction of the Murney Tower and work had proceeded so rapidly on it that the masonry was ready for testing by the 10th of June, 1846. The contract for the Shoals Tower was also let in January of that year, but work on it proceeded at a much slower rate.

The construction of the Shoals Tower differed from that of the other towers in that it was built on a shallow shoal in the harbour and was completely surrounded by water. This posed technical problems that were not encountered in the construction of the other towers. William Murray was awarded the contract for its construction and he probably sub-contracted the initial work to John Greer. It was Greer's job to construct a coffer dam (Fig. 4) on the shoal and pump out the water on the site. He set to work immediately, making good use of the ice, and by March 20th of 1846 had completed the dam and had begun to pump out the
Figure 3. Map of Kingston Harbour. (Public Archives of Canada.)
Kingston, Canada

Sketch showing relative positions of the works referred to in the accompanying return of ammunition, called for by DW Circular No. 57.

Scale: 1 inch = 1 mile.

CITY

LAKE ONTARIO

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Figure 4. Plan and cross-section of coffer dam as proposed in 1846. (Public Archives of Canada.)
Ref. or Drawing No. KINGSTON-1846

DETAILS: Smith Tower - Cover Plan

Kingston, W. M.
Main and sections of edifices proposed for the Tower on the Market branch.

Plan referred to survey hundred dated 5th February 1846

Wm. M. Green
Robert Draceon
William Fyergus

The foundations of Tower to be of rough stooks laid radiating from the center.

Section on A-B

Scale: 100 feet to 1 inch.

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water. This chore occupied fifteen pumps manned by six or seven men each until the middle of June when the interior of the coffer dam was pumped dry. This dam was 90 ft. in diameter and 7 ft. 6 in. in height, meaning the displacement of 47,750 cubic ft. of water. On June 15th, 1846, the Oregon Treaty was signed and this project, begun with the utmost urgency, slowed considerably and it was not until October of 1847 that the tower's construction was completed. Although the tower was completed in 1847 it wasn't armed for another 14 years.

The garrison for the tower was never very large and for the most part it was placed on a maintenance basis or was looked after by a caretaker. It was first occupied in 1849 by four guards and between then and 1854 the number of men never rose above seven. In 1855-56 the tower stood vacant, because of the Crimean War, but as a result of Britain's involvement in the United States Civil War, the garrison rose to 23 men. These men were all single, whereas before it is believed that the tower was used for married quarters. After the crisis in the United States had passed the number of men again declined to its previous 1850s level.

The tower was occupied by a British garrison until 1870 when, as stated above, all Imperial troops were withdrawn
from British North America. At that time it was turned over to Lt.-Col. Wyly, Director of Stores of the Dominion Government and kept on a maintenance basis for 10 more years. After this period it was considered obsolete and abandoned. A local informant stated that the tower had been occupied at the turn of the century and later by a Kingston family, but this story has yet to be substantiated. However, such a circumstance would explain the recovery of certain artifacts such as toys. After this final abandonment, the tower languished until the mid-20th century when it was re-roofed to protect it from the elements.
METHODOLOGY

Technique

When the author arrived on the site a great deal of cleaning on the third level had already been completed, and work had just been begun on the first level. This latter had consisted of the cleaning of the stairwell beneath the stairs that had let up to the second level. At this time the contractor was using this area to store re-usable bricks, and the archaeologist had no control over the dispensation of his labour crew. Until the contract had been rewritten, the archaeologist observed the cleaning process and investigated those areas of particular structural interest.

Because of the undifferentiated nature of the fill inside the tower, systematic levels of excavation were not maintained. The excavation consisted mainly of the removal of this fill and the cleaning and recording of the features that remained in place, primarily of floor joists and flooring.
**Operation System**

The traditional operational-lot system used by the National Historic Sites Service was employed on this site. The tower proper was given the code number 16H and the operations consisted of the three floor levels, each room or special compartment thereon being assigned a sub-operation designation. These are all described in the Appendix. Lot differentiations were rarely made, and lot number one was usually the designation given in any particular sub-operation for artifacts recovered from the fill. A lot 2 designation was infrequently given, and only in cases where a definite distinction could be made in the provenience of the artifact.

**Recording Techniques**

To prevent duplication of effort the recording of information from the tower was divided in such a fashion that Mr. Crockett was responsible for the sketching and drawing of all structural features as they were revealed by the cleaning operation. This entailed the recording of floor plans of the various rooms within the tower along with all significant structural features such as remnants of flooring, joist support systems etc. Particular attention was paid
to the more fragile aspects of the building, i.e. the rotted flooring and door frame mouldings, whereas such features as the stone lined vent systems were left unrecorded. The reason for this was that the recording of these more permanent features was unnecessary, because the site was to be recorded in detail by an "As Found" recording team from the Technical Services Branch in the near future. Most of Mr. Crockett's recording was done in the form of scaled sketches of the particular compartment or detail and related to a master plan of the tower.

The information recorded by the archaeologist related mainly to artifacts and their contexts. This was accomplished by using the operational, sub-operational and lot system described above. A journal was kept describing the various aspects of the tower as they were uncovered, and these different features were recorded photographically as well.

Artifacts

All artifacts recovered were recorded as to provenience, but in some cases this was impossible. The artifacts in this category were found before the arrival of the
archaeologist on the site.

Photography

Aside from a few external photographs of the tower, all photography on the site necessitated the use of electronic flash equipment. The cameras used were both Pentax with interchangeable 28 mm., 35 mm., 50 mm. and 55 mm. lenses.

Units

Because of the different systems used by the archaeological section and Technical Services, the units vary in this report. Those used on the various drawings are in inches and fractions of inches whereas elevations etc. were read in feet, tenths of feet and hundredths of feet.
Stratigraphy

This Martello Tower had been the home of innumerable generations of pigeons and bats and their dung and deceased along with fallen brick, masonry and wooden moldings constituted the fill inside the tower. The weight of this debris and the subsequent deterioration which the tower underwent after it was slated as obsolete brought about the collapse of the second level wooden floor. This in turn caused the partial collapse of the ground floor into the air space below. After this collapse the wood of the floor continued to rot and the pigeon dung, etc. filtered down into the bottom-most air space so that in time the whole became an undifferentiated mass. As a consequence, the jumble of timbers etc., prohibited traditional excavational techniques from being employed, and in fact made them impractical.
EXCAVATIONS

The following discussion details the excavational work conducted on the site, and begins with the ground floor. Only the windows, boiler, top of the magazine and the floor area above the #2 ordnance store required any excavation on the second level, and on the third level only the latrines were cleaned. The rest of the third level had been cleaned prior to the arrival of the archaeologist.

The Ground Floor

The ground floor of the tower (Fig. 5) was divided into five rooms or stores. These were all connected by a corridor to a set of stairs that led up to the second or main level of the tower. In the exterior wall of the commissariat stores there was an arched chamber, but the function of this feature is still uncertain. These rooms as seen on Figure 2 were the #1 ordnance store, the #2 ordnance store, the magazine, the barracks stores and the commissariat stores. The two other structural features recorded on this level were two windows that opened onto
the corridor from the magazine. Centrally located in the tower was the main support pillar for the entire structure.

The tower was circular in shape and the interior rooms on both the ground and second floor levels were more or less wedge-shaped with the exception of the powder magazine which was rectangular. Some of the general features that pertained to the ground floor will be discussed now rather than under the separate headings of the different rooms. These include the stone floor, the joist seating technique along the outer wall and the interior facing of the outer wall.

The basic platform upon which the tower was constructed was composed of undressed limestone set in mortar, radiating out from the center of the tower. This floor was unevenly levelled and never intended as a working area. Above it and separated by an air space of 7 in. were the floor joists upon which the flooring was laid.

Along the inner perimeter of the exterior wall the floor joists rested on a ledge and butted directly against the inner face of the wall. This ledge shown in Figure 6 had a double step in it. The joist keyed to the top-most step and rested on a wooden nailer laid along the bottom-most step. This nailer, though broken in spots to allow for partitions, etc. continued around the entire perimeter of
the interior face of the wall.

The ledge mentioned above was cut from limestone set in the base of the wall. This stonework continued up the face of the wall from the stone floor approximately 2.15 ft., or to the top of the floor joists. At this point the stone was discontinued and the facing material was changed to brick. The first course was a header course and the second, third and fourth courses were stretcher courses succeeded by another header course.

All of the floor joists on the ground floor were laid on an east-west axis, parallel to each other in all rooms. These joists measured approximately 4 in. by 12 in. This approximation was made necessary as a consequence of the deterioration and shrinkage that these structural members had undergone. In the various drawings included with this report detailed dimensions are provided.

Central Corridor

The connecting corridor between the various rooms on the ground level was basically 'Y' shaped. The stem of the 'Y' was the stairwell to the second level. The eastern arm led to the #1 ordnance store and the western arm led to the commissariat and barracks stores. This western arm had a
dog-leg section to it as seen in Figure 5.

Of the seven original floor joists that were laid in the corridor only remnants of six remained. These joists were in a very deteriorated state and several crumbled into dust during the excavation. The joists had butted into recesses in the masonry partitions of the corridor which were about 7.5 in. deep. Beneath the joist the masonry had been slotted for a nailer which still remained in place. This nailer was approximately 3 in. by $\frac{3}{4}$ in. and was recessed into the masonry beneath the joist. Above the joist and at the top on the stone masonry was a small ledge 7.5 in. wide on which the floor rested. At this same level the brick corridor partition was begun. This partition was the width of one brick length. The bricks were laid in the same fashion as those in the interior face of the outer wall, i.e., one header course for every three stretcher courses. In the main area of the 'Y' of the corridor there was no flooring present on the remaining floor joists.

**Dog-leg**

Turning west off the main line of the corridor was a short extension which connected the barracks stores with the rest of the ground level. This extension also enabled the
personnel of the tower to close off the commissary from the rest of the ground level without closing the barracks stores.

There were three floor joists in this extension area which were continuations of the floor joists in the main part of the corridor. These joists were fixed in slots in the western partition wall of the corridor extension. The slots continued all the way through the stone masonry into the small alcove of the commissary, but the joists were not continuous, stopping at the partition wall. Above the joists was a small ledge, 1 in. to 2 in. in width upon which rested the floor.

There were some remnants of the floor still in place on the joists, but these were very fragmentary. Also in place were cast iron bands which had held the floor in position. These perimeter bands which were found throughout the entire structure were screwed into place and it was surmised that they acted to prevent the floor from shifting or warping during times of action. Figure 7 is a cross section of this band which was trapezoidal in shape with a bevel on the upper side. That they were produced specifically for this building is certain, because all of the corner angles and curves are cast to fit.

At the eastern end of this extension or at the edge of
the arm of the 'Y' was a diagonal strip of stone masonry. This piece of masonry acted as the sill to the doorway leading into the commissary and as the base of the brick partition. In this instance the construction parallels that which was used in the eastern arm of the 'Y' and it becomes a support for the floor joists which ran into the extension. Along both sides of this strip were nailers, and the segment of the masonry near the commissary was slotted to receive the northernmost joist in the corridor extension.

#1 Ordnance Store

The eastern arm of the corridor provided access to the #1 ordnance store (Fig. 5). This room was a truncated wedge-shaped space directly beneath the main entrance to the tower. It was assumed from the artifacts found that it was primarily used for the storage of shot. This assumption was based on the large number of grape shot found in the northern corner of the room.

The room prior to excavation was filled to a level of approximately 5 ft. with debris and it was the first room to be cleared. The reason for this was the need for a work space for the clearing of the remainder of the tower.
The stone floor conformed to that already described as did the interior face of the exterior wall. Again the floor joists were laid parallel on an east-west axis and, \( \frac{14}{14} \) joists were employed. This wooden floor (Fig. 8) and the floor inside the barracks store had suffered most from the effects of the elements. Both of these floors had been exposed to moisture which combined with the effects of the dung had brought about a severe state of deterioration. The remaining joists extended about halfway into the room and still retained some flooring. There were several planks of sub-flooring remaining and evidence of what might have been finished flooring. This was very fragmentary and no finishing nails for retaining such a floor were found. It may be that evidence which was construed as being finished flooring was nothing more than remnants of planking from the second level that had fallen onto the floor and adhered to that floor in the process of decay.

The joist support for the exterior wall has already been described and Figure 9 is a detail of the system used to support the joists that butted against the interior partition walls. This detail conforms to the system used throughout the interior of the tower on the ground level. In this instance the joists were inserted into slots in the stone masonry, but bore directly on a nailer which rested on a
ledge below them in the same masonry. The distance between the bottom of the joist and the stone floor below was approximately 11 in. The floor planks on the top of these joists were approximately 1 7/8 in. by 10 1/2 in., but this size was not consistent throughout the structure.

The door sill of the entrance to the #1 ordnance store was wooden and rested directly upon the stone masonry that formed the base of all the superstructure. In this case as can be seen in Figure 10 the floor joists rested on their wooden nailer, but above them another wooden member 4 in. by 6 1/4 in. had been inserted between the stonework and the brick partition. To this member the flooring was attached. Adjacent to the entrance of the room was the doorway to the #2 ordnance store.

#2 Ordnance Store

The number 2 ordnance store was a small brick vaulted room through which personnel had to pass to get to the magazine. In fact this was the only access to the magazine. Entrance was achieved through a door in the north partition wall of the room. The floor structure of this room was in better repair then in any of the other rooms in the tower. The floor joists were intact and in place and some of the flooring
still remained on the joists as seen in Figures 5 and 11. The brick partitions forming the walls for this ordnance room were 1 ft. 11 3/8 in. thick and the bricks were laid in the same manner as described previously. The air space below the joists was 9 1/2 in. The remaining flooring was laid on a north-south axis, and had a thickness that varied from 1 3/4 in. to 1 7/8 in. The widths and lengths of these planks varied.

The doorway to the room (Fig. 12 and 13) had a sill similar to that found in the #1 ordnance store in that on each side of the stone and mortar masonry sill were two wooden members that were recessed into the brick partition wall and to which the planking of the floor was attacked. When excavated the flooring was still in place on the sill and held there by bevelled iron straps.

The joists themselves were butted against the interior face of the exterior wall in the same manner as discussed under the general comments concerning the ground level. Their opposite ends were butted into the slotted interior partition as was the case in the #2 ordnance store. The distance between the joists ranged from 9 7/8 in. to 1 ft. 1 1/2 in.

The ceiling above this room was of arched brick construction, although most of it had collapsed. This was probably the
result of meltwater and rain leaching out the lime which bound the mortar between the bricks. This arch, which will be discussed in more detail later, curved from east to west in a direction opposite to the arch of the magazine, which was entirely intact. The door way to the magazine was in the west wall of this room.

The Powder Magazine

Because of the dangerous aspects of the powder magazine special attention was paid to its construction. The following description of its construction and usage is quoted here:

"It was entirely bricked over to protect the contents from the damaging influence of any dampness from the stonework. The brick across the ceiling reinforced the floor above and served as an added protection against shot which might otherwise crash through during an engagement. Along the walls air spaces were built to allow free circulation and lessen the danger of spontaneous combustion.

While these precautions were taken to prevent nature from causing damage, others
were taken to see that no harm should result from human carelessness. Metal nails, for example, in the boot soles coming into sharp contact with metal nails in the floor, might generate a spark which, in a magazine with a capacity for sixty-six barrels and seventy-four cases of gun-powder, would cause tremendous damage. Every man detailed to visit the room was therefore required to wear soft-soled shoes, and all floors and benches within it were laid down with wooden pegs. Metal was placed nowhere but on the outer side of the door and although this metal was copper sheeting which had not the same tendency as other metals to produce electricity through friction, it was heavily coated with insulating paint.

With lanterns burning in other parts of the building, and with metal in many places as well, it was imperative to exercise special care in putting powder in or taking it from the magazine. There was always the possibility of a small leakage, and a small draft, created even by a door opening or by
a person moving about, might be sufficient to blow loose particles into the main part of the building and into direct contact with flame and friction. To minimize danger the magazine was made almost foolproof. Anyone wishing to enter it had first to open an outer door leading from the corridor at the centre of the building, which he was obliged to shut behind him before going further. Opening next an inner door he not only gained access to the magazine proper, but also made the room temporarily larger by the area of the passageway between the inner and outer doors. The powder required was placed in this passage and the inner door was closed, after which the outer door was opened and the centre of the building reached. By the use of double doors the interior of the magazine was never in direct contact with the rest of the building. To give light an aperture about two feet square went through the magazine's brick wall about five feet from the floor to a closet off the corridor. This aperture was fitted with a movable pane of
glass, flush with the inner wall of the magazine, with a large sill behind it entirely cut off from the magazine. A burning lantern placed on the sill shone through the glass into the magazine without any risk of danger." (Lavell 1936: 171)

This account of the powder magazine (Fig. 5) was substantiated by the excavations of that room. It was impossible however to make any observations concerning the floor as this had been destroyed almost completely during a fire at some time in the past. The brick walls and the overhead vault were still intact and it was possible to locate the positions of the floor joists from the slots in the masonry (Fig. 14). Sorting through the ashes and the small amount of debris that remained in the room it may be assumed that the flooring was held in place by wooden pegs. This assumption was based more on negative evidence than anything else, because there were very few nails found on the stone floor and none that could be directly associated with the wooden flooring. As might be supposed this was also the only room in which no iron floor batten was found. As to there being no iron work in the room, it should be stated that the wall racks were held in place by iron wall anchors.
Lavell's description of the window arrangement was correct as well. As can be seen in Figures 15 and 16 these two windows were both inset in the magazine wall and they were glazed with double panes. Excavation of the window sills provided examples of the glass used which was cast plate glass $15/64$ in. thick. The window surrounds or framings were also sheathed in copper and the hardware was cast brass. Both windows were hinged on the corridor side, but the framing was screwed into place with copper screws on the magazine side. These windows were approximately 2 ft. square and they were set on granite sills.

The entrance to the magazine was also double-doored as described by Lavell, although the doors were missing. There were still remnants of the framing remaining and these too were copper sheathed. The distance between the two doors was only $22\ 3/8$ in. not giving a man much room to maneuver. The sill itself was composed of a mortar masonry core with two wooden members, one on each side of the sill. This sill which can be seen in Figures 17 and 18 was different from the other door sills in structure, but the structural significance of this difference is as yet unknown.

Barracks Store

This room lay to the east of the magazine and was identical
in plan to that of the #2 ordnance store. It had, however, been exposed to the elements to a greater extent, and the joists were in an extremely deteriorated state. These crumbled to the touch and a great deal of caution had to be exercised in the excavation of the room. Figures 5 and 19 present this room in plan form and as it was photographed after excavation. As can be seen the floor joist support system was the same as that found in the rest of the building.

The only access to this room was through a door in the northern partition wall. The sill in this instance still had remnants of flooring and the wooden sill members remained in place. It was constructed somewhat differently from that of the other sills in the building in that there was one wooden member down the centre of the sill and one on the room side of the sill. On either side of the sill were floor joists. This detail is illustrated in Figures 20 and 21. Also in place was the iron strap batten that held the flooring in position.

Commissariat Stores

Situated in the northwest quadrant of the tower was the commissariat stores. This room was basically wedge-shaped as was the #1 ordnance store with the exception of the
corridor extension which led to the barracks stores. This extension created a small alcove in the western corner of the room as can be seen in Figures 5, 22, and 23.

The joists and flooring which were relatively intact and in place had partially collapsed into the air space below. Like the #1 ordnance store this room had fourteen joists, and the nailer around the perimeter of the room, which was absent in the ordnance store, was still resting on its ledge. This nailer was spliced in several places with a simple scarf joint as is seen in Figure 24, and the joists were connected to the nailer with a half lap joint. The joists that ran through the small alcove did not continue into the corridor, but butted against the corridor's joists. These shorter joists measured approximately 5 ft. in length.

The sub-floor planking was still in place and there was some evidence of finish flooring on top of this. The iron batten was also in place.

Pantry

Built into the exterior wall of the commissariat store room was the feature 16H1K. This feature was first thought to have been a firebox or oven of some sort, but excavation
has almost eliminated this possibility. Currently, it is thought to have been some sort of storage facility such as a pantry for butter and meats, etc. The reasons for discarding the assumption that this was a firebox are several: first, what was thought to have a flue later proved to have been the drain from the latrine on the third level; second, there was no facilities for a grate or ash removal; third, the walls of the feature showed no evidence of carbon, and fourth, the majority of all food bones were found here.

This pantry, if such it was, is shown in Figures 25, 26, and 27, and the entire feature gives the impression of having been added at a later date. This can be seen in the quality and nature of the brickwork around the opening. The top of this opening was arched brick which continued to the rear of the pantry, however the side walls were poorly dressed limestone and the rear wall was a combination of this type of limestone and rubble. A 9 in. cast iron pipe from the latrines on the terrepleine passed through the pantry to the water approximately 15 ft. below. This pipe had been shattered at some time after the tower's abandonment, because no fecal or organic matter was found around the opening of the shattered pipe.
The Second Level

The second level (Fig. 2) was the main or barracks level of the tower, whereas the ground level was the storage level. This level had at one time contained the entrance foyer, the officer's quarters and the soldiers barracks. Also situated on this level were three windows for the placement of 32 pounder carronades, a boiler for heating water and a hand pump for bringing water up from below. Leading from this level on the southern side of the tower were the stairs to the third level.

At the time of excavation little remained of this level that could be recorded and for the most part the wooden floors had collapsed onto the ground level. The exceptions to this were the brick arch of the magazine which was still sound and a remnant of the brick arch that had once been the ceiling of the #2 ordnance store. The windows were still intact, but their floorings had suffered considerably from the effects of weathering. Only one of these was successfully excavated, it being the one nearest the entrance.
The Roof of the Magazine

This feature (Fig. 28) was the most important in terms of preservation, because the vault was still sound and much of the floor that had rested atop it remained.

The floor joists in this instance ran parallel to those on the ground level, i.e., in an east-west direction. These joists were not of the same dimensions as those found below and they had been hewn to fit the curvature of the vault. Another notable feature of the joists was that many of them had been drilled for 1 1/2 in. holes spaced about 7 1/2 in. apart. This spacing, however, was not consistent. The function these holes served was not determined, but it was reasonably certain that they were not drilled to hold pegs for retaining the floor. The extensive use of nails and the lack of any dowels precluded that assumption. The joists as can be seen in Figure 28 did not extend out over the barracks store or over the #2 ordinance store, but butted the separate joists that did. This arrangement was noted in two instances and was further substantiated by the occurrence of double nailers on each side of the magazine walls (Figs. 29, 30).

Atop the floor joists were remnants of the sub-flooring and some evidence to support the hypothesis that
this level had had a finished floor was found. Curved sections of the iron floor batten were also found in place along the perimeter of the wall.

The Officer's Quarters

The only other area of the second level that remained at least partially intact was that which had rested atop the brick vault above the #2 ordnance store. This vault differed from that of the magazine in that it curved in an opposite direction, i.e., east and west. In this case the floor joists were also cut to receive the curve of the vault and in those areas where the curve exceeded the thickness of the joist, brick pads were used beneath the unsupported portions of the joist (Fig. 31). This vault was in a very poor condition and a great deal of it had already collapsed into the room below. The support system is shown in Figure 32.

The officer's quarters was a wedge-shaped room in the fourth quadrant of the tower and centred on the first window east of the entrance. The exact location of this room could be ascertained by several features to be described below. First, four of the corner iron floor batten brackets were found in place. Figure 33 shows the two that lay on either side of the northern partition of the room. The other two
were found at their locations where the wall partitions neared the centre of the structure. Second, there still remained discolourations on the ceiling caused by the wall partitions and third, the position of the stove pipe hole. All of this confirms the officer's quarters layout as presented in Figure 2.

The points at which the joists butted the interior face of the exterior wall of the tower differed from those which were found on the ground level. In this instance the brick work was slotted to receive the joists. This circumstance occurred around the entire perimeter of the wall. A 5 7/8 in. ledge had also been cut in the central stone column to receive the joists which intersected it. The last three joists on the eastern side of the column were continuous, extending from the outer wall to the column. Because of the state of collapse and deterioration, it was impossible to determine this relationship on the western side of the column.

The room on the western side of the column, the barracks store, was not vaulted and all of the joists had collapsed down to the ground level. Since this room did not have a vault, it was difficult to determine the joist support system. It was assumed that the joists spanned the distance between the outer wall and the western wall of
the magazine and were supported only at their ends by the aforementioned walls. There was no evidence of a nailer or wooden load-bearing member anywhere along outer wall perimeter.

The rest of the floor that had constituted the soldier's barracks had collapsed to the ground floor. In some cases it was possible to attribute artifacts to this level, but these mostly fell into the realm of building hardware.

Second Level Windows

There were three windows on the second level and Figure 34 is a photograph of one of these prior to excavation. These windows were large enough to house a 32 pounder carronade and were closed with a double shutter arrangement. The outer shutter (Fig. 35) was made of sheet iron and hinged to the outer side of the tower wall, and each of the shutter leaves had a small rectangular opening in it. Behind this was another wooden shutter which opened inward. Most of these shutter leaves were present inside the tower, but for the most part the jams had become separated from the wall and had collapsed inward.

Only the first window east of the entrance was
excavated completely because the ground was frozen in the windows and excavation destroyed more structural data than it provided. Figure 36 is a diagram of this window and how the floor joists were laid. One notable feature of the second and fourth joists was that they had been cut and bevelled. The reason for this is unknown but these notches may bear some relation to the types of gun carriages used for the carronades. Attempts were made to excavate the other windows, but these attempts were discontinued when frozen debris was encountered. However, during these excavations no other floor joists were uncovered. There was also no evidence of flooring found in the window, but the iron floor batten found throughout the rest of the site was in place below the opening of the window. The interior of the window was faced with cut stones which were used to tie the window into the facing brick of the interior wall surface. The use of dressed masonry around doorways, windows and vents in the brick face of the interior of the exterior wall predominated throughout the structure.

**Boiler**

On the second level between the second and third windows was the tower's boiler and evidence of its firebox (Fig. 37).
This feature was cast iron and was described in the following manner by Lavell (1936: 174): "when required, the water was brought by a hand pump to the main floor where the cooking apparatus was situated. For a siege everything was designed to meet the most extreme conditions. Two huge cauldrons, set on top of a firebox, were placed in a recess in the stone-work, and the steam from the cauldrons was forced into pipes which entered the wall to be recondensed for further use." At this point Lavell was describing the towers in general, however, the Shoals Tower differed from this description in that it had only one cauldron. A large pipe did lead into the wall from this cauldron but no outlets were noted.

The Hand Pump

The niche for the hand pump was located immediately to the west of the entrance. The pump itself was absent, but the plumbing was still in place. It is uncertain from where the water for this pump came because the planned cistern shown on Figure 2 was apparently not built. It is possible that the pump connected directly to the river, but, again, this is conjecture.
Third Level Stairwell

This set of stairs was on the southern side of the tower at its thickest part, 15 ft. It exited between the southwestern and southeastern 32 pounders on the gun platform. The entrance on the second level did not have a hinged closure, but the exit on the third level did and this was held in place by a very large latch hook. The stairs were cut limestone.
The Third Level

The third level was the action level or gun platform. On this level on rotating barbette carriages were three 32 pounders overlooking the harbour. Covering the gun platform was a wooden roof that could be cleared away in time of action. This platform is currently covered by a wooden roof, but one that has been put up recently.

At the time of excavation the gun platform had already been cleaned of the dung that had covered it and of course, contained none of the other debris found in the lower levels. The only areas investigated on this level were the two latrines that were recessed into the southwestern parapet wall.

Latrines

The two latrines were located side by side and were identical in almost all respects. The fill in the latrine area was undifferentiated pigeon dung and no stratigraphy was apparent. The latrines were separated by a brick-filled wooden partition and the lumber used to cover the brick work was hand beaded. The toilets themselves were sunken below
the floor level of the gun platform and were approached by three steps that led down from that level. The toilets consisted of wooden seats placed above a cast iron bowl, (Fig. 38) that funnelled the waste into a central pipe that dropped to the water underneath the tower. This pipe was the same one mentioned under the discussion of the pantry. Fragments of the toilet seat for the southern-most toilet were found, but not for the other latrine. Both latrine openings had doors, although the door of the northern latrine had been torn from its hinges. The other door was in place and can been seen in Figure 39. This door was held closed by a thumb latch and had a small sliding wooden window cover over the window (Fig. 40). The doors themselves were curved to match the curvature of the parapet wall.
ARTIFACTS

The artifact collection from the tower was small and consisted mostly of iron building hardware. The ceramics, glass and miscellaneous groups of material were very poorly represented. The building hardware in the course of time had fallen down into the debris as the doors, window moldings and other wooden features had rotted and pulled away from the stone walls. The other large category of metal artifacts found was ordinance that had been left behind when the tower was abandoned.

Because the tower stood open to the public and the weather, and because of the undifferentiated stratigraphy, artifact counts were not considered pertinent. This was especially true of nails, because no systematic effort was made to collect all of the nails in the building. To have done so would have destroyed other important features such as the remaining flooring and aperture moldings. A sample of the different types of nails used was taken, however.

Although object counts were made it had been my intention to treat these artifacts in a qualitative sense rather than in a quantitative manner. This is the result of the feeling that the sample was not large enough or
representative enough to justify statistical treatment and that an attempt at such a treatment would not provide any more information than a qualitative description of the material.
Ceramics

The ceramic collection represented eleven vessels and none of these were very distinctive. All could be dated to the latter part of the 19th century or the early 20th century and they consisted of the following:

- Porcelain egg cups 2
- Stoneware beer bottle with the inscription "Fisher and Thorton, Kingston", near base 1
- Plain, widemouth, partially vitrified storage jar 1
- Plain, partially vitrified cup with wheat straw motif molded on rim 1
- Plain saucer same as cup 1
- Plain, partially vitrified saucer, no motif 1
- Small bowl, plain, partially vitrified 1
Small plate, white earthenware paste, no decoration 1

Black transfer printed cup 1

Tea pot lid with treacle glaze common to many New England potteries, e.g., Bennington 1

Small porcelain, Siamese cat figurine 1

Miniature plate, cup and saucer of porcelain from child’s tea set 3

Because of the small size of the collection it would be difficult to say that it represented garrison life. What was more likely was that it represented the people who lived in the tower after the garrison was removed and the tower abandoned by the military forces.
Pipes

The pipe fragments from the Market Shoal tower included only 12 stem fragments and one pipe bowl. Of the pieces that had identifiable marks all could be dated to the mid-19th century. Only three pipe stem fragments carried any indication of maker's marks and two of these were the mark of William Murray, Glasgow. Murray was known to have been making pipes in that city between the years 1833 and 1861 (Walker 1971: 25). The other pipe stem was marked Dixon, representing a pipe manufacturer in Montreal between the years 1847 and 1894 (Walker 1971: 25). Three of the stems had traces of green or yellow glaze around the mouthpieces, a practice which was popular during the 19th century, and another had a flattened tip or mouthpiece (Fig. 41). This effect was quite similar to the type of tip used on briar pipes which had become popular during the latter part of the 19th century (Walker 1971: 31). The only bowl found had its distinguishing characteristics marred and was unable to provide any clues as to its place or date of origin.
Coins

Only two coins were found. One of these coins is a copper half-penny and the other is a copper penny (Fig. 43 & 44), and both were minted by the Bank of Upper Canada in 1857. The Bank of Upper Canada was formed in Toronto in 1820 and in 1849 it became the government banker after the burning of the parliamentary buildings in Montreal. It was also given the privilege of issuing copper coins, but during the financial crises of 1867-68 its operations were suspended and it was unable to re-organize (Breton 1894: 116).
Buttons

Only six buttons were found in the excavation and five of these were white, felspathic buttons of the type found on shirts, etc. (Fig. 45). The sixth was a brass Canadian militia button (Fig. 47). Embossed on the face of this button is a crown over three field pieces with the words "Canada Militia" circled around the edge. On the reverse side of the button are stamped the words "Superior Quality" and the letters "P P B". All parts of the button including the face, back and eye are made of brass. The face is domed and folded around the edge of the back and the eye is a 'u' shaped loop riveted through the back of the button. This type of button, described by Emilio (1911: 161), was worn by the Canadian Militia, Army Artillery between the years 1890-96, but his description varies from that of the button found in that he noted the maker as being P. Tait Limerick.

Associated with the buttons were two button sticks or button cleaning guards (Fig. 46). These brass guards were slid between the tunic and the button to protect the tunic while the button was being cleaned. Both of the sticks are made of brass, but one is open ended while the other is closed. On one side of the open ended button stick is stamped the date 1811 and the other side bears the stamp of the
manufacturers. "Smith & Wright, Button Ornament Manufacturers, Contractors, Birmingham." The closed end button stick bears no manufacturer's stamp, just the stamped inscription "JVII." Button sticks were discontinued with the recent introduction of non-tarnish buttons.
Glass

The glass artifact collection was not much larger than that of the ceramics, numbering 16 pieces. Of these 16, three were liquor bottles, three were druggist bottles, two were beverage bottles, three were lighting devices and five were table glass. This object count was based upon identifiable fragments and does not necessarily represent whole objects.

Liquor Bottles

Of the three liquor bottles found, two were olive-green and had been turn molded and the other was made of a brown glass that carried stippling and part of an embossed design. The two olive-green bottles date from a post-1870 period (Toulouse 1969: 532). The brown stippled bottle looks to have been machine made (Jones, personal communication) and probably dates from the 20th century.

Beverage Bottles

Two aquamarine beverage bottles were recovered from the excavation, but one was very fragmented and all that could be determined about it was that it had been made in a two piece mold. The other (Fig. 48) was made for the American Bottling Company and used as a closure device the Hutchinson stopper. This stopper was patented in 1879 and discontinued.
in 1912 (Riley 1958: 97-98).

Druggist's Bottles

Three druggists bottles were recovered from the excavation. Two of these (Fig. 49) were complete and the third was represented by the neck and lip. All three of these bottles had the type of lip known as the "Prescription Lip" which was illustrated in the 1897 annual catalogue of Whithall, Tatum and Company (1897: 10). The two complete bottles were made by this company for W. D. Gordon and Company, Chemists, located on Princess Street, Kingston. This company appears in the Kingston City directory for the year of 1872, but does not reappear in succeeding years. One of these bottles was an 8 oz. Philadelphia Oval (Whitall, Tatum and Company, 1897: 15) and the other was a tall "French Square" of the same capacity (Whitall, Tatum & Co. 1897: 12). The Whitall Tatum and Company glass manufacturer, whose factories are located in Millville, N. J., developed in 1857 out of a series of ownership and partnership changes that began with James Lee in 1806. Begun as manufacturers of cylinder glass it is now the oldest continuous glassmaking plant in the United States (Toulouse 1971: 544-45).

Lighting Devices

This category included a lamp chimney, a font for an oil lamp and an oil lamp base with handle (Fig. 50). It was
uncertain as to whether or not these had come from the same lamp, but it was quite possible. The pressed glass lamp base was circular in shape and unadorned by any decorative motif.

Table Glass

This category included five different patterned pieces, all of which were pressed and date from the latter part of the 19th century. One such pattern was that of the "Bull's Eye Variant" produced in the 1850s and later in the 1870s. This particular piece (Fig. 51) was a goblet and closely fitted the description given by Lee (1960: 154-55). The metal of the glass was heavy and there were six bull's eyes tapering down into an hexagonal stem, but the stem itself was missing as was the foot. The bull's eye pattern was employed by the New England Glass Company and the Boston and Sandwich Glass Company and Lee (1960: 154-155) states that the variant style was illustrated in an undated catalogue of Bryce Bros., Pittsburgh, Pa.

The second heavy patterned piece was a small creamer with a flattened sawtooth design. This creamer closely resembled one illustrated by Lee (1960: 202) and is shown in Figure 52. This pattern was also produced from the late 1840s and early 1850s and was illustrated in an undated catalogue of George Duncan and Sons of Pittsburgh, Pa. (Lee 1960: 138).
The last glass object of the heavy pressed variety was a small bowl with ribbed sides. This bowl had what appeared to be a ground and polished pontil mark on the base and has not yet been identified (Fig. 53).

There were two other pressed glass pieces in the collection, but these were much lighter in weight than the aforementioned vessels. The first of these was represented by a small rim fragment that carried a section of a decorative motif on the interior surface. This was probably a lid to a sugar dish (Fig. 54) and the decorative motif was that of the "Cabbage Rose" (Lee 1960: 373-4). This pattern was popular in the late 1860s and one producer was the Central Glass Company in Wheeling, West Virginia.

Another vessel of light weight in pressed glass was a small honey or preserve dish measuring 3 1/2 inches in diameter (Fig. 55). This dish bore the "Bleeding Heart" pattern produced by the King Glass Company of Pittsburgh prior to its absorption into the United States Glass Company in 1891. The series bearing this motif was begun in the 1870s (Lee 1960: 399-400). All of these fragments were tested under ultraviolet light and found to contain no lead indicating that they were made after 1864 when soda glass began to replace lead glass (McKearin & McKearin 1948: 142).
Window Glass

The remaining glass that was found within the tower was that which had been used to glaze the windows of the magazine. This plate glass was found on the window sills and had a thickness of 15/64 in. It is not known where this glass was manufactured, but it was probably cast (Davis 1949: 168-70).
Metal Artifacts

The metal artifacts found constituted the bulk of the artifacts retrieved from the excavation and the majority of these items were building hardware in the form of nails and wall anchors. Metal artifacts were divided into functional groups; building hardware, ordnance, ordnance hardware, artillery tools and miscellaneous.

Building Hardware

Some mention of the manner and materials with which the tower was constructed have already been made. The major building materials used were limestone and brick. The floors were wooden and the flooring was held in place with wrought nails. These nails (Figure 56) were for the most part 4 in. or 6 in. in length with a chisel tip and a diamond shaped head. There were also 5, 4 1/2, 3 3/4 and 3 in. wrought nails used as well. There were also some cut nails in lengths of 6, 5, 4, and 3 1/4 in. found. The only use noted for these cut nails was in the construction of the wooden window and door moldings. There were also some wire nails found, but their number was very small and probably did not relate to the original tower construction.

Another type of nail found in the construction of the
tower was a copper tack 13/16 in. in length. These tacks were used to attach the copper sheathing to the door and window frames of the magazine.

Among the debris a large number of washer-headed bolts were found still retaining wood about their shanks. These bolts measured approximately 6 in. in length and had a shank diameter of 7/16 in. Although none of these bolts were found in situ their most probable use was that of binding together the laminated interior doors of the structure. The gap between the washered head and the nut on the threaded end measured 4 5/8 in. although this varied somewhat. An example of this type of bolt can be seen in Figure 57. Along with these bolts a number of threaded screws were found. These screws were used to attach the iron floor battens to the flooring or to attach closure hardware such as shutter fasteners to their moldings. All of the ones measured were 2 in. in length.

Another item found in large quantities and still in situ were wrought iron wall anchors. These wall anchors (Fig. 58) were approximately 7 in. in length and were used to retain uniform racks in position along the walls. Contrary to the statement made by Lavell concerning the use of non-ferrous metals in the magazine, these anchors were used to retain wall racks in that room.
Another item already discussed but used throughout the tower were iron straps to batten down the flooring. This batten shown in Figures 7 and 62 was made especially for this tower as demonstrated in the fitting of the various corners and angles of the building. Much of this material remained in situ and was left there for the Technical Services Branch to record. There were also a number of small door covering vents still in place within the tower and an example of these is shown in Figure 63. This particular door had fallen or been removed from its hinges and was found in the debris of the commissariat stores.

The hinges used to swing the closures in the structure were either cast iron, wrought iron or brass. The brass hinges (Fig. 64) were used on the doors and windows of the magazine. The wrought iron hinges varied in size from 2 ft. to 3 ft. strap hinges used to hang the larger doors, to the smaller T-shaped hinges used to hang the interior shutters on the second level windows. Very large pintles such as the type shown in Figure 58 were used for the major doors.

The above-mentioned types of building hardware constituted the bulk of that found within the building, although there were several miscellaneous items found. These included an iron ring, several iron and copper floor
grates, lock parts, two sliding bolts and a very corroded thumb latch. Thumb latch fixtures were used on the doors of the third level privies as seen in Figure 65 and were probably used on the other doors in the structure.

Ordnance

In the original proposal the Shoals Tower was designed to carry two 32 pounder smoothbore cannon and one 24 pounder smooth bore cannon on the gun platform and three 32 pounder carronades on the second level. This plan was changed and the tower was ultimately armed with three 32 pounder smooth bore cannon on dwarf traversing carriages on the gun platform. Although the carriages were stamped 1857, this was not the date that the tower was armed, but the date that the carriages were manufactured. They were shipped out to Kingston in 1859 and the first two guns were mounted in 1861. The third was installed in 1864. These three guns still remain on their carriages as installed.

The carronades which fired from the second level windows were installed even later. Records showing the installation of the first two appear in 1862 and the final carronade was installed in 1869. The mounting of all these guns was prompted by the Civil War in the United States.

The inventory of excavated ordnance was relatively
small, consisting of three 32 pound solid shot, 114 small-shot, 14 grape-shot platforms, and six iron discs. There was no small arms equipment found except for one trigger guard (Fig. 69).

The three cast iron solid shot weighed 31 lb. 7 oz. each. The grape-shot was also cast iron and weighed 2 lb. 12 oz. each and had a uniform diameter of 2 3/4 in. All of these smaller shot were found in the #1 ordnance store as were their spindles and bases. These shot still had fragments of canvas clinging to them and the platforms upon which the shot were stacked consisted of iron discs 7/16 in. thick with a diameter of 6 in. (Fig. 66). The spindles, forge welded to their centers, had a height of 8 in. and the shot was stacked upon these bases three high in rows of three, then wrapped in canvas and bound in place with rope. This type of shot was known as quilted grape-shot and nine of them plus the spindled iron disc weighed 30 lb. This shot is the same as that illustrated in Gooding (1965: 41). The iron discs mentioned above were also probably used to make a type of grape-shot. This type described by Manucy (1949: 69) consisted of iron shot set in tiers in a canvas sleeve and separated by iron discs. These discs were 7/16 in. thick and had a diameter of 5 in. There were also some fragments of tin sheeting found in close proximity to these shots which may indicate that tin canisters were also used to encase the shot. This
sheeting was too fragmented to determine this with certainty.

Ordnance Hardware

The hardware associated with the working of the guns was also sparsely represented, consisting of three cleats and one iron skid (Fig. 66) for a gun carriage.

Artillery Tools

One gunner's pick was found and it is illustrated in Figure 68. A ratchet lever or crank (Fig. 70) for elevating a 32 pounder cannon was also found.

Miscellaneous Metal Artifacts

This category consisted of a mason's chisel, a pulley wheel, and some stove parts. Also included in this inventory was an 8 oz. nesting weight (Fig. 72) for an equal arm balance with the inscription "Canada" on the back. Below this was a crown over the letters 'VR' over an 'A'. Two lateen spoons were also recovered, as well as one padlock and lock escutcheon (Fig. 73 and 74). Some cast ornamental iron grill work (Fig. 75) was found, but not enough to determine the pattern employed.
Wooden Artifacts

The wooden artifacts consisted mostly of door and window framing and moldings. The objects included in this collection do not represent any sort of statistical sample of the material available for much of it was left in place for future study. Samples of these moldings, floor joists and flooring, etc. were brought back to Ottawa for analysis toward species identification. Currently, it is believed that most of the wood used in the construction of the tower was oak.

Two other objects which, perhaps, should be described under Artillery Tools, recovered were a wooden quoin (Fig. 70) used of elevating a 32 pounder cannon or carronade and a wooden capstan for a 32 pounder gun carriage (Fig. 67). Stamped on the end of the quoin was the inscription "32PR W D." (Fig. 71).

Uniform Racks

Aside from the flooring and window moldings the other major use of wood in the tower was in the construction of uniform racks that lined the walls of all of the rooms. These were held in place by the wall anchors described under metal artifacts, accounting for such a large number of those
items. These racks consisted of planks attached to the walls into which were inserted spindles of the type shown in Figure 76. Most of these spindles had rotted at their bases and had collapsed into the debris that filled the tower. All of this woodwork was painted grey.

**Miscellaneous Wooden Artifacts**

These consisted of one black checker and several pieces of wooden dowel used as uniform hangers or racks.

**Bone Artifacts**

There were only three bone handled utensils found in the excavation, a three pronged fork and a knife and a toothbrush handle (Fig. 77). This toothbrush handle was marked N. C. POISON - Kingston. There was also a small bone playing die found (Fig. 78). The rest of the bone consisted of food bones with butcher marks and some skeletal material from small animals that must have gotten into the tower and died there. No analysis has yet been done on this material.

**Leather Artifacts**

**Shoes**

Leather shoes were found in the #2 ordnance store and in the area of the commissariat store. Only one shoe was found in this latter area, but the total possible number of shoes found were five. This figure is based on the
differing types of shoe parts found.

Vamps

There were three vamps found in the #2 ordnance store and all three had been joined to the lower parts of the shoe by use of the MacKay process of stitching patented in 1862 (Anderson 1968: 59). One of these vamps actually had the vamp and quarters combined into one piece joined at the heel, and the quarters were eyed for laces (Fig. 79). The shape of all three vamps was that of a rounded toe.

Quarters

There was only one quarter found and this had been attached to the sole by stitching and had been eyed for laces. This quarter probably belonged to one of the vamps mentioned above.

Outsoles

There were two blunt-toed outsoles (Fig. 80) found in this room as well, but manufacturing processes indicate that they were not the same pair. One of these outsoles had been fastened to the uppers by the MacKay process mentioned above with the aid of a screw machine and the other outsole exhibited the Goodyear Welt process which was patented in 1875 (Anderson 1968: 61).

Two other outsoles found in this room and belonging to a pair were also manufactured with the Goodyear Welt
process. In this case the soles had been turned before the uppers were sewn in place and the heels were attached with wooden pegs. These two shoes postdate 1875. There were also two insoles and one heel lift from this area and they dated from the same period and probably belonged to the same shoes.

Aside from these the only other significant shoe parts found were in the commissariat stores. These parts were all fragments of one shoe and included the vamp and outsole. The entire shoe was held together with wooden pegs indicating an earlier date than those shoes mentioned above. After 1846 with Elias Howe Jr's patenting of a sewing machine designed to attach the uppers to the lowers by stitching, the peg method of fastening the uppers to the lowers was rapidly supplanted, indicating that this shoe was probably manufactured shortly after that date. This may have been the oldest shoe found in the excavation.

As a final statement to this section on artifacts, it would appear that most of the material found within the tower was deposited there during the last part of the 19th century. Most of this material dated from 1860 to 1890 with a few artifacts both earlier and later. This arrangement would be expected given the active life span of the tower and the personnel concentration which was at its highest during the 1860s. The structural artifacts can
be dated with some sort of surety to the early period of the tower, i.e., 1847-49 with the exception of the ordinance which was installed in the 1860s. The major importance of these artifacts lies in the information they can convey concerning the structure itself and its periods of activity rather than in presenting a representation of the quality of life of the persons that occupied the tower.
CONCLUSIONS

This report has so far dealt with the structural elements of the tower and its physical presence, but nothing has been said concerning its effectiveness and the general effectiveness of the fortifications surrounding Kingston Harbour. Lavell describes them in his article as being highly effective and they may have been at an earlier time against smooth-bore cannon and wooden sailing ships. However, by the time they were armed in the 1860s, smoothbore cannon were definitely obsolete and being rapidly replaced by rifled guns, and sails were being replaced by steam. Lavell bases his argument on the fact that while a ship running down the channel to Kingston would have an easy time of it, it would be very difficult for that same ship to tack back up the channel against the prevailing southwesterly wind. He overlooks the fact that this would present little problem to a steam vessel attacking from that direction. Another factor overlooked by both the builders of the towers and Lavell was the development of rifled guns. In 1846 both an Italian and a German had successfully rifled cannon and in 1855 Lord Armstrong of England developed an iron breech loading rifled cannon whose design was considered revolutionary.
At the same time, arms manufacturers in the United States were developing rifled cannon and this development was to be very fast paced with the coming of the war between the States (Manucy 1949: 14). By 1863 the Union Artillery had 100, 200 and 300 pounder Parrott Rifles which were used to reduce Fort Sumter, South Carolina, to rubble from a distance of two miles. Siege guns of this type set up on Garden Island or the most northerly tip of Wolfe Island could have done the same to the defenses around Kingston.

Studies were carried out under field trial conditions by the Royal Artillery in 1860 to determine the Martello Tower's ability to withstand rifled fire (Bourgoyne 1861: 1-9). The guns employed were of the type developed by Armstrong. These trials demonstrated the effectiveness of rifled ordinance at distances for greater than those previously employed by smoothbore cannon. The tower in this instance was reduced to a brick pile after 152 rounds. Another tower besieged under similar conditions of range, etc., but by smoothbore cannon, was deemed a failure.

In conclusion it must be stated that the effectiveness of the tower against the weaponry of the day was nil. However, the towers and accompanying fortifications did offer some psychological comfort to the inhabitants of
Kingston and they would have probably been effective as a rearguard defense, allowing the inhabitants to escape to the north and Ottawa if the need ever arose.
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Figure 5. Ground level plan of tower (16H-73-102-23).
Appendix: Archaeological Operations Used At Market Shoals Tower

16H1 Ground level or storage level
   A. Corridor
   B. #1 ordnance store
   C. #2 ordnance store
   D. Powder magazine
   E. Barracks store
   F. Commissariat store
   G. Stairwell
   H. Eastern magazine window
   J. Western magazine window
   K. Pantry

16H2 Second level or barracks level
   A. Floor atop powder magazine
   B. First window east of entrance
   C. Second window east of entrance
   D. Third window east of entrance
   E. Boiler between windows #2 and #3
   F. Barracks floor above commissariat store
   G. Entrance
   H. Floor above #2 ordnance store
   J. Floor above barracks store

16H3 Gun platform or terrepleine
   A. Northern latrine
   B. Southern latrine
Figure 6. Cross-section of exterior wall with floor joist ledge, detail A (16H-73-102-3).
Figure 7. Cross-section of iron floor batten with nail,
(16H-73-102-10).
Figure 8. Remnants of the flooring in the #1 ordnance store. It is possible to discern in this photograph fragmentary evidence of finished flooring. The camera is facing down and to the south.
Figure 9. Cross-section of the interior brick partition wall footing and floor joist slot, detail B. (16H-73-102-5).
Figure 10. Cross-section of doorway between corridor and #1 ordnance store, detailed (16H-73-102-15).
Figure 11. #2 ordnance store as excavated. Joists are still in place and two pieces of the iron floor batten can still be seen along wall. The nails in the tops of the floor joists are wrought and were used to fasten down the flooring. The camera is facing north-east and the scale is 2 ft. in length. 16H-172M.
Figure 12. Cross-section of doorway between #1 ordnance store and #2 ordnance store detail D-D. (16H-73-102-12).
Figure 13. Door sill of #2 ordnance store as excavated. View is from the north looking into the #2 ordnance store. Note the notches in the brick work for the door frame. 16H-152M.
Figure 14. Plan view of the doorway between the #1 Ordnance Store and the #2 Ordnance Store. (16H-73-102-21).
Figure 15. Eastern window of magazine taken from the north. Note the hinges and depth of casement. Window hinged outward toward viewer. 16H-95M.

Figure 16. Western window of magazine taken from north or corridor side of window. 16H-98M.
Figure 17. Cross-section of the doorway between the powder magazine and the #2 ordnance store detail E-E, illustrating double door sill arrangement. (16H-73-102-14).
Stone tower base

Joist slot

Door sill

Brick partition

Floor joist

nailer

0 1 Ft.
Figure 18. Powder magazine door sill as excavated. View is from the powder magazine or the west. Note slot in sill and double framing on door. 16H-155M.
Figure 19. Barracks store floor as excavated. View is from above and the east. Note the deteriorated state of the joists in this room. Leaning against the wall is a section of the iron floor batten that had fallen from the room above. The small stone faced opening is a blocked up air vent and the scale equals 2 ft. 16H-210M.
Figure 20. Cross-section of the doorway between the barracks store and the corridor detail F-F. (16H-73-102-19).
Brick partition
Flooring

Door jamb
Door sill
Door sill
Joist

Stone tower base

Drain or slot running through wall from barracks stores to corridor.

0 1 Ft.
Figure 21. Door sill of barracks store as excavated. View from the north or the corridor side of the door. Note the differences of construction in this sill and the others in the tower. The masonry in this sill is molded to receive two horizontal members, one in the middle of the sill and the other on the barracks store side of the sill. The doorway to the magazine is also slotted for two horizontal members but on both sides of the sill and these are part of the double door framing. The doorway into the #2 ordnance store is not slotted for horizontal members and the flooring was attached to the two floor joists in the adjacent rooms. 16H-259M.
Figure 22. Commissariat as excavated. View is from the south showing the flooring and a joist that had collapsed into the air space below the ground floor. 16H-195M.

Figure 23. Alcove in commissariat as excavated. View is from the south. 16H-193M.
Figure 24. Detail of scarf joint in perimeter nailer in the Commissariat Stores. 16H-73-102-1.
Scarf joint

Top View

Wooden nailer

Side View

0   1 Ft.
Scale
Figure 25. Pre-excavation view of pantry (16H1K) from east. The pantry and commissariat store outside were both filled with debris to a depth of 3-4 ft. 16H-9M.
Figure 26. View of pantry (16H1K) after excavation from the east. Note the bonding or lack of it in the brick work around the aperture of the pantry. 16H-197M.

Figure 27. Interior of pantry after excavation. Note top of cast iron latrine pipe between scale and photoboard. 16H-232.
Figure 28. Plan of magazine roof showing floor joist arrangement and existing flooring. (16H-73-102-22).
Figure 29. Cross-section of the top of the partition wall illustrating the double nailer arrangement for the floor joists of the magazine roof floor and the floor of the room above the #2 ordnance stores, detail G. (16H-73-102-18).
Figure 30. Double nailer arrangement on roof of magazine. Small fragment of wooden nailer was found beneath joist in upper right-hand corner of photograph. The scale equals 2 ft. and the camera is facing in an easterly direction. 16H-132M.

Figure 31. Vault above #2 ordnance store as excavated. View is from the south. Note how joists are supported by brick pads and cut to fit the curvature of the vault. The direction the camera is facing is north and the scale equals 2 ft. 16H-190M.
Figure 33. Iron floor batten corner brackets. The northern partition wall of the officer's quarters separated these two brackets. View is from the west.
16H-100M.
Figure 34. Second level window, 16H2B, after excavation. Window opening is surrounded by wooden frame, much of which had fallen away from window. Horizontal beams on floor are joist for 32 pounder carronade platform. Camera is facing east. 16H-184M.

Figure 35. Exterior shutters of second level window 16H2B. Camera is facing south west. 16H-34M.
Figure 36. Plan of second level window, 16H2B, after excavation. Note the manner in which two of the floor joists were bevelled. 16H-73-102-6.
Figure 37. Boiler, 16H2E, on second level prior to excavation. View is from the east. The boiler was the cast iron pot shown. Beneath it was the firebox which had fallen into the room below. Above the pot was an iron pipe which fed water into the boiler. 16H-3M.
Figure 38. Latrine bowl in third level latrine 16H3A. Bowl was of cast iron and was reached by walking down three steps. View is from the east. 16H-219M.

Figure 39. Door to latrine 16H3B. Doors were curved to conform to the curvature of the parapet wall. View from the east. 16H-217M.
Figure 40. Rear view of the latrine door illustrating door lock, thumb latch and small sliding door at top of door. Below the lock was a sliding bolt. Lumber in door is hand beaded. View is from the west. 16H-222M.
Figure 41. Clay pipes excavated from the Shoals Tower.
Pipe bowl—(16H1F2)
Stems Top to Bottom—(16H1E1)
(16H2A1)
(16H2A1)
Photograph catalogue number RA-1386B

Figure 42. Marred maker's mark on the side of pipe bowl 16H1F2. Photograph catalogue number RA-3464M.
Figure 43. Obverse and converse sides of 1857 Canadian Half Penny (16H2D1). Photographic catalogue numbers RA-3473M and RA-3474M.
Figure 44. Obverse and converse sides of 1857 Canadian Penny (16H1F1). Photographic catalogue numbers RA-3463M and RA-3475M.
Figure 45. Five white felspathic buttons (16H2B1). Photographic catalogue number RA-1370B.

Figure 46. British Army button "sticks" used as guards to prevent cleaning agent from getting on uniforms. Top stick (16H1E1), bottom stick (16H1F2). Photographic catalogue number RA-1386B.
Figure 47. Converse and obverse sides of Canada militia button (16H1F2) used by the Canada militia during the mid-1890s. Photographic catalogue numbers RA-3471M and RA-3472M.
Figure 48. Beverage bottle of aquamarine glass (16H1Fl) employing Hutchinson stopper made for American Bottling Company. Photographic catalogue number RA-1385B.

Figure 49. Two druggist bottles made by Whitall, Tatum & Co. for W. D. Gordon, Chemist, Princess Street, Kingston. The bottle on the left is a "French Square" and the bottle on the right is a "Philadelphia Oval". Both are from the same provenience, 16H1Fl. Photographic catalogue number RA-1384B.
Figure 50. Font (16H1F2) and base (16H1F2) from an oil lamp. These came from the same provenience and may be from the same lamp. Photographic catalogue number RA-1390B.

Figure 51. Goblet (16H2E1) of pressed glass with "Bulls Eye Variant" design. Photographic catalogue number RA-1391B.
Figure 52. Small pressed glass creamer (16H2E1) with flattened saw-toothed design. Photographic catalogue number RA-1392B.

Figure 53. Pressed glass tumbler (16H1K1) with ground and polished pontil mark on base. Photographic catalogue number RA-3470M.
Figure 54. Pressed glass sugar bowl lid (16H1P2) with "Cabbage Rose" design. Photographic catalogue number RA-1389B.

Figure 55. Small pressed glass honey or preserve dish (16H1K1) with a "Bleeding Heart" design. Photographic catalogue number RA-1388B.
Figure 56. Various sized nails used in the woodwork of the tower. Photographic catalogue number RA-3480M.

Figure 57. The bolt at the top has been described as a bateau bolt (16H2F1) while the bolt at the bottom (16H1E1) was used to bind together the laminated wooden doors that were used in the interior passageways of the tower. Photographic catalogue number RA-3469M.
Figure 58. Wrought iron wall anchors (16H1Z1) used throughout the building to fasten equipment and uniform hangers to the brick walls of the tower. Photographic catalogue number RA-3476M.

Figure 59. Pintle (16H2G1) used on the first set of wooden doors just inside the main entrance way of the tower. The outside doors to the tower were sheet iron and their pintles were fixed in the mortar of the building. Photographic catalogue number RA-3485M.
Figure 60. Wooden bolt receiver (16H1E1) on left and door latch part on right (16H1D1). Photographic catalogue number RA-1372B.

Figure 61. Copper grate (16H1Z1). Use and location where found uncertain. Photographic catalogue number RA-1369B.
Figure 62. Sections of iron floor batten. The top two were cast to fit into the corners of the commissariat while the third piece is just a short piece of straight stock. All are from the same provenience, 16H1F1. Photographic catalogue number RA-3478M.

Figure 63. A hasp (16H1F1) used on one of the interior doors and a small vent door used in the barracks stores (16H1E1). Photographic catalogue number RA-1371B.
Figure 64. Copper window hinge from powder magazine window. View from the north. 16H-91M.

Figure 65. Thumb latch, door lock and sliding bolt used to secure the latrine door on latrine 16H3B. 16H-228M.
Figure 66. Spindle, plate and shot (16H1B2) from the #1 ordinance room. This shot was used to make quilted grape shot and the remnants of canvas can still be seen clinging to the shot. Photographic catalogue number RA-1377B.

Figure 67. Gun carriage skid (16H1Z1) and wooden capstan for gun carriage or a tampon for the mouth of a cannon (16H1F2). Photographic catalogue number RA-1374B.
Figure 68. Gunner's pick (16H1Z1). This tool was used by the gunner to clear the vent hole and puncture the powder bag. Photographic catalogue number RA-1378B.

Figure 69. Trigger guard (16H1F2) from some type of small arms. Photographic catalogue number RA-3468M.
Figure 70. Wooden quoin or wedge (16H1Fl) and wrought iron crank (16H1Z1) used for elevating a 32 pounder cannon or carronade. Photographic catalogue number RA-1373B.

Figure 71. Base of wooden quoin (16H1Fl) with the stamped inscription "32 P^R WAD". The arrow separating the W from the D is the mark of the British Quartermaster Stores. Photographic catalogue number RA-1376B.
Figure 72. Obverse and converse sides of an eight oz. brass scale weight (16H2B1). Photographic catalogue number RA-3466M.
Figure 73. Brass lock escutcheon from the commissariat (16H1F1). Photographic catalogue number RA-3465M.

Figure 74. Iron padlock (16H1B1) with brass escutcheon plate. Photographic catalogue number RA-1380B.
Figure 75. Fragments of cast iron grill work (16H1F1).
Not enough of this grill was found to determine the complete pattern and its use is not known either. Photographic catalogue number RA-3481M.

Figure 76 Wooden uniform or equipment hangers (16H1Z1).
Although the provenience for these particular specimens is unknown it is certain that they were used in all rooms of the tower including the magazine. Photographic catalogue number RA-3483M.
Figure 77. Bone toothbrush handle (16H1F2) with the words "N. C. Poison Kingston" stamped into the handle. Photographic catalogue number RA-1387B.

Figure 78. Bone playing die (16H1F2). Photographic catalogue number RA-3633 M.
Figure 79. Shoe vamps (16H1C1) from the #2 ordnance store. The vamp on the left has the letters "I.F." stamped into the leather. Photographic catalogue number RA-1381B.

Figure 80. Shoe soles (16H1C1) from the #2 ordnance store. Top two outsoles were attached to the uppers of vamps by the Goodyear Welt process and the bottom outsole was fastened by the MacKay process. Photographic catalogue number RA-1382B.