FINAL WORKING DRAFT FOR REVIEW AND APPROVAL

BASIC SPOKEN 'WORKING' TOUR GUIDELINES

For Tour Guides and Docents

HISTORIC WILLIAMSVILLE WATER MILLS

Early 19th Century Grist Mill

[**Nominal Age Range: 5 to 12**]

This narrative is intended to be read and learned along with the scripted form. Although it has been written for children ages 5 to 12, the guide must be prepared to improvise, based upon the actual age range of a particular tour group - from pre-school children up to adults - and the nature of the questions asked.

To do this effectively, the guide must learn the material in the recommended reference sheets and the books and pamphlets on milling and local history.

TRANSITION

Good Morning, girls and boys.

Welcome to historic *Williamsville Water Mills*.

My name is Donald Beman, and I will be your guide today for an exciting journey back in time - a journey that will take us back *one hundred and eighty-five years* - when we pass through *that* portal behind us, and enter the grist mill built by Jonas Williams in the year 1811 here on the banks of the Eleven Mile Creek, which today we call Ellicott Creek.

When I was in school, I read that history is made up from the hopes and the dreams of those people who lived before us, and that the things we inherit from them - *like this wonderful old water mill* - must be cared for with love and tenderness, and a gentle hand, as if it was a newborn baby, so that they can live and continue to grow. If that's true, and I believe it is, then *our* hopes and dreams, yours and mine, and what *we* do today, will someday become the history for others to inherit and care for.

This is one of the reasons we care for the water mill that Jonas Williams built long ago: So that you, and someday *your* children - and everyone, young and old - can share in the hopes and dreams from the past, and learn about life in an old mill.

TRANSITION

The Ellicott Creek, which is just on the other side of the mill, is one of the reasons that Jonas Williams built his mill here, and not in downtown Buffalo, or East Aurora, or in North Tonawanda somewhere. The fast running creek, and the waterfall, provided the energy he needed to turn a water wheel, which turned the millstones inside the mill to grind the grains grown by the farmers - such as wheat and corn and buckwheat, and rye - into meal and flour so that we could make good things to eat, things such as cereals and breads.

On the porch behind me you can see an old millstone, one which we *retired* after many years of hard work, day after day, grinding grains into flour for the people of Williamsville, and the Town of Amherst, and Buffalo, and people in the towns and

villages all around western New York - and further west, where grist mills hadn't been built yet by men like Jonas Williams.

The other reason Jonas Williams chose to build here is that he was close to a very important highway. But not a highway as we know them today. It was an unpaved and bumpy dirt road called the *Great Iroquois Trail*, perhaps twenty feet wide, which was cleared through the forests and over the fields by the Seneca Indians. The Great Iroquois Trail served as a very important road for the Indian tribes on the Iroquois Confederacy - the Seneca, Huron, Oneida, Onondaga, and Mohawk - and for settlers traveling west in their wagons across the territory which would someday become New York State. The settlers came from places such as Massachusetts and Rhode Island and Connecticut and Vermont and, of course, from the busy seaport of New York, on their way to a new life on the American frontier, which in 1811 was here in western New York, on the shores of Lake Erie.

And it's that road - *up there on the hill behind you* - the road you probably traveled on at one point in your journey to get here today. We now call the Great Iroquois Trail, Main Street, or State Highway 5. Or 100 years ago the *Buffalo-Batavia Road*.
It runs from Pennsylvania on our western border, all across New York State - 400 miles! - to Massachusetts on our eastern border.

So with fast running water, fertile fields for farmers to clear and grow grains, and a road for wagons to travel on and ship the meal and flour to customers, and the hard working people living around the creek, Jonas Williams had everything he needed to build and operate a successful grist mill in the year 1811, in the small community which soon became known as - *Williams Mills*.

And I bet you've already guessed by now that our village, *Williamsville*, was named after Jonas Williams. This honor was given to Jonas not just because he built a grist mill here, but because of the many things that he did to organize and develop, and most importantly

serve all of the people who had settled here in the wilderness of western New York less than 30 years after the end of the Revolutionary War, the war which earned us our freedom and independence from England. And he stayed here through the War of 1812, helping to rebuild the City of Buffalo.

TRANSITION

Williamsville Water Mills is a grist mill.

A grist mill is a place where dried grains such as wheat, oats, rye, barley or corn are ground into meal and flour - using millstones like the one on the porch behind me - to make cereals and breads, and many other things to eat - and even some things to drink! - all of which we will learn about inside the mill.

Our word grist comes from the old Middle English word ***gruen***, which means to *grind*. Other things can be ground in a grist mill besides grain - some rather curious things - such as cement and fertilizer. Even gunpowder! At one time here at our mill, we made a special kind of cement called - *hydraulic cement* - which was used to help build the locks for the Erie

Canal. We also made fertilizer for the farmers, which was spread on the fields to help the wheat and the corn, and the vegetables, grow bigger and stronger. But of course we didn't grind the cement or the fertilizer at the same time we were grinding flour - heavens no!

As with many of the grist mills built in the American colonies, and many of the mills in Europe, our mill used the energy from fast moving and falling water to turn a water wheel, which then turned a pair of large stones shaped like big fat wheels, or truck tires, wheels which we call *millstones* - like the one on the porch - to grind the hard dried grains grown by the farmers into meal and flour.

However, water mills - with a water wheel turning the heavy millstones - weren't the only kind of grist mills. *Windmills*, which I'm sure you've all seen pictures of, were also used to turn the millstones. As a matter of fact, windmills were the only kind of grist mills in many countries in Europe, and also parts of Asia, where arid land gave farmers little running water

to turn water wheels. One country in northern Europe is famous today for their windmills, Holland, a small country which didn't have fast running streams, because it didn't have mountains for water to come rushing down from. And it didn't have waterfalls, like we do here in Williamsville with the Ellicott Creek, because the land there is flat and below the level of the sea.

But even without the running water, the Dutch, which is what the people of Holland are called, milled the finest flour in Europe, and more of it then anyone else, to become known as the *'millers to the world'*. And they only used windmills to do it.

The people who taught the Dutch to become millers, and how to make such fine flour were the Romans, who were the largest millers of wheat and grain for almost four hundred years

Many people don't know this, but windmills were also popular here in America. At first they were built along the seacoast near Boston and on Cape Cod and Rhode Island. Then they were put up on Long Island, which sticks out into the Atlantic Ocean from New York

City. These windmills captured the energy from the wind blowing in from the Atlantic Ocean to turn the large vanes, or propellers, on the windmills, which then turned the millstones and ground the grain.

Windmills were later built in other parts of America, in places such as Michigan and Illinois, and the flat lands of the Midwest, in Kansas and Texas, because wind was more plentiful there than fast running water in creeks, or waterfalls. There was even a place called *Little Holland*, which was built by a group of hardy Dutch settlers 150 years ago on the windy shores of Lake Michigan. And the city of Holland Michigan is still there today, with old windmills everywhere. And lots of tulips!

We should remember that most of what we know today about milling and turning grains into meal and flour, we learned from the very first people who settled here in the New World, men and women from countries such as England and Holland, and soon after that from France and Germany. These settlers brought with them their own millstones since they didn't know what they would

find here. They also brought the many words we now use to describe grist mills and milling. During the tour of our water mill, we will learn about other words that came from milling, but which we use today to describe other things ... things such as money!

So, if we're all ready, let's start on our journey back in time. Follow me.

TRANSITION

Before we enter the portal back in time, let's stop for a minute or two and look at this wonderful old millstone. It weighs more than *two thousand five hundred pounds*, which is what some cars weigh, and about what *forty* of you boys and girls would weigh if we scrunched you all together into a small circle the size of that millstone and put you on a scale!

Go ahead, it's OK to touch it. As a mater of fact, it's actually considered good luck to touch the face of an old millstone. For centuries, tired old millstones, or sections of them, were used for entrance steps to houses, because it was believed that they would bring good luck to all those who entered the house. For this

same reason, sections of millstones were sometimes used as headstones on graves. Then there's the belief that the luck you get from rubbing the face of an old millstone will keep the person you marry from ever becoming a *'millstone around your neck'*, which means that you will have a loving husband or wife, healthy children, and a happy married life.

While you're touching the millstone look closely and you will see thin seams of a special kind of mortar - mortar is a type of glue we use to stick stones and bricks together. Using this special mortar, the smaller stones were glued together to make this large round millstone. This iron belt was then wrapped around the stones to keep them from coming apart when the millstone was tipped over onto its face and turned around and around to grind the grains. The belt is like the iron hoop on a wagon wheel that holds the spokes and rim of the wheel together.

This very millstone was one of a pair of millstones that worked together as team to grind the hard dried grains into meal and flour. This millstone is called

the *runner* stone, because it *runs* - or turns around and around - when its lying flat and face down on top of the other millstone. That other stone, which is still inside, in our gift shop - but not for sale! - is called the ***bedstone***, because it lies perfectly still and doesn't move, while the runner stone turns on top of it, but never touches it. And the rusty iron bar you see inside the hole in the center of the millstone - the *eye of the stone* - is used to hold up the runner stone, while it turns around and around over the bedstone, slowly grinding the grain.

And feel the rough grooves and tiny crevices that have been chiseled and scratched into the stone. And the smooth surfaces too. And remember them, because they each have a special job to do in grinding the grains. And we'll see exactly what those jobs are when we're inside the mill and using another millstone, a baby millstone, to actually grind grain into meal and flour with our own hands.

OK, now that we're all filled with good luck, let's slip through that portal of time and enter Jonas

Williams' grist meal. And be sure to duck down when you follow me through the portal, especially the adults, I don't want anyone to bump their head on today, and not be able to come with us back to yesterday! That's it. Come on! Everyone duck way down and follow me.

TRANSITION

Did we all make through the portal?

Adults too?

Great!

As we walk back to the milling area look at all of the bags and sacks around us, and smell the air. The sacks are filled with food; bird food and dog food and cat food, which are all grains - or seeds, which is what grains are - grains of one type or another. Some sacks have just one kind of grain in them, but most of the sacks are filled with mixtures of different types of grains to give the animals a balanced diet, much the same way we mix different types of foods - such as breads and fruits and milk and vegetables and meats and fish - for a balanced diet.

Here we are! Where a master miller and his helpers, or *apprentices* - boys who were learning to become millers - labored to make flour 185 years ago. And in this very room, walking on this floor, which has a rich *patina*, or soft brown finish, which is from the flour dust and the oils from the grains that have been spilled onto the floor and ground into the wooden planks for nearly two hundred years now, making them smooth and shiny.

The word *miller* is another Old English word. It comes from the word ***mylen***, which means to *'fight with the fists'*. Sort of grinding and mixing things up so to speak!

Being a miller was a very important job in the community. As a matter of fact, there are some very famous people in our nations history who were millers. Two of them went on to become presidents of our country: George Washington, who made one of the finest white flours in the colonies, was one of them; while Abraham Lincoln was another; and then there was Davy Crockett who, after a life as a famous frontiersman,

and serving as a congressman in Washington, DC, built a grist mill on a river and settled down with his family. But not for long, for he would quickly grow tired of such a quiet life and head west - to his destiny - and his death in the battle of the Alamo, in Texas.

What many people don't know about our mill is that we've been operating as a mill, without stopping, ever since we first started, 185 years ago. We're actually the longest *continuously operated business in western New York*. This means that we haven't ever been closed or out of business, or stopped milling, whether it was grinding grains or cement, or making fertilizer, in all those years, right up to today.

We're also honored to be on the National and State Registers of Historic Places. This is a very special list of the buildings and places from our nation's past that are still with us today, because people loved them and cared for them, buildings that our government believes should be preserved and protected for future generations; because it's our heritage - our history as a nation.

TRANSITION

The grains were milled right here, and they're still being milled here even today. The millstones, which do all of the grinding, are inside this ***tun***, which is also known as a *stone case*. Spelled *T U N*, tun is another one of the words brought to the New World by the early settlers. The word *tun* comes from the Old English, and means a large cask or barrel or vat.

On top of the tun stands the *horse*, and riding on the back of the horse is the *hopper*, which is used to hold the grain as it's being fed down through this chute up here from the bins, or storage boxes, upstairs. The hopper feeds the grain into the *shoe*, right here, which then slowly drops the grain down into the eye of the stone. Remember the hole we saw outside in the center of the millstone on the porch? The grain is then spread out between the two millstones and ground into meal or flour.

Here, come look. That's it, come close. You can see the top of the runner stone inside the tun, and the

eye of the stone in the center, where we feed the grain. Once the grain is ground into meal or flour, it drops downstairs through another chute, and is taken upstairs to the top floor of the mill by a conveyor to be sorted and put into storage bins. We sort the meal and flour using wire screens, sort of like sifters in a sand box, or a sifter your mom or dad might use in the kitchen to sift flour when they're making a cake. The machine that does this sorting is called a *bolting machine*, which is shown in this picture here.

You might say that we have a great big loop, as you can see in this other picture: the farmer brings us the grain; we check it out and weigh it, and give him a receipt for it; we send it upstairs using a conveyor; when it's time to grind it, we bring it down through this chute to the hopper, then through the shoe and into the millstones; when it's milled, another chute takes the flour downstairs; and second conveyor takes it all upstairs, where it's sorted by the bolting machine and stored in bins until it's needed; then it's

dropped back down through any one of the chutes around us into sacks. Whew! That's a lot of up and down!

And how do these *conveyors* work? We use the same water power to operate them that we use to turn the millstones. The conveyors - which we call *cup conveyors* - move inside some of these wooden chutes. As a matter of fact, everything - the grain and the meal and the flour - is moved upstairs and downstairs inside the mill using these chutes all around us, the ones with names on them telling us what comes out of each one. When we want to move grains or meal or flour upstairs, we use the cup conveyor. When we want to bring the grain down to mill it, or the flour to sell it, we simply drop it down through the chutes.

TRANSITION

When our millstones were running continuously, grinding wheat, we could make one hundred and twenty-five bushels of flour each day, which is over *six thousand pounds of flour*, or 1,250 bags of flour like one that mom or dad buys at the supermarket.

TRANSITION

Jonas Williams designed his mill so that everything would come in and out through the same door, the same portal we passed through to get into the past, and into the water mill.

Here, let me show you how it works with this conveyor, which we have connected to an electric motor so we can easily show you how it works without starting the millstones. This milled corn and corn meal from the millstones drops downstairs and is taken upstairs by the cup conveyor to be sorted into cracked corn and corn meal using screens, or sifters. The cracked corn will come down one chute, here, and the corn meal will come out the other.

Watch.

See!

Pretty neat, isn't it?

Here, feel it - this way - using your thumb in your hand.

What we're doing is exactly what the miller did to test the meal or the flour while he was grinding it, to

see if it was being milled the way he liked it. Or the way the farmer wanted it done. He would scoop up a handful of flour from this small hole and rub his thumb around - like this - feeling the flour to see how fine it was.

If it was too coarse, which meant it wouldn't make a fine loaf of bread or a cake, the miller would lower the runner stone so that it was closer to the bedstone, making the space very, very small, which would make the flour very fine. If he was milling corn, and wanted it to be coarse, like this cracked corn here, he would raise up the runner stone to make the space between the millstones bigger, which would make the corn rough and coarse, just like this.

This way of testing the meal or flour has given us another expression in our language - *'the rule of thumb'* - which means to test or check something out without actually measuring it with an instrument or a tool, but instead to use our own experience - our *feelings* - to know if something is right, and that it measures up to what people expect.

TRANSITION

Now, remember outside, when I asked you to feel the grooves and the cracks and the flat surfaces on the face of the retired old millstone?

Good, because I now want to show you how we get those grooves and cracks into the face of the millstone, and I also want to show you what they do.

This is the type of stone used to make the millstone we saw outside, and also the ones here inside the ***tun***. It's called French *burr* stone, and comes from the Marne valley, near the village of Chalons, in northern France. In Europe. It's a type of stone called fresh water quartz, which is found in the fields of northern France. This fresh water quartz does not have to be *quarried* - or cut out of the earth - like most other stones do. It's found lying on the ground, or just beneath the surface. Some of the stones are a little bigger, but most of them are about this size.

You can see that it has lots of holes in it, almost like a sponge. The holes help to make it light - for a stone! They also let air pass through, which helps to

keep the millstones cool when they're grinding the grains, since the grinding makes them get very hot, which is not good because the heat can make the meal or flour pasty, and even a little bitter. And because it's quartz, which is a very hard mineral, French burr millstones don't wear down very quickly, so they last a long time.

Stones such as this, as well as other kinds of stones, were brought to the New World in the bottom of the ships that the settlers traveled across the ocean on. They also helped to keep the ships steady in the water when the ocean got rough from a storm. Other special stones came from quarries in England, from the Peak District, near Derbyshire. They became known as *Peak* or *Grey* stones. Regardless of which type of stone was brought to America, they must have been very good, since it was very expensive to bring these stones over the ocean in the ships

Because of this cost, settlers looked for stones here in America. One of the more well known stones came from the small village of High Falls, near

Kingston, New York, which is a city along the Hudson River, and which was also the first capital of New York State. This stone was called Esopus Millstone, and was quarried, or cut out of the Shawangunk mountains.

TRANSITION

As you saw from the millstone on the porch, we fitted many small stones together in order to make a single large millstone.

The one on the porch has more than twenty stones in it. This model I have here shows how this is done. Once the stones are mortared together, then wrapped with the iron belt, we dress the face of the millstone - that's right, dress it! - using these tools here beside me, which are the actual tools used here in the mill for years and years.

A millwright would chisel grooves into the face of the millstones. The deep, rough grooves are called *furrows*, just like the furrows that a farmer plows into the ground in order to plant his grains. The flat surfaces are called the *land*. And the fine lines scratched onto the land are called *cracks*.

The furrows start the milling process by tearing the hard grains open when the runner stone turns on top of the bed stone. The runner stone gets very close to the bedstone, but it can never touch it, and I'll tell you why in a moment. The fine cracks keep doing this tearing job, while the land - the smooth flat areas - grind the grain into a finer and finer flour for baking bread and pastry.

The furrows then do a second job by guiding the flour to the outside of the millstone, where it falls into a groove between the millstone and the tun - a groove we call the *curb* - where it's swept around and drops into the chute, downstairs, then is taken upstairs and sorted, and put into storage bins. The furrows also guide the hot air out of the millstone to keep it running cool.

As you can see from this model there were different patterns for dressing the millstones, such as the *sickle dress* or *quarter dress*. There were other patterns besides these. This was because different millers thought one pattern was better than another,

and chose that particular pattern to mill *his* grain.

The furrows also had different names. These longer furrows were called *master* furrows, the next smaller ones were called *journeyman* furrows, and the shortest ones were called *prentice* furrows, which meant apprentice, or a beginner.

TRANSITION

This might be a good time to stop for a minute and learn a few more of the words or expressions that come from milling and the life of a miller. The person who dressed the stones, and did many of the other difficult jobs in a mill - the jobs requiring special training and years of experience - that person was called a *millwright*, which means someone who is an expert in all of the jobs needed to keep the mill running, such as: dressing the stones, a job which could often take days; forging the iron hoops to hold the French burr stones together as a single millstone; balancing the millstone so it didn't wobble when it turned around and around; and keeping everything else repaired.

Quite often these millwrights traveled from mill to mill, offering their services for hire, which could include food and lodging, and often flour, in addition to the payment of money. In order to know if the millwright knew what he was doing, if he was experienced, the miller might ask him, '*Show me your mettle*', whereupon the man would hold his hands out for the miller to look at. And if that man was experienced, his hands would have been swollen and scarred from tiny bits of stone buried beneath his skin, which had been chipped off of the millstones - red hot! - when he was dressing them. He might also have them lodged under the skin on his face. Or he might have a patch over one eye, blinded in that eye because of a burning hot spec of stone that flew up into his eye.

No, I'm afraid we didn't have safety goggles back then, as we do today.

So when we say that someone is '*Testing our mettle,*' we mean that they're testing our character to see what we're made of, and to know who and what we are

- like the miller who asked to see the millwright's hands to know what he was made of, and to see if he had the experience needed to do the job.

Now, there's word I think you'll find a little bit funny. It's the word for this iron bar - a *damsel* - which sits inside the eye of the millstone and turns when the millstone turns. As it does, these rounded corners knock on the shoe - like this - and shake the grain out of the shoe. The faster it turns, the faster it shakes the grain out, and the louder it gets, until it sounds something like this.

Well, as the story is told, a miller in England, hundreds and hundreds of years ago, ran out of his mill one day with his hands over his ears, crying out, *"I can't stand it anymore! The noise is worse than the chatter of a damsel!"* And ever since that time, this bar has been called a damsel, after the noisy chatter of a young maiden. A damsel is a device which shakes, or *chatters*, another part of a machine in order to make something happen, such as shaking the shoe to make the

grain drop down into the eye of the stone - like this - and at just the right speed.

I don't know if it would be OK today - naming the bar after a girl - but history is what it is, and we can't change it just because *we've* changed. So we take care of it, and learn from it.

TRANSITION

The milling of grain could also be very dangerous. Remember that fine dust in the air when I ran the cup conveyor? When the millstones were turning and busy milling wheat into flour, and the conveyors running, and flour being dropped down the chutes, dust just like that would fill this room, and often the entire mill, with a cloud of fine white powder, which is called ***stive***.

With only a tiny spark, perhaps from a runner stone that wasn't properly balanced, and struck the bedstone - creating sparks from the quartz - that cloud of fine powder would explode like a bomb, and start a fire that could quickly burn the entire mill down to the ground.

And that's how many of the mills here in America were lost ... to a fire, caused by a dust explosion.

To try and keep this from happening, the miller did his very best to keep the runner stone perfectly balanced, and he also never let it get too close to the face of the bedstone. And if you look around, you'll see that we have wooden tools - such as that wooden shovel on the wall - so that we didn't make any sparks. And if we did, and a fire started, we had fire buckets everywhere, like those up there, and filled with sand not water to put out the fire before it got too big. We used sand to smother the fire, because the water would only push the flour dust around, thereby making the fire spread.

Boy, so many things to learn just to make flour for bread!

TRANSITION

Enough of just *talking* about milling, let's get busy and mill some grain ourselves. OK? And let's use corn, since corn is such a popular grain for foods here

in America, and perhaps far more popular than you might realize.

This cob corn was what a local farmer would have brought to the mill for milling, after harvesting it and letting it dry so that it was hard and able to be milled. We can't mill freshly harvested grains, since they form a paste when they're ground because of the moisture - or water - that's in the grain.

The farmer would have unloaded the cob corn from his wagon, using burlap sacks much like this, for us to weigh on a scale like this one over here. We would then tag all of the sacks he brought in with his name so that we would know exactly how much was brought in for milling, and who owned it.

We did this so that after we milled the corn, and weighed the corn meal, he would know that he was getting back the right amount of corn meal for the dried corn that he'd brought to us to be milled. And so that we would also know how much to charge him for our work in shelling and milling his corn. But the farmer didn't pay us with money, he paid us in what was

called *kind*, which meant that he gave us part of the corn meal as payment for our work. We would then sell that corn meal to get money to buy things that we needed, or we traded it to other farmers, or other merchants, in exchange for things such as cloth to make clothes, or salt or sugar or meat, or tools and supplies to run the mill. We even used it as part of the wages we paid to our apprentices.

This method of payment often led to distrust of the millers by the farmers, who never knew if they were getting all of the meal or flour from the grains they'd brought to the miller for milling. Especially if that miller became very prosperous, when they were always struggling to make ends meet.

This method of payment to a miller may have been the reason behind the nickname that President Lincoln is known for; *Honest Abe*. It seems that he couldn't make any money as a miller in Salem, Illinois, back in 1831, since he gave too much flour back to the farmers, and never took enough for himself in payment for his services. Mr. Lincoln obviously didn't have the *'thumb*

of gold' that George Washington had, since Mr. Washington was a very prosperous miller, before he became our first president.

But then maybe that's all for the best, since Abe Lincoln was forced to give up milling, which would eventually lead him to become one of our greatest presidents. While on the other hand, because George Washington was so prosperous, he was able to help our country win the war for independence, when our country didn't have the money to pay him for his work as General Washington.

This method of payment, and the important role the miller played in a community gave rise to other words and expressions in our language, which are now commonplace, but which many of us do not realize came from milling. The words *bread* and *dough*, and also ***moola***, are slang words used to mean money. And someone who is the *bread winner* in the family is the one who makes earns the money to buy the bread, and bring it home, to feed their family.

Look at how many towns or villages or streets have the word mill in their names: Mill Street; Millville; Mill Valley; New Hope Mills; Millers Corners; on and on, all across our country.

TRANSITION

Ok, once we had this cob corn from the farmer, *our* work as a miller would begin.

First, we had to *shell* the corn, or strip the kernels of corn off of the cobs. To do this, we used a machine, such as this old corn sheller. Someone not much older than you would have had the job of shelling dozens and dozens of sacks of corn, which meant thousands and thousands of ears just like these, so that the miller would have just the kernels to mill.

Watch ... this is how we did it.

See!

Pretty neat isn't it?

And we got to keep the empty corn cobs, too. Some we would chop up and sell for insulation in houses. And some were sold for a very special purpose. Can anyone tell me what that was?

No?

Here, feel how soft they are, maybe that'll give you a clue.

No!

They were sold for use at home, in the outhouse, since we didn't have this ... good old toilet paper!

Don't look at me! It's what most everyone used back in those days on the farm and in the country. That's until the Sears and Roebuck Company began printing their mail order catalogue ... and its pages replaced corn cobs in the outhouse!

Before we mill these kernels of corn into corn meal and corn flour, let's see what a kernel, or seed - or a berry, which is what grains really are - what that kernel is made up of.

This is a drawing of a kernel of corn. But it could be a drawing of any one the grains, since they all have the same basic parts: the outside, or bran; the inside, or pulp; and the germ, but it's not the kind of germ that makes us sick.

The outside skin - or *bran* - gives us fiber to help us digest our food. The bran also gives us most of the B vitamins, along with about 20% of the protein from the kernel.

The pulp - or *endosperm* - is white and starchy. It's the part that gives us white flour for white bread and pastry dough, and cakes. It contains most of the protein, about 75%, in the kernel of grain.

And the tiny germ - or the *embryo*, which is the part of the seed that sprouts into a new plant - the germ gives us vitamin E, a very important vitamin for our health, as well as some protein.

In the milling and sifting, or bolting, processes, we break apart the kernel, and separate the bran and the germ from the pulp, which we keep milling until we have a fine white flour.

If we leave the bran and the germ in the flour, we get whole wheat flour. Stone ground whole wheat flour, like we make, must be kept in the refrigerator, since the germ will spoil, or go bad and taste yucky, if it's not kept cold. Whole wheat flour is the healthiest

flour we can eat, since it has the bran and the germ in it, and all of the vitamins.

But when we leave the bran and the germ in the flour, the bread we make from that flour isn't as sticky, and can't rise up and become soft and fluffy, like white bread does, because the gluten - the sticky rubbery part - doesn't work as well.

But whole wheat bread is much, much better for us. So if you have the choice, try eating whole wheat bread, and also the darker, heavier breads, instead of always eating plain white bread. Or *'rubber bread'*, which is what some Europeans called white Wonder Bread when they first saw it here in America.

While we're talking about grains, let's take a close look at them. Here we have wheat, soft red winter wheat to be more exact. It's planted in late fall, lies dormant over the cold winter months, then grows through the spring and summer, and is harvested in late August or early September. This particular type of wheat makes a fine white flour that's used for cakes and pastries. It was grown right here in

Amherst, at the Donald Spoth farm, on Tonawanda Creek Road, along the Erie Canal.

Here we have summer wheat, which makes a flour that's good for breads. See the different shape and color of the grain?

These other two grains are rye and oats. But the oats may not look like what you're used to seeing, since they haven't been cut, or rolled flat like oatmeal.

And what do think this grain is? I'll give you a hint, it was once one of the most popular grains in America, and it makes great pancakes. Anyone know?

Right, it's buckwheat!

TRANSITION

These grains, and other types of seeds, were for thousands of years ground into meal or crude flour to make breads and cakes. Beginning with primitive man, many different types of hand mills were used to do this.

These pictures illustrate some of the more common hand mills, starting with two stones, which were

smashed together to crush wild seeds to make a paste for eating and cooking.

Actually, these devices did not tear and grind and **mill** the grains the same way our millstones do, they simply crushed them into a crude paste. But still, the idea of milling was begun.

Beginning with the oldest known device, the stones, we have a saucer mill, using a hollowed out stone dish and a round stone ball, which was rolled around in the dish, crushing the grains.

Here we have what is called a saddle mill, which uses a cigar shaped stone that's rolled back and forth in this long, hollowed out stone basin to do the same.

This one is called a mortar and pestle.

These other mills, created and used by native Americans, were improvements on the mortar and pestle. This one used water power, while this one employed a stone. It both cases the weight of the water or the stone produced a hammering motion, making it easier to pound the grains and crush them into meal and flour.

TRANSITION

Ok, enough about nutrition and grains and ancient mills! Let's turn these kernels of corn into meal and flour! And to do that we're going to use this baby millstone, which is called a *quern*. The word quern comes to us from Middle English again. Querns were everywhere in Europe, long before there were grist mills to grind the grains for everyone. Querns were also used here in America by the Pilgrims, and many of the other early settlers. Querns have even been found at the burial sites for the Vikings who, it is said, would not leave home without their quern to mill the grains and seeds that they found in the wild, to make cereals and crude breads. Small quern-like millstones have even been discovered in the ancient shipwrecks on the bottom of the Mediterranean Sea.

Here on the top we have a runner stone, which sits on top of the bedstone. On the face of the stones we can see the furrows,
these small grooves radiating out from the center of the stone. And this is the curb I told you about, which collects the meal or flour. We don't have a

horse or a shoe or a hopper, since we feed the grain into the eye of the stone by hand, like this.

OK, let's turn the runner stone around and around and see what we get.

Here, would you like to help?

Grab hold of this handle with me.

Now, everyone watch closely. And listen, too, because a millstone is said to talk. And when it does, it tells the miller if it's doing a good job by the growl in its voice.

OK, start turning it. That's it, you're doing just fine. I know it's hard, because the runner stone is heavy, and the grain is very hard.

There - see! - we're getting corn meal and corn flour from the kernels of dried corn we put into the eye of the millstone, just like the full sized millstones do.

Come on, don't stop, let's fill up the curb with cornmeal.

Here, feel it. And taste it, too. Go ahead, it's OK, it's fresh and clean. And good for you, too.

TRANSITION

OK, what do we use this cornmeal for? Can anyone tell me?

Yes, you're right, cornbread.

Can you think of anything else we can make from cornmeal?

No?

How about this!

[Corn Flakes]

Or this!

[Corn oil]

Or this!

[Corn syrup]

Or this!

[Log Cabin syrup]

No? Well let's see what it's made from? It says here that it's made from corn sugar and corn syrup.

Hmmmm!

And what about this?

[Hershey's syrup]

No? Well let's check this one too. Hmmmm, it says here that it's made from corn sweetener and corn sugar and corn syrup. Oh, and it also has a little bit of chocolate flavor in it. Boy!

And what about this?

[Dog biscuits]

No? It says it's made from corn meal!

Now, I've got one that will really surprise you.

[Starbursts]

No? Well, it says here that it's made from corn sugar and corn syrup. As a matter of fact, its almost *all* corn by products!

TRANSITION

Ok, let's get back to the corn meal, and cornbread.

When some of the very first settlers arrived here in the New World, in a territory we now call the Commonwealth of Virginia, or the state of Virginia, they were welcomed by the native peoples, who offered the settlers gifts of food - food which would eventually keep them alive through their first winter

here in America, when their own food supply had run out and they were faced with starving to death.

One of those foods was something very much like what I have here in this basket, under this cloth. It's made from corn meal and is called *pone*, a native American word for cake, or bread.

Can you say *pone*?

Good!

The corn *pone* - or corn *bread* - made by the native people was different from what I have here in that they made theirs with water, honey, and sometimes fruit, such as wild berries or crab apples, or fruit juice. And of course, corn meal, which they ground from the dried corn, or *maze*, that they grew around their villages. While my cornbread is made using whole milk, eggs, sugar, honey, maple syrup, vanilla, and whole wheat flour. And also baking powder to help it rise, since the cornmeal keeps the flour from rising up. And of course, I use cornmeal.

But our corn bread is also very much like the corn pone made by the native Americans, because we use stone

ground corn meal and stone ground whole wheat flour, which have all of the parts of the grain in it - the bran, the pulp, and the germ - for a healthy *whole grain* bread. While the corn bread you buy in the store - or the corn muffins from Tim Horton's - use white flour which, as we now know from what we've learned, does not have the bran or the germ in it. And the germ has been taken out of the corn meal. We're missing some of the best, and healthiest parts!

Would you like to try some of *our* stone ground corn bread?

You know, seeing this corn bread, and talking about the corn pone the native Americans made for the early European settlers, reminds me of something that was very popular during the Civil War - *Johnny Cake* - prepared by the men of the Confederate Army, the soldiers from the south. With corn meal and water and honey, they made small cakes, almost like pancakes, but thicker, which they fried in pans, or baked on hot rocks around their campfires.

Corn bread has been a staple, which means a basic food, for Americans ever since the time of the very first settlers. You might say that cornbread is *more American than apple pie!*

Now, before we go downstairs to the millwright's work shop, let's take a few minutes and look at the illustrations on the walls around us. They tell the story of harvesting and milling grains, and what many of the tools are used for here in the mill. They also show you some of the hundreds and hundreds of products made from grains, many of which are not food. Some may even surprise you, such as paper and glue, and even fuel for cars.

Look at all of the tools. And the bushels of grain. And ask me any questions you like about milling, I'll do my best to answer them for you.

And if you like, try your hand at milling corn using the quern. But one at time, and carefully.

TRANSITION

Well, I think it's time for us all to go downstairs and see what turns these heavy millstones and runs the

conveyors, and to see the workshop where the millwright and his apprentices built and repaired things for the mill. So follow me in a single file. And be sure to hold onto the handrail, the stairs are steep.

TRANSITION

Well, here we are! This is the millwright's workshop.

Come on, everyone gather around me again. But don't sit on the floor like we did upstairs, because unlike the floor in the milling area - which had a soft and shiny patina on it from the flour dust, and the oils in the germ of the grains - this floor is dirty and yucky from the grease, or tallow, used to lubricate these big gears behind me, and also the big pulleys overhead. Dust and dirt - and the powdery stive - would fall onto the floor and mix with the greasy tallow to form this dark, almost sticky surface on the wooden floor. If you look closely, you can see that the planking isn't smooth and shiny like it is upstairs, but tacky and dull. Go ahead, touch it, and feel the difference.

Tallow is a hard white paste, kind of like Crisco. Or bacon fat. That's because it *is* fat. It's made from cooking the fat from butchered farm animals, such as cows and sheep, and even old horses. Tallow was used to make candles, because it burned at a nice slow rate, and for a long time. It was also used to make soap. And it was used as a lubricant, which is something that makes things smooth and slippery so they work better and last longer, things like machines. But unlike grease, which is made from oil pumped up out of the ground, tallow smokes a lot when it gets too hot from the friction of things rubbing together, things such as these gears, or these pulleys and belts over our heads.

So when the mill was busy, with the millstones upstairs turning, and these gears turning - and the equipment around us operating - this workshop could be filled with smoke from the burning tallow. Yes, it smelled - like melting fat - but worse than that was that it got into your lungs when you breathed it in day after day. That's right, it was not good for the

health of the apprentices, or the millwright, or even the miller himself. Or the miller's children, just like you boys and girls, who often worked down here, helping their father and mother make a living.

Here, peek inside this tallow can and see what real tallow looks like. And smell it. Then think what the workshop might have been like when the tallow was heated up, filling the air with a delicate, almost invisible blue-white smoke. Yuck!

So, here we are, standing beneath the millstones upstairs; over five thousand pounds of French burr stones over our heads, where *this* fat iron bar goes up through the ceiling - through the center of the bedstone - and holds the runner stone up.

Following the iron bar down from the ceiling, we come to this *driven gear* - a *driven* gear is one that is turned by another gear, which we call the *drive gear*, or the one that does the pushing. If you look past this driven gear you will see another gear, which is attached to yet another iron bar that also goes up through the ceiling. That bar was for the second pair

of millstones, which were taken out of service when we added the country store years ago, and which is now our gift shop. That iron bar once turned the millstone that we all touched for good luck outside on the front porch.

Because we had two pairs of milling stones, we were what was known as a *merchant mill*, which meant that the mill was bigger than most other mills, and producing lots more meal and flour.

The runner stones upstairs were turned by *these* heavy iron bars, which are connected to *these* large driven gears. And these gears were turned by this single *drive gear*, here in the center. Look at the driven gear for the millstone we took out of service. You can see that it's raised up, and no longer touching the drive gear. We did this so that we only turned one pair of stones at a time, when we didn't have enough grain to mill. Or were dressing that stone. Or fixing something else.

And you can see that this iron bar here in the center - *the one attached to the single drive gear* -

goes straight down through the floor. It goes down into a dark and damp and cold room beneath our feet, which is where all of the gears were once located, when we still had a waterwheel outside the mill, a wheel that looked very much like this one in this illustration. However, our waterwheel was covered, and looked like this, which is an actual photograph taken of our waterwheel over one hundred years ago.

You can see from these two illustrations here that both of the waterwheels were turned by water that ran over the top of the waterwheel. This type of waterwheel was called an *overshot wheel*, because the water from the flume - *shot over the top of the waterwheel* - as you can see by this other illustration.

There were different types of waterwheels, not only in size and shape, and how many paddle blades they had - these are the paddle blades here - but how the water turned them.

This other illustration shows you four of the basic designs for waterwheels: the *overshot* wheel, which we once had here; the ***pitchback*** wheel, where the water

dropped behind the wheel and turned the wheel backwards; the ***breastshot*** wheel, where the water came in right at the middle of the wheel; and then finally the *undershot* wheel, where the water struck the wheel at the bottom, and turned it backwards, just like the pitchback wheel.

The type of waterwheel that was put on a grist mill was determined by how the water from the stream could be brought to the wheel. Here in our mill we used an overshot design because we had a waterfall and could build the mill down the hill from the stream, and bring the water through a flume - a *flume* is this long open box, or trough, here in the picture - over the top of the waterwheel.

When there was no waterfall, and therefore no drop in the water, a miller would usually use an undershot wheel, such as the one shown here. He would then build his grist mill right on the stream - the same way Davy Crockett did with his grist mill! - with the running water passing underneath the waterwheel.

When the water in a stream was too slow, or weak, a miller might build a damn to make a pond, then take the water from the pond, which now had more energy in it from falling down from the damn, to turn his waterwheel ... as you can see in this picture.

While waterwheels were the way a miller captured the energy from the running water, they were also a problem for him. The biggest problem was that they required lots of care and repair to keep them working, since the running water could wear them out. Regular repairs often forced the mill to stop milling, and this cost the miller money. It also made his customers unhappy.

In addition to the wear and tear from the running water, there was the damage to the wheel from the water freezing during the cold winter months. And there was one other problem, one which happened in the late spring and during summer, and in early fall - as we can see in this illustration! - children climbing and playing on the waterwheel, and going for a ride.

As much fun as it might have been, it was also dangerous. This was because you could get caught in the paddles in the wheel, and could break an arm or leg. Or worse! you might get dragged down underneath the water, and drown.

Winter could be just as dangerous, because boys and girls would ice skate ... as you can see in *this* illustration ... on the frozen mill pond. But the ice was very thin close to the waterwheel, before it froze and stopped the wheel from turning. Well, the children might dare each other to see who would skate the closest to the wheel, only to fall through the ice into the freezing cold water, and often drown.

Because of all of these reasons, we took away our waterwheel about ninety years ago - after the turn of the century - and put in a water turbine, which is underneath this floor, and buried halfway in the ground. A turbine looks something like this. You can see from this drawing that the water turns the blades of the turbine, which turn the drive shaft - and the

drive gear - which then turns the driven gears, and the millstones upstairs.

This '*newfangled*' turbine allowed us to operate the mill all year 'round, without having to worry about the waterwheel freezing up, or about children getting hurt. And it didn't need a lot of care and repair like the wooden waterwheel, which saved us money. Sadly, however, we are left today without the romantic sight and sounds of a wonderful old-fashioned waterwheel outside our mill.

We were also left without one of the most interesting, and perhaps the scariest parts of an old grist mill: the gear room, or sometimes called the hopper room, where the transfer gears were located that changed the motion of the turning waterwheel so that it was facing up - spinning these iron bars and gears behind me - so that we could turn the millstones overhead.

The hopper room was someplace very special, with mystical, almost magical powers. For hundreds and hundreds of years, beginning in Europe and continuing

here in America, parents brought their young children to the mill to be placed in the gear room, often overnight - and alone - which was dark and damp. It was believed that this could reduce or prevent whooping cough! And it was also believed that it could cure them of stuttering!

There's also the belief - which I think comes to us from Germany - that a devil lives in this dark and damp and cold room. This tale was perhaps told to scare the children and keep them out of the room, since they could get seriously hurt in the dark by the turning gears. Perhaps the reason they snuck into the room was that flour and meal would often drop down through the cracks in the floor, down into this room, and the children would catch it, or scrape it off the timbers, and take it home to help feed their family. Only it was sometimes without all of their fingers, that's if they were unlucky enough to get their hand caught in one of the gears in the dark. Or something worse!

This drawing I have here is a photocopy of the actual drawing by a famous Roman engineer - *Vitruvius* -

who designed this mill - *over two thousand years ago*. If we look closely, we can see that it's almost the same design as our mill: the waterwheel; the gears; the shaft; the hopper; the shoe; even the tun; and especially the millstones.

This very design gave everyone - the Dutch and the Germans and the French and the English, and even the Americans - a model from which to build *their* grist mills. As we can see from our own mill, the design has changed very little. As a matter of fact, the only thing not in Vitruvius' design is a damsel bar, which it's believed that the Dutch added.

TRANSITION

If we look underneath these heavy timbers holding up the gears and the iron bars - and the heavy runner stones - we can see a funny shaped gear attached to the main drive shaft, close to the floor. This gear is called a *bevel gear*, and it's how we steal some of the energy from the water turbine to turn other things besides the millstones: we turn another drive shaft, which turns the pulleys that operate the grain and

flour cup conveyors inside these chutes; and we turn *these* pulleys overhead, which turn these belts - that turn these other pulleys - which operate machinery such as this old grinding stone.

And this is another reason why a miller was so popular; he could do even more things that the people living around the mill needed to have done, such as shaping and sharpening axes and knives. He could also turn a lathe, such as the one behind you, and make special shapes, such as porch posts and stairway posts.

Let's take a few minutes to look at the illustrations and the pictures on the walls around us, and talk about them. They show us many things about our mill, such as what it looks like inside - all five floors - including the turbine pit beneath us.

TRANSITION

As we head over to the work bench, where the millwright kept his carpentry tools, let's stop and take a quick look at the chutes and cup conveyors.

This chute takes the milled meal or flour through *this* chute behind it from the millstone, and conveys it

upstairs, where it's sorted by the bolting machine, then stored in bins. The flour must also cool down, since it's still pretty warm after being milled. It's also down here where the chutes with the cup conveyors in them are cleaned out of one type of flour, such as rye, before we mill another, such as wheat or corn. If this isn't done, we get a mixed flour, which could contaminate a whole batch of flour upstairs.

The apprentice working down here would also have to make sure that there was nothing being done that might create a spark, since when he opened these clean-out doors, the stive - or very fine flour dust - would come out too, and might explode.

Boy! It sure did take a lot of experience to run a mill safely, now didn't it?

TRANSITION

And here is one of the most popular sections of our mill;
the millwright's carpentry workshop, which is filled with all types of interesting tools for woodworking from the 19th century.

Building and repairing things in and around the mill was a very important part of a millwright's job ... it *was* his job. A millwright had to be part *mason*, who is someone that builds and repairs things made with stone and brick and mortar, such as that floor behind you, or the millstones; and part *blacksmith*, who is someone that makes things out of iron, such as the hoop we saw wrapped around the millstone, or the wrought iron hinges on a door, or the latches that keep the chutes closed, and even many of his own tools, such as the blades for axes; and he was also part *carpenter*, which is someone who cuts and shapes wood to make things, like the planking for the floor we're standing on, or the wood paneling on the walls and the ceiling. And the stairs and doors and window frames. And the chairs and tables and cabinets. Even this very workbench! And he also made all of the equipment the miller use to mill grain; the chutes, the hopper, the horse, the shoe, the tun, and the storage bins upstairs. Even these giant wooden beams behind us,

which hold up the heavy gears and the runner stones upstairs ... and hold up the entire mill too!

Today we still have millwrights working in our factories and plants, and even in our schools. They are men and women who are trained to do many different jobs: plumbing; masonry; carpentry; a little iron work, such as fixing gates and fences; repairing equipment, such as boilers and trucks and snow plows; and doing many of the other things needed to keep our factories and schools and airports open.

When we look around and see all of the things a millwright had to do, we can see that he was as important to a mill as was the master miller. The millwright and the miller were two parts of a team that made a mill successful. The other important part of that team was the miller's wife, who worked just as hard as the men, and quite often longer than the men did, since a woman's day usually began before a man's, and quite often ended after he was in bed and asleep.

So when we look at a mill such as this, and think of it as a bustling business, we must realize that in

order for it to have been a success, it took not only hard work, but also teamwork: the miller and the millwright, and the skills and experience of a the miller's wife, all working together, each doing their own job; and each helping the other.

In a few minutes we'll take a look at the many different jobs a woman did as an important part of the team here. Some of the jobs you will recognize. But there are some others - jobs just as backbreaking as a man's work - which may surprise you.

TRANSITION

Now, back to the millwright's carpentry shop.

On this one wall we can see the many tools used by the millwright to cut and trim and shape large timbers into posts and beams, such as these around us. The millwright used these two- man saws to cut the timbers, just like we see in this photograph.

But the timbers first had to cut from trees, and that was often done in a saw mill which, interestingly enough, was yet another type of mill that was built here on the shores of the Ellicott Creek - taking

advantage of the same fast running water to turn the giant saws that were needed to cut and rip the trees into crude timbers, which could then be shaped by the millwright.

Then, using drawings such as this, which the millwright prepared from the designs the miller made for his mill, the millwright would begin cutting and shaping and trimming the timbers needed to make the frame - or skeleton - of the mill.

These timbers were then notched - like this ... or perhaps this - so that they would fit together securely. To do the work of notching the timbers the millwright used these double-handled shapers and wood chisels. And also these heavy wooden mallets to hammer the chisels. All of these tools had to be kept *very* sharp in order to cut through the green wood. *Green* wood is wood that has just been cut down, but not dried or aged yet, and which is what was used to build things such as grist mills and saw mills.

But the wood for the floors and the walls and the ceilings -and the furniture and cabinets - was dried

and aged so that it could be more easily shaped and sanded. And so that it wouldn't crack or warp or twist after it was part of a table or chair.

Once the posts and beams were notched and fitted together, holes were drilled in them for pegs to help keep them together. To drill these large holes, the millwright used a tool called an *auger* - just like this - which is a hand drill, and required two men to turn. This drawing, and this sample that I have here, show us how the notching and the pegs work together. And over here we can see the end of a peg, which is helping to hold these two heavy beams together.

TRANSITION

On this other wall here, we have the tools for shaping the dried hardwood used to make this flooring, and these walls, and that cabinet over there. These hand tools are called *planes*. They have small, razor sharp blades, like little chisels, which stick out of the bottom and trim - or ***shave*** - the wood to get it to the shape we want so that the pieces fit together tightly.

These two pieces of wood flooring have already been shaped. This shape - or *joint* - is called *tongue and groove*.

This is the tongue.

And this is the groove.

Using these two pieces of flat hard wood, and these planes, we can make a tongue and groove joint ourselves.

Here, let's try.

TRANSITION

Say, do you remember the water turbine I told you about, the one that I said was half buried in the ground, in a room beneath us? And remember this drawing? Good.

Well, before we leave the carpentry shop, I'd like to show you the turbine pit, and the part of the huge turbine sticking up out of the ground. We can see it through this glass panel on the floor. But first let me turn a light on, because it's really dark down there.

And after you've had a look, spend a little time checking out the illustrations and pictures on the wall beside the carpentry tools. I think you'll find them very interesting.

OK, one or two at a time ... come close and kneel down.

There's the top of the turbine.

That long wooden box is the covered flume carrying the water from our mill pond, which is on the other side of Main Street.

And the black iron bar coming out of the top of the turbine, and up through the floor we're standing on, is the drive shaft of the turbine. It turns the gears up here in the millwright's workshop, and they turn the drive shafts for the millstones and the cup conveyors and the bolting machine way up on the fifth floor, and even the pulleys and belts that operate the lathe and the grindstone down here.

And that stream of water - or *discharge flume* - will be joining up with the Ellicott Creek, after

having done its job turning the blades of our water turbine.

Pretty neat, isn't it!

TRANSITION

Now let's make the last stop on our tour of the grist mill and see some of the things that the women ... and also young girls like yourselves ... did to help make this a winning team.

TRANSITION

We see around us some of the tools and equipment used by the women to do *their* jobs; tools which required long hours of practice to use skillfully, so that their jobs would be done properly - in the very same way that men and young boys had to practice and learn how to use their tools and machinery in order to do their jobs well. Although there were different tools for different jobs, each job was none the less important to the success of the mill, and the quality of life for the whole family, and therefore the whole community of Williams Mills.

Along this wall you will see a collection of various devices used to mill or grind things by hand - to grind or separate or tear them apart - everything from grains and coffee and spices and pea pods, and even paint.

That's right ... paint!

From the objects set beside the devices - such as the tea leaves with this tabletop quern - you can see exactly what each of the tools did to help the women do their job.

And if you think it wasn't hard work, just think about what it was like having to turn this heavy tabletop quern for an hour or more - *every day* - just to mill tea leaves for the family tea.
Or for a few more hours to make ground tea to sell to people traveling through Williamsville on their journey further west.

TRANSITION

Here are three very important products that the women and young girls worked hard to make: *linen* - for use in making cloth for clothing, and other things

around the home, as well as around the mill, made from a sturdy cloth; *linseed oil* - which was used to dry and harden paint and varnish, and to make printing ink; and this - *paper* - but not just any paper, fine writing paper.

All of these products are made from a special plant called *flax* - a plant of the species named *linum*, which is where the word *linen* comes from. Flax is a tall thick grassy plant that was grown in the fields of Amherst, just outside the Village of Williamsville.

The linen thread is made from the long thin fibers hiding inside the hard stalks of the flax. It was not easy to get these strong fibers out of the stalks. And it was just as difficult to turn the fibers into thread, which could then be woven into linen for dresses and shirts and pants, and even something as delicate, but durable, as a fine linen table cloth ..... just like this!

The linseed oil was made from cooking the seeds from the flax flower for hours and hours. Then filtering it - while it was still hot! - to take out

the bits and pieces of the seeds. Because the oil hardened in the air, which is one of the reasons it was used for paints and printing inks - to make them dry and become hard so they wouldn't smudge or rub off - the women had to know what they were doing, and work fast to keep everything from getting hard before they could bottle it.

The linseed oil all by itself was also used to protect wood, on barns and mills, and also on ships. It was brushed on, even without any color. It protected the wood from drying out from the sun and the wind. And it also protected it from getting soaking wet from the rain and snow, and rotting.

Here are just a few of the products which have linseed oil in them.

And here is a piece of wood with linseed oil on one end, and nothing on the other. See the difference?

Although it was hard and dirty work - making the linseed oil and the linen cloth and the paper - the women were able to sell what they made, which brought money into the mill, and to their family. This was

very important, since a miller might not always get money for milling a farmer's grain, as we already know, and this money would help the miller and his family buy things that they couldn't trade flour for.

What hard work, you ask?

Well, just look at these pictures showing how the flax was harvested and processed, and tell me it wasn't backbreaking work.

TRANSITION

This *flax break* was used to crack and break the stiff bark surrounding the fine flaxen fibers after they had been soaked in the pond for days, and softened.

After the reeds of flax were broken, they were combed out, or *hackled*, just like in these illustrations.

Using this flax break was hard work, because it was heavy. And it could also be dangerous if it wasn't used properly. Or if you weren't strong enough, and it slipped out of your hand - or your helper's hand - when you were pulling the flax through these wooden blades.

Like this!

Then the flax had to be dried and spun into thread, using a spinning wheel ... such as this one.

And after we had the thread wound on spools, we would then weave it into cloth using a loom ... just like this one, which is almost two hundred years old ... even older than our mill.

The women did all of this work - and many other things too, like *cooking and baking and cleaning ..... and having babies!*

TRANSITION

Whether you were sawing wood to make timbers or planking for the floor, or shelling corn and milling grains - or breaking and hackling and weaving flax to make linen - or boiling the flax seeds to make linseed oil - the jobs all required lots and lots of practice, good skills, and hours and hours of hard work.

So ... anybody want to work in a grist mill?

It's for ten hours a day, six days a week.

No!

Well, just thinking about it makes *me* thirsty.

Let's go get some apple cider, and see the cider mill.

OK?

'END'