

# EXHIBITING SIMPLE MACHINES AT THE NANTUCKET OLD MILL

## PROJECT TEAM:

BAILEY JOSEPH, MACK PHILLIPS, MITCH READ, BEN THORNTON

## SPONSORS:

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**NANTUCKET**  
HISTORICAL ASSOCIATION



**WPI**





The background of the slide is a faded photograph of a traditional wooden windmill. The mill has a steeply pitched roof and a prominent red door at its base. A person is visible standing to the right of the mill. The entire scene is overlaid with a semi-transparent light blue filter.

# PROJECT MISSION

ENHANCE THE VISIBILITY OF NANTUCKET'S  
OLD MILL BY CREATING INTERACTIVE  
EXHIBITS THAT SHOWCASE ENGINEERING  
PRINCIPLES PRESENT IN THE OLD MILL.



BACKGROUND  
RESEARCH

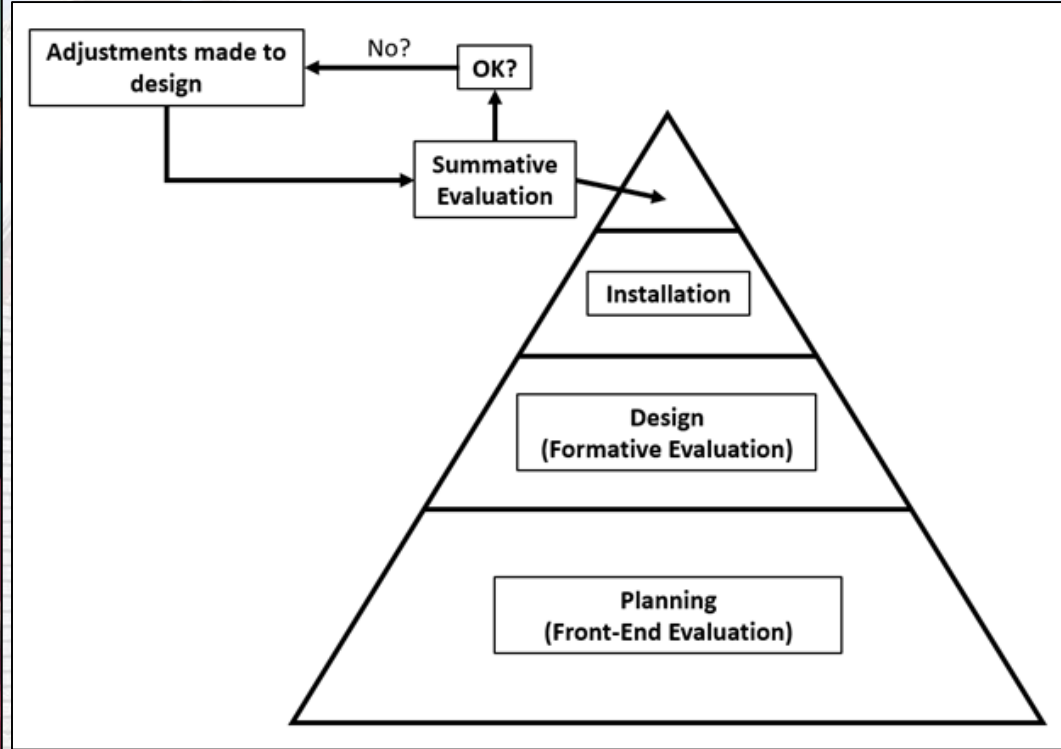
INITIAL  
DESIGNS

FINAL  
DESIGNS

SUPPLEMENTAL  
RESOURCES

FUTURE  
RECOMMENDATIONS

# RESEARCH EXHIBIT DESIGN AND EVALUATION.



# SEVERAL CRITERIA WERE CONSIDERED IN THE DEVELOPMENT OF THE EXHIBITS.

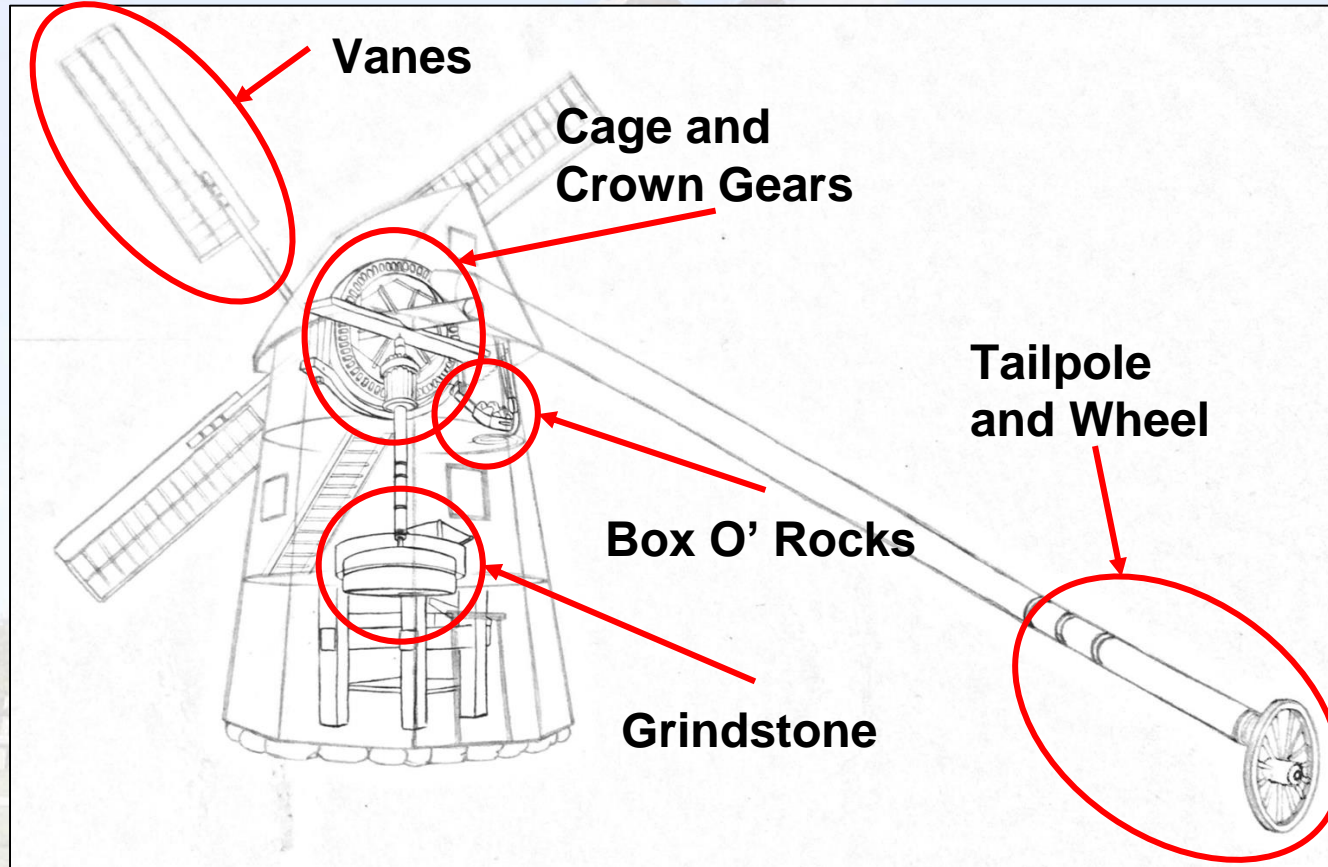
<b><i>NHA Design Criteria</i></b>	<b>Safe</b>	<b>Durable</b>	<b>Educational</b>	<b>Simple</b>	<b>Creative</b>	<b>Innovative</b>	<b>Accessible</b>
<b>Race to the top!</b>							
<b>How fast can spin the grindstone?</b>							
<b>Who can make the windmill turn first?</b>							
<b>Can you lift the box o' rocks?</b>							
<b>How many sheets to the wind?</b>							



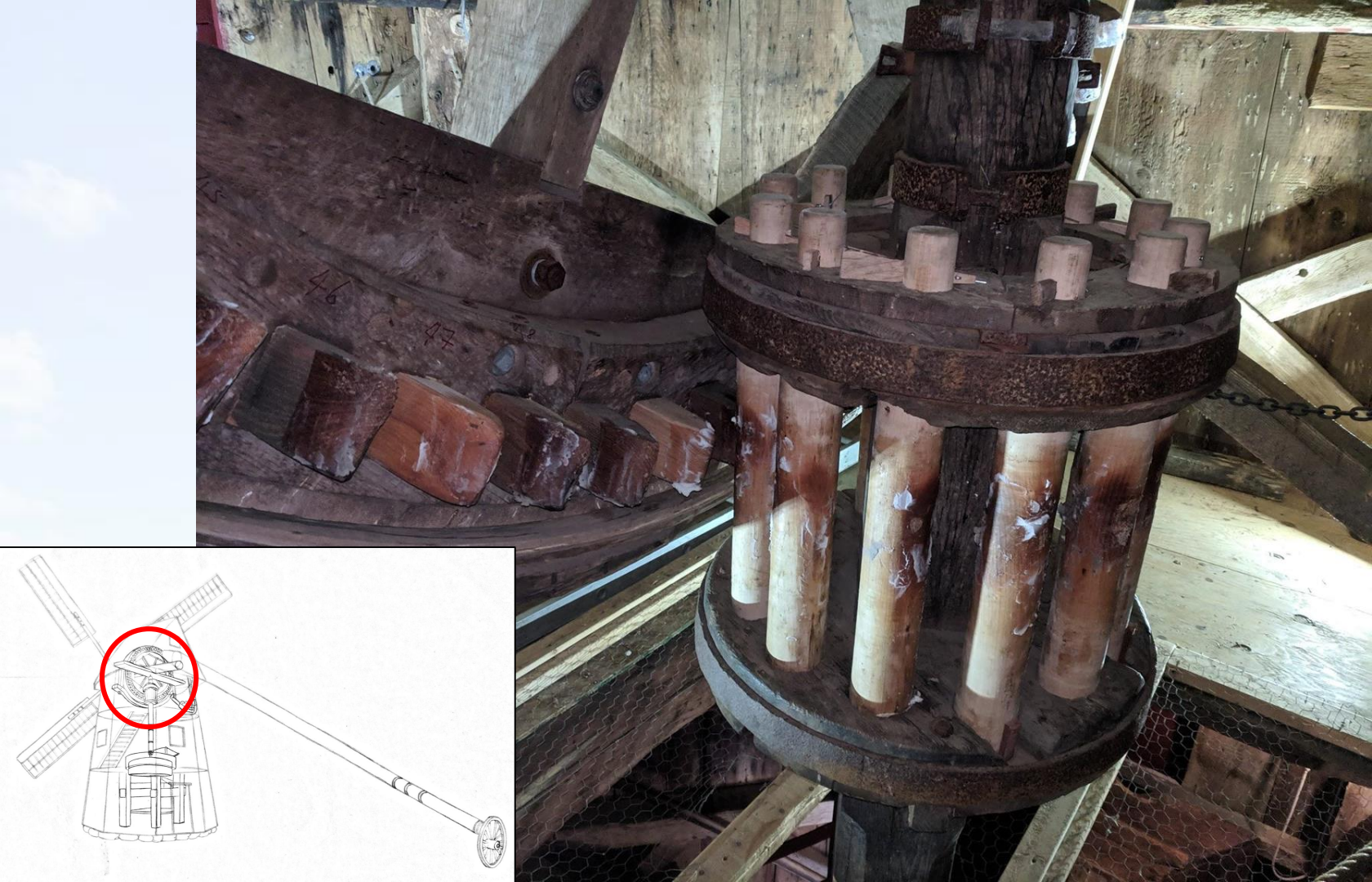
# WE LEARNED ABOUT MILL OPERATION AND PRESERVATION.



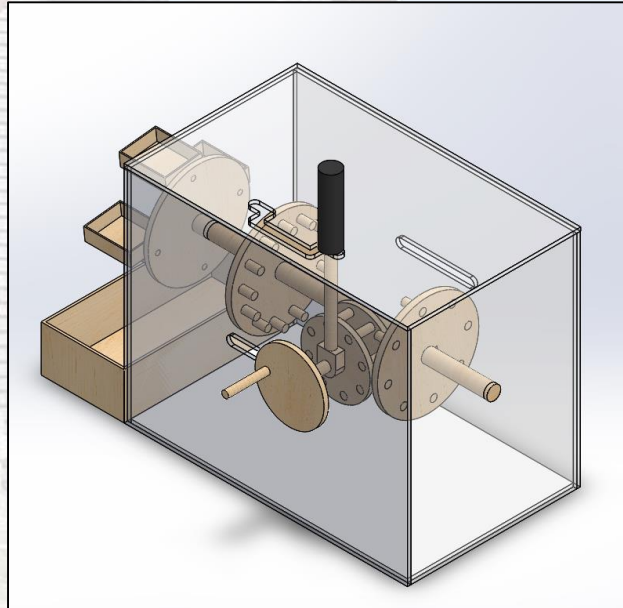
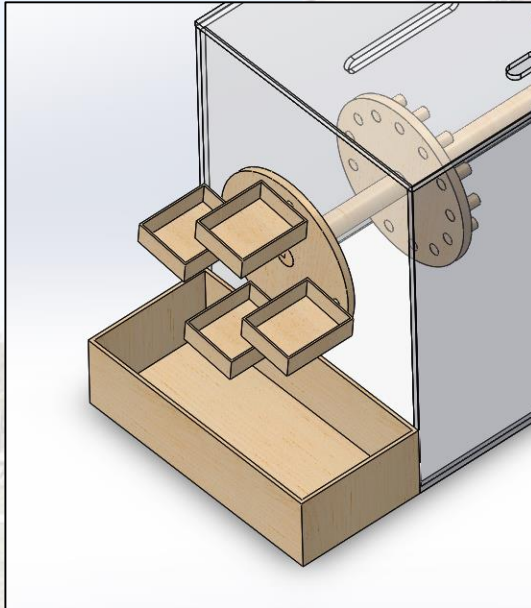
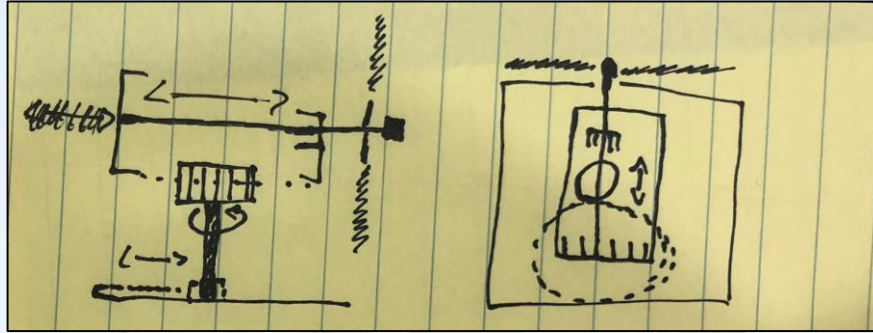
# THE OLD MILL IS BUILT OF SIMPLE MACHINES.







# SHIFTING GEAR RATIOS



# SHIFTING GEAR RATIOS

ITEM NO.	PART NUMBER	QTY.
1	Transmission Shaft	1
2	16 Tooth Spur Gear	1
3	Chamfered Tooth	24
4	Cage Gear	2
5	Tooth	8
6	8 Tooth Spur Gear	1
7	Turn Shaft	1
8	Crank	1
9	Crank Handle Pin	1
10	Grindstone	1
11	Case Side Panel	2
12	Case Front Panel	1
13	Case Top	1
14	Bottom Panel	1
15	Case Bottom	1
16	Glass Top	1
17	Glass Side	1
18	Crank Shaft Support	1
19	Angle Support	2

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UNLESS OTHERWISE SPECIFIED:		NAME	DATE
ALL DIMENSIONS ARE IN INCHES	TO SERVICES	DRAWN	12/14/18
FRACTIONAL	ANGULAR DIMENSIONS	CHECKED	
DECIMALS	TO SERVICES	ENG APPR.	
	TO SERVICES	MFG APPR.	
	TO SERVICES	G.A.	
	TO SERVICES	COMMENTS:	

TITLE:		DATE	
THE SHIFTING GEAR BOX		12/14/18	
SIZE	DWG. NO.	REV	
B			
SCALE: 1:24 WEIGHT:		SHEET 1 OF 26	

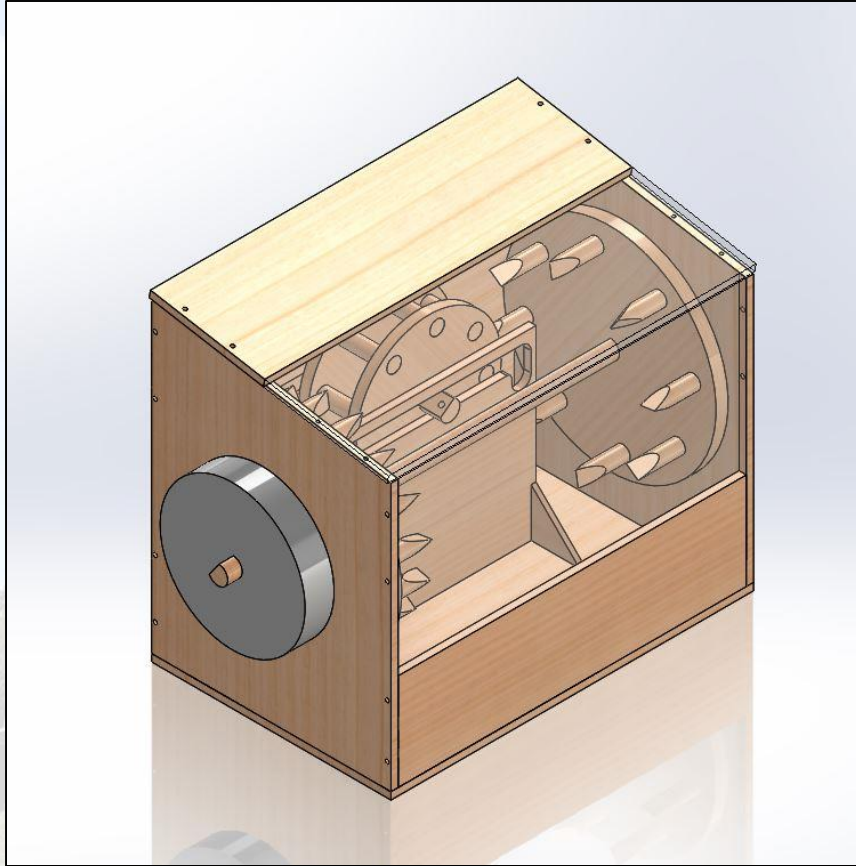
4 3 2 1

A B

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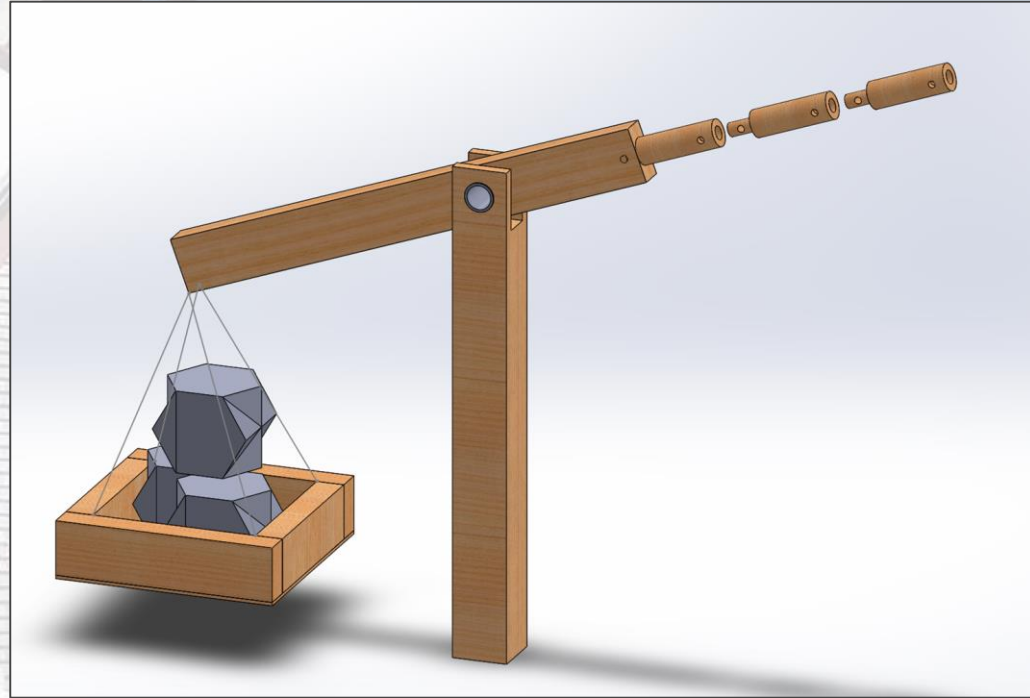
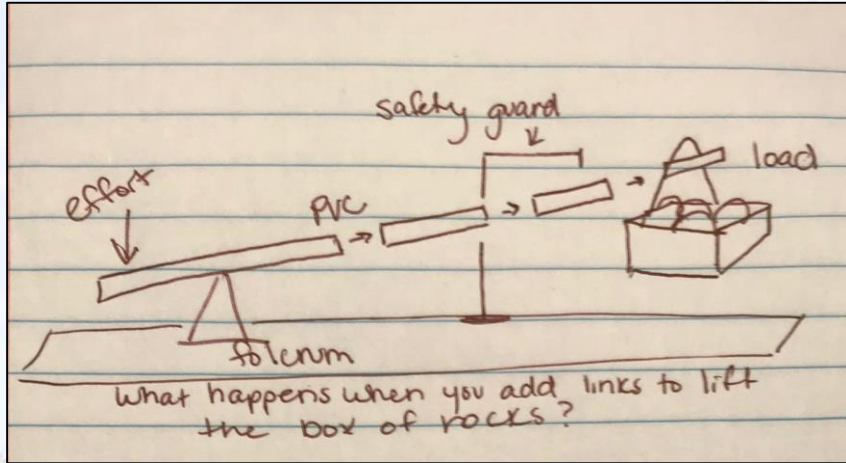
# SHIFTING GEAR RATIOS





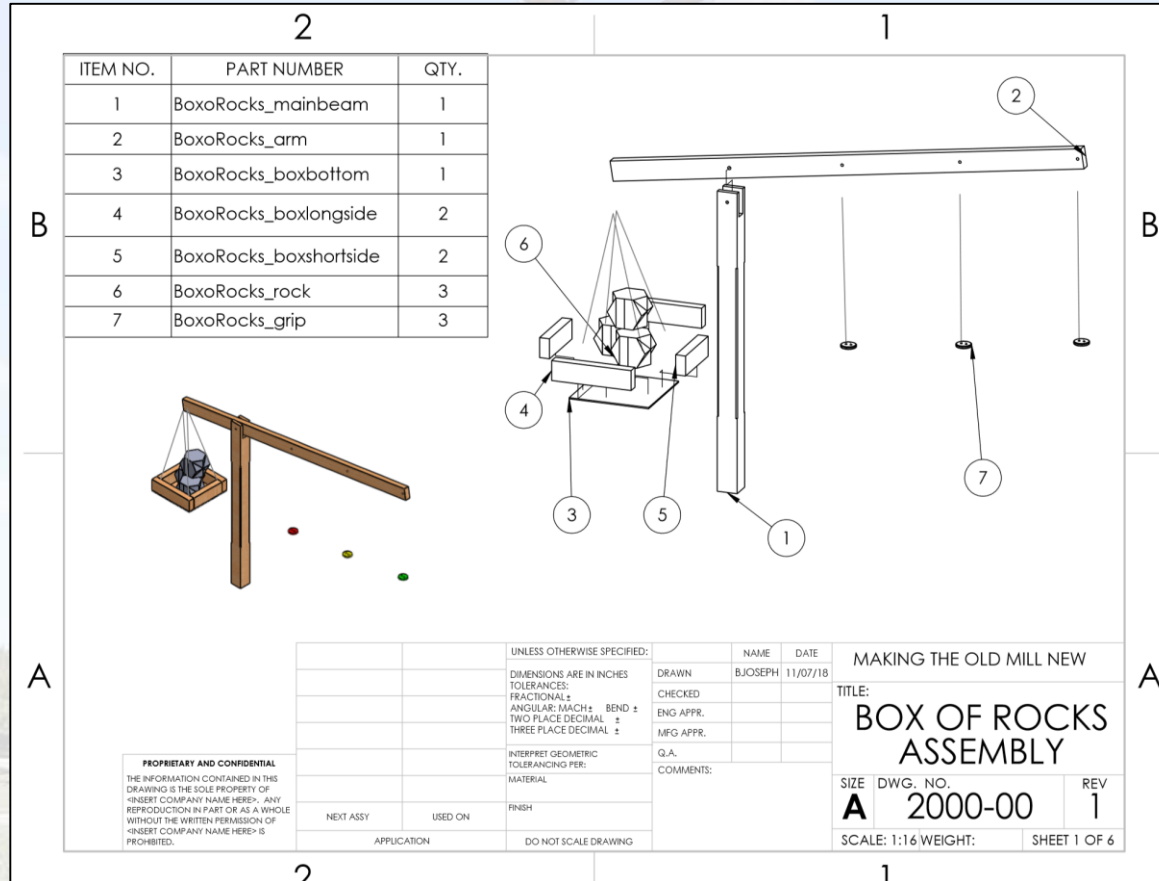


# BOX O' ROCKS

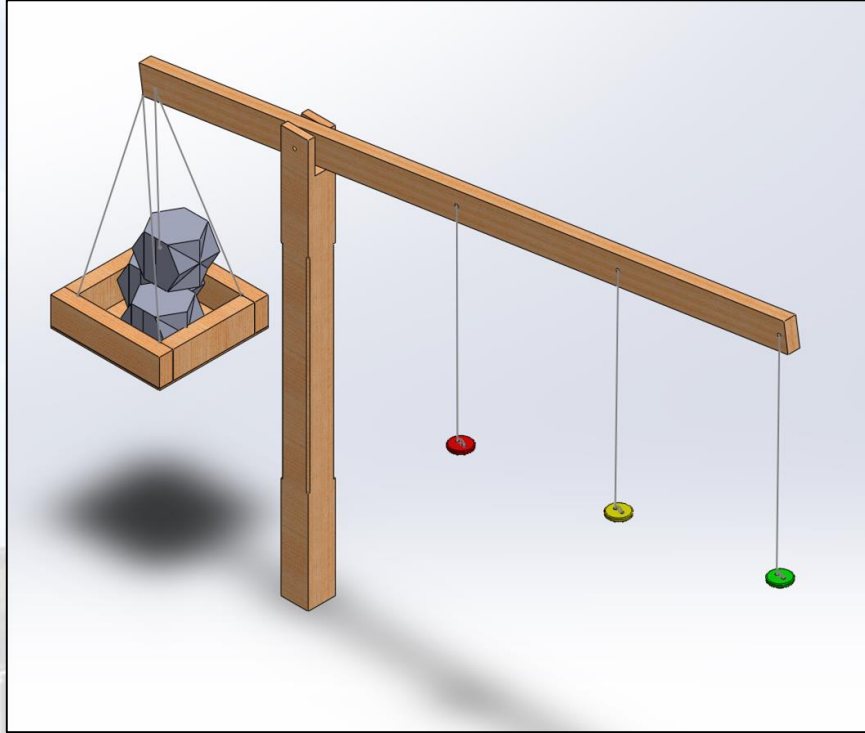




# BOX O' ROCKS



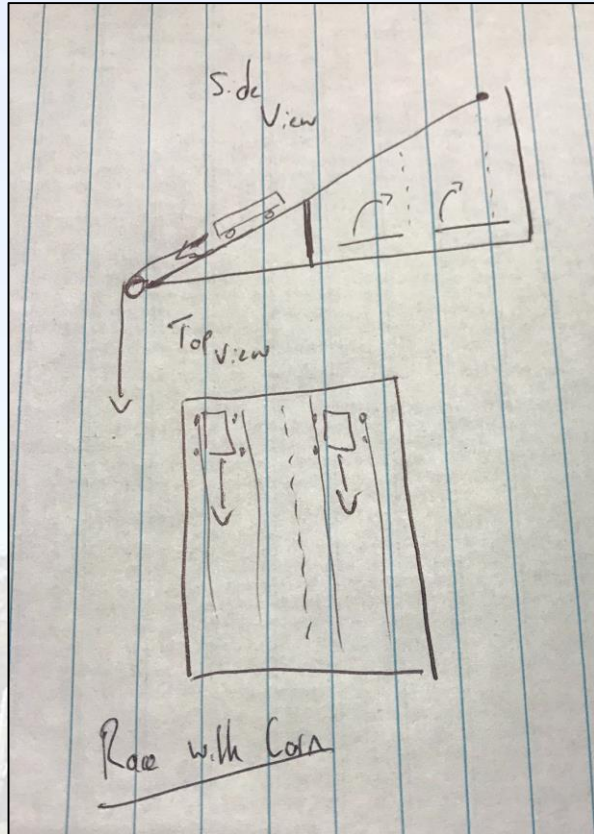
# BOX O' ROCKS



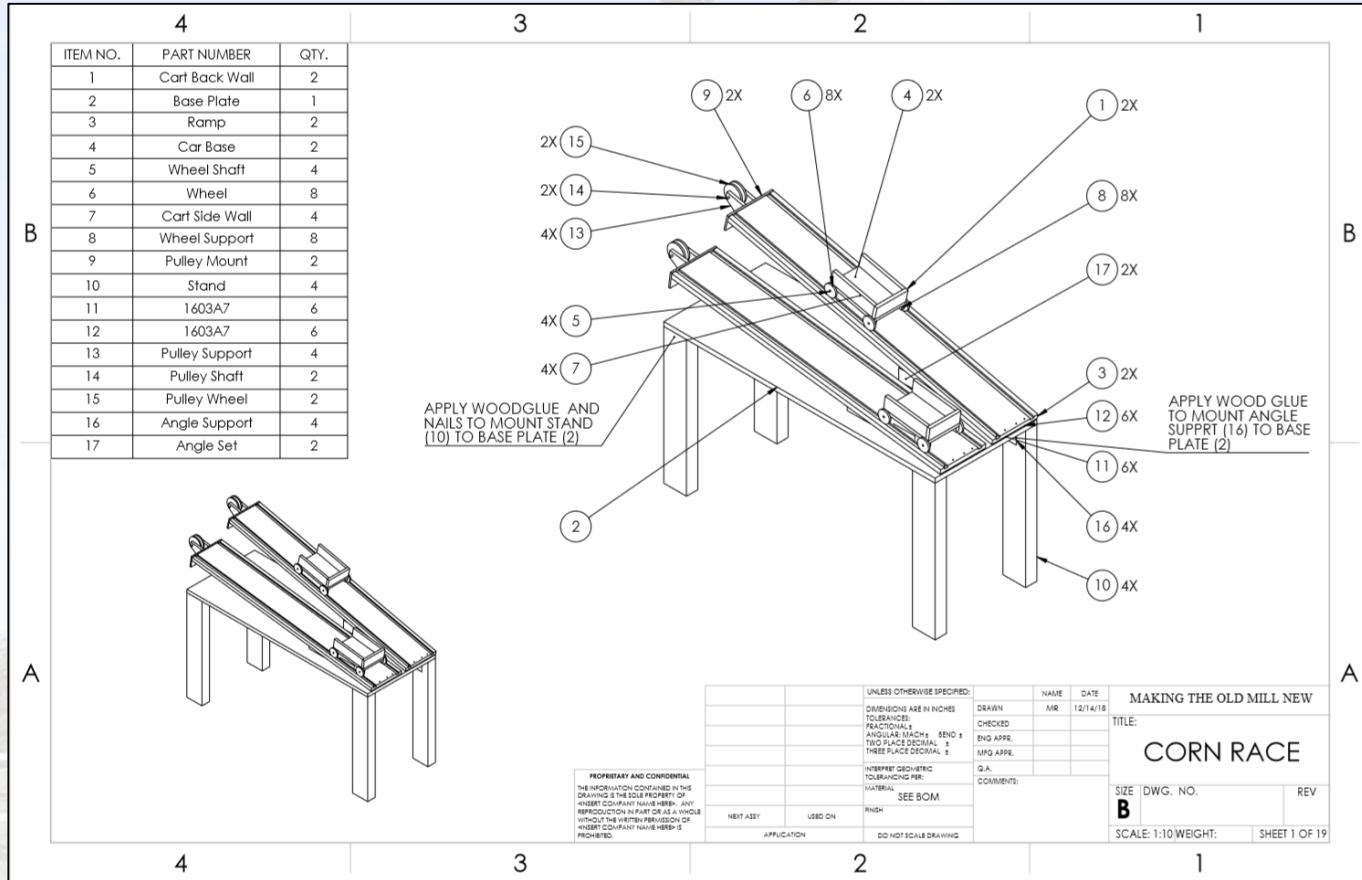




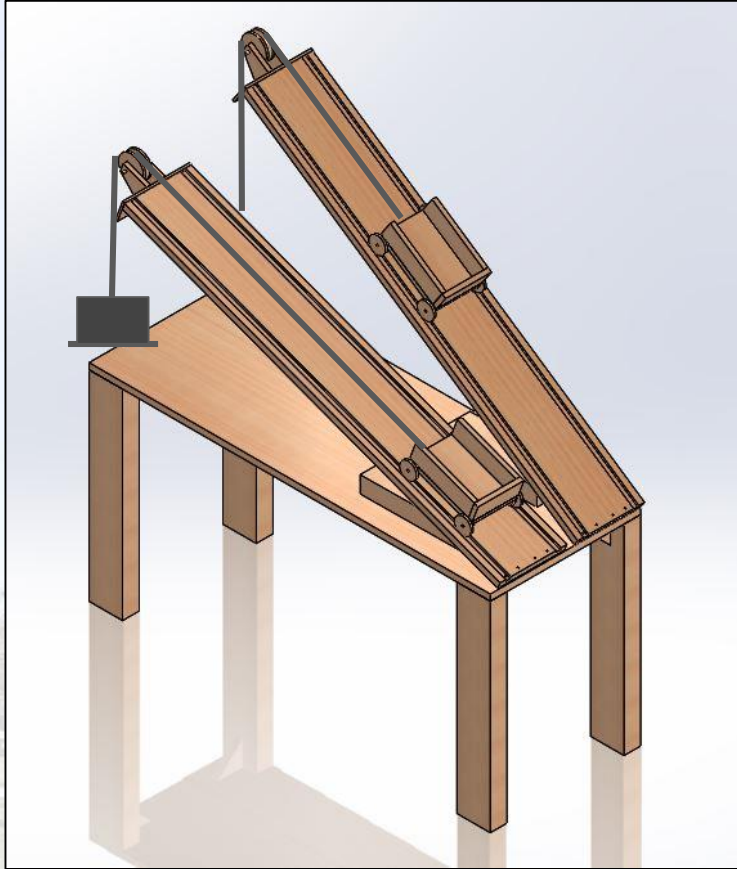
# RACE TO THE TOP!



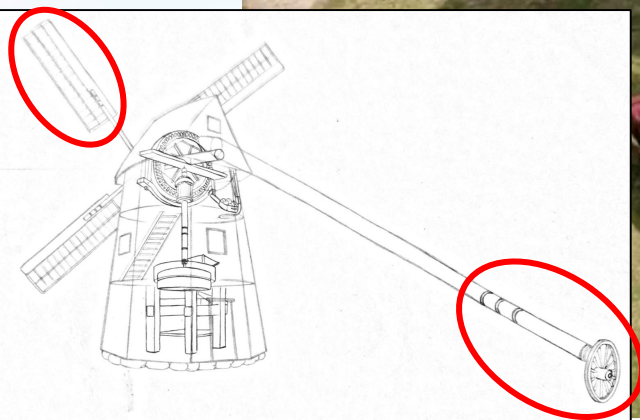
# RACE TO THE TOP!



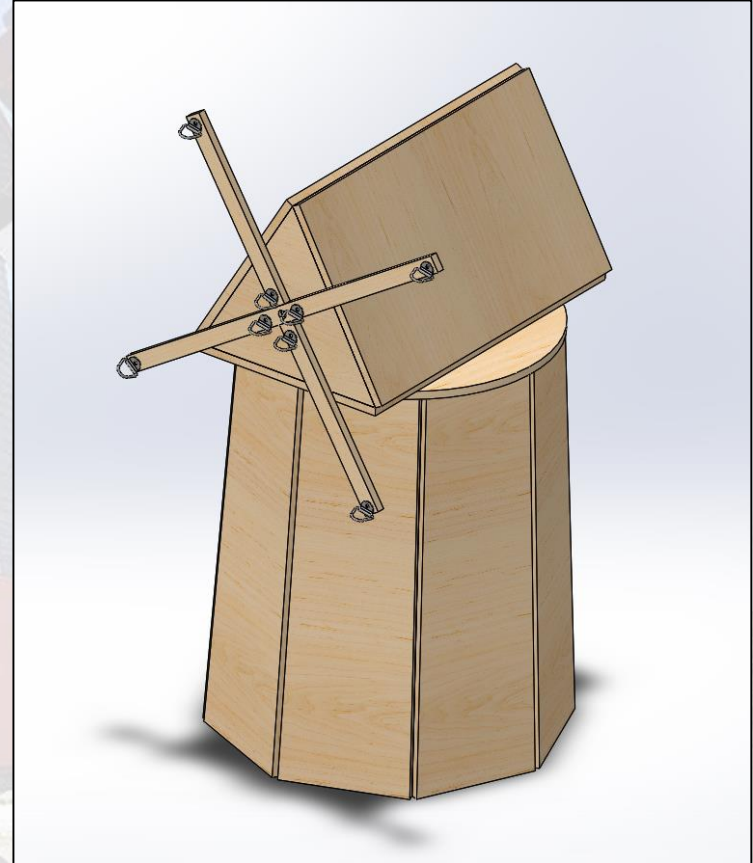
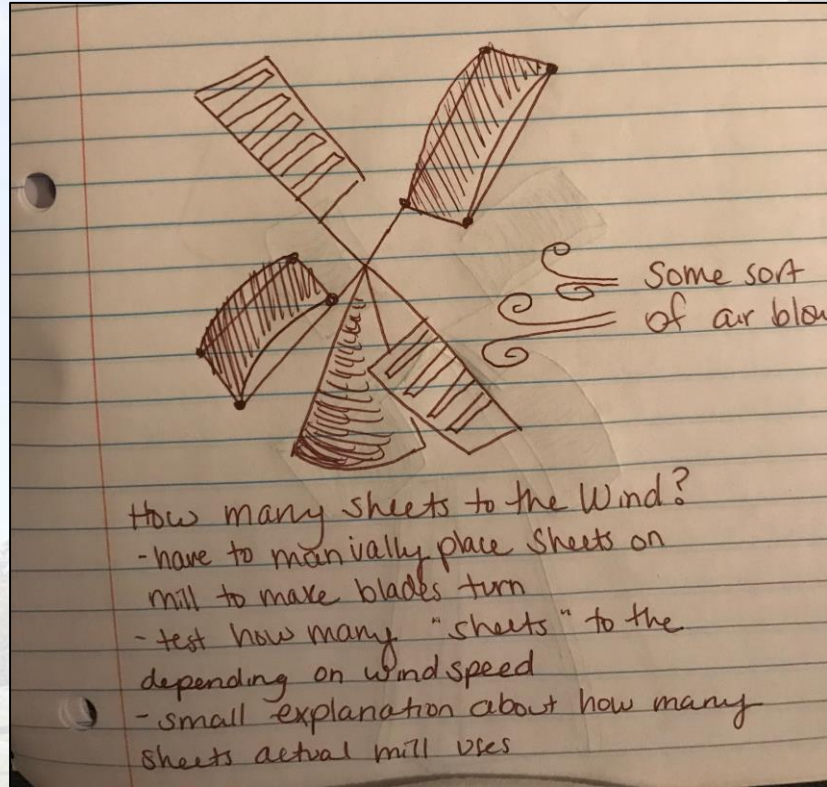
# RACE TO THE TOP!







# SHEETS TO THE WIND



# SHEETS TO THE WIND

ITEM NO.	PART NUMBER	QTY.
1	Top	1
2	Smock	2
3	Smock Bottom	1
4	Front Wall	1
5	Back Wall	1
6	Center Shaft	1
7	Vane	8
8	Vane Arm	8
9	Sheet	4
10	Center T	1
11	Sails Rod	4
12	Bottom	1
13	Wall	6
14	Trim	8
15	Center Shelf	1
16	1488A110 SURFACE-MOUNT HINGE	4

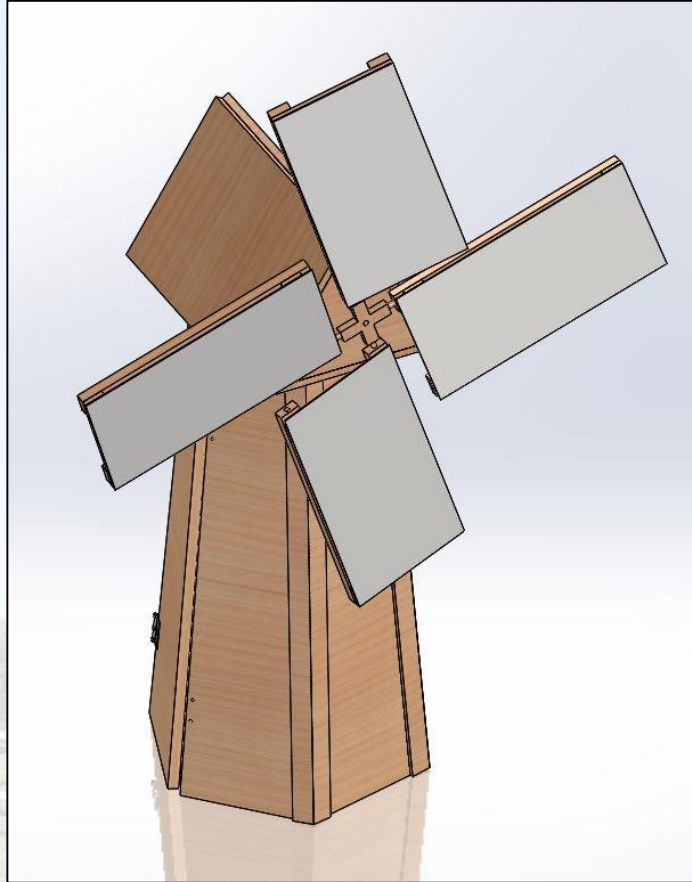
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UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN		12/14/18
TOLERANCES	CHECKED		
FRACTIONAL	ENG APPR.		
ANGULAR MATCH	MFG APPR.		
TWO PLACE DECIMAL	G.A.		
THREE PLACE DECIMAL	COMMENTS:		
INTERPRET GEOMETRIC TOLERANCING PER ASME Y14.5-2018	SEE BOM		
NEST ASST	USED ON		
APPLICATION	DO NOT SCALE DRAWING		

MAKING THE OLD MILL NEW			
TITLE: SHEETS TO THE WIND			
SIZE	DWG. NO.	REV	
B			
SCALE: 1:32/WEIGHT:		SHEET 1 OF 20	



# SHEETS TO THE WIND



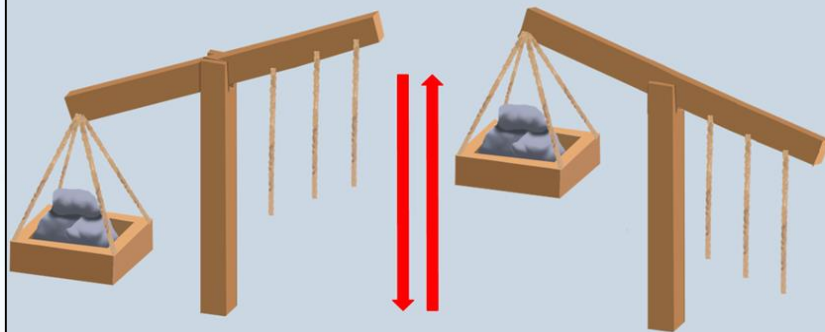
# THE NHA WORKSHOP WAS A RESOURCE AS WE DESIGNED AND PROTOTYPED THE EXHIBITS.





# EACH EXHIBIT IS DESIGNED TO HAVE EDUCATIONAL VALUE.

## CAN YOU LIFT THE BOX O' ROCKS?



WHAT'S GOING ON HERE? **MECHANICAL ADVANTAGE!** THE FARTHER AWAY THE EFFORT IS FROM THE FULCRUM, THE EASIER TO LIFT THE LOAD.

HOW DO THE MILLERS STOP THE WINDMILL FROM SPINNING? THE ANSWER IS SIMPLE, THEY USED A GIANT BOX OF ROCKS!

**CHALLENGE:** CAN YOU LIFT THE BOX OF ROCKS? TRY PULLING ON THE ROPES TO SEE WHICH ROPE MAKES IT EASIER TO LIFT.

**INSTRUCTIONS:** STAND TO THE SIDE AND PULL DOWN ON ONE ROPE TO LIFT THE BOX OF ROCKS.

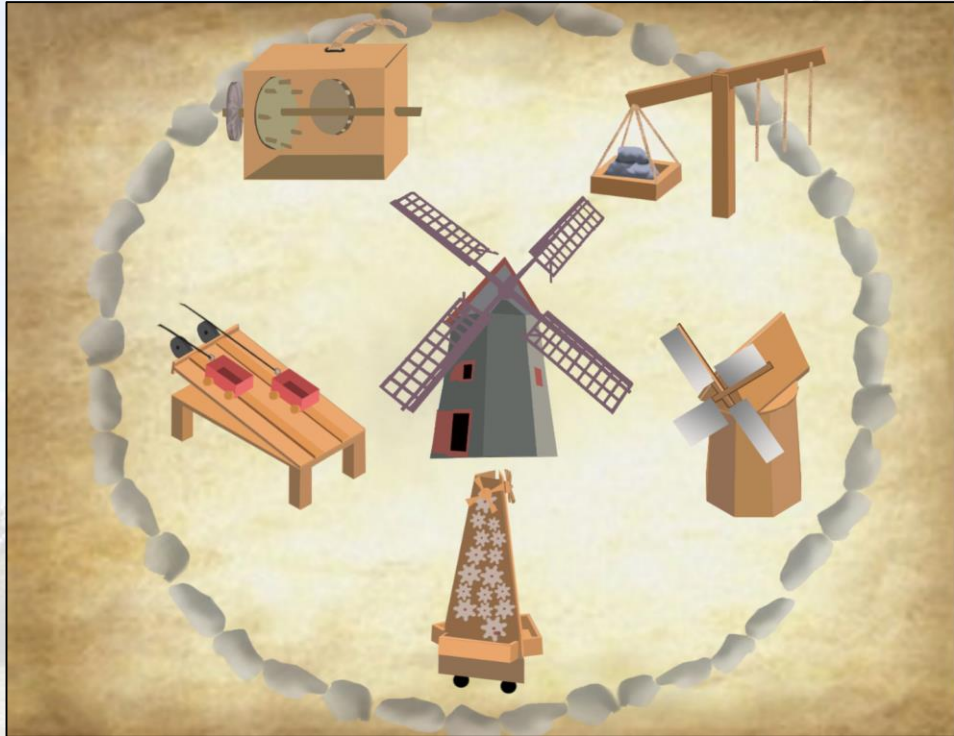
**DO NOT HANG OR CLIMB ON EXHIBIT**



**NANTUCKET**  
HISTORICAL ASSOCIATION

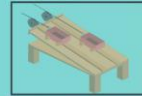


# A VOYAGE LOG WILL PROVIDE VISITORS WITH AN ADVENTURE AT THE OLD MILL.



COLLECT YOUR EXHIBIT STAMPS  
TO GET THE MILLER'S STAMP OF  
APPROVAL

STAMP BELOW!



MANNY THE MILLER IS A REAL  
MILLER AT THE OLD MILL! HE'S  
LIVED IN NANRUCKET HIS  
WHOLE LIFE AND HAS HELPED  
RUN THE MILL FOR OVER 13  
YEARS.

LAST STOP! MILLER'S STAMP  
OF APPROVAL!

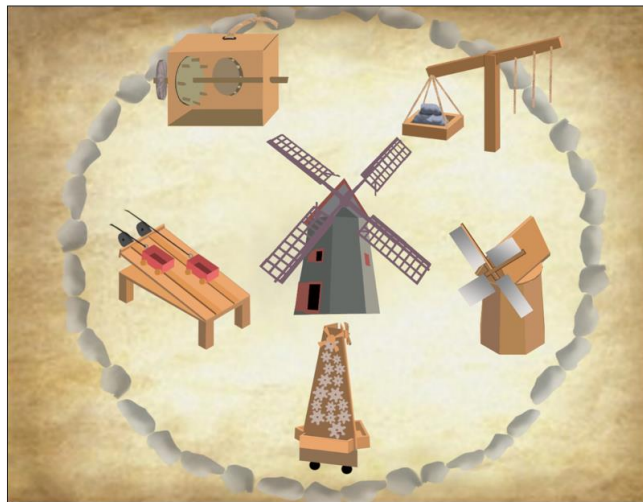


# SUPPLEMENTAL MATERIAL WILL AID TEACHERS.

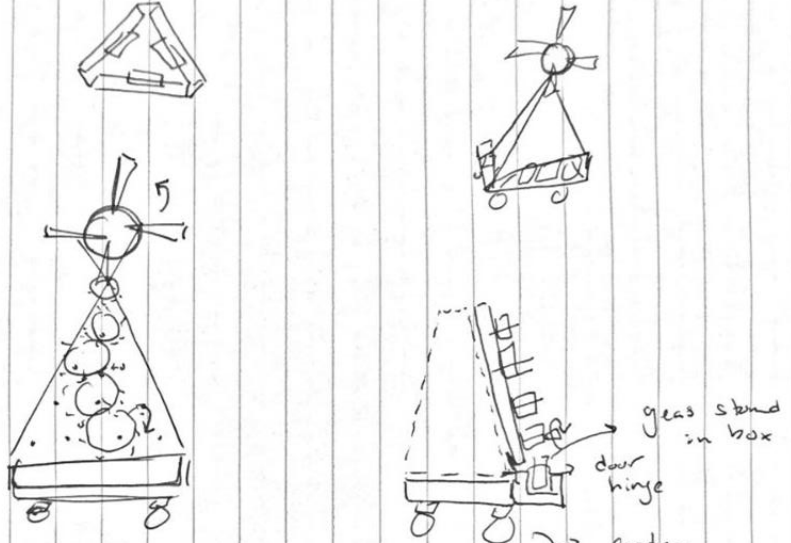
## TEACHER EDUCATIONAL GUIDE FOR EXHIBITS AT THE OLD MILL



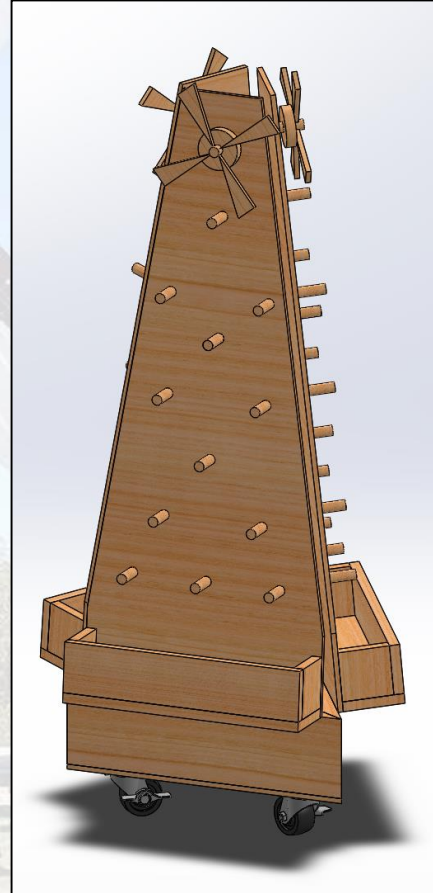
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# GEAR PUZZLE



- competition between different sides
- "Who can make the mill turn first?"
- Have to assemble gear train.

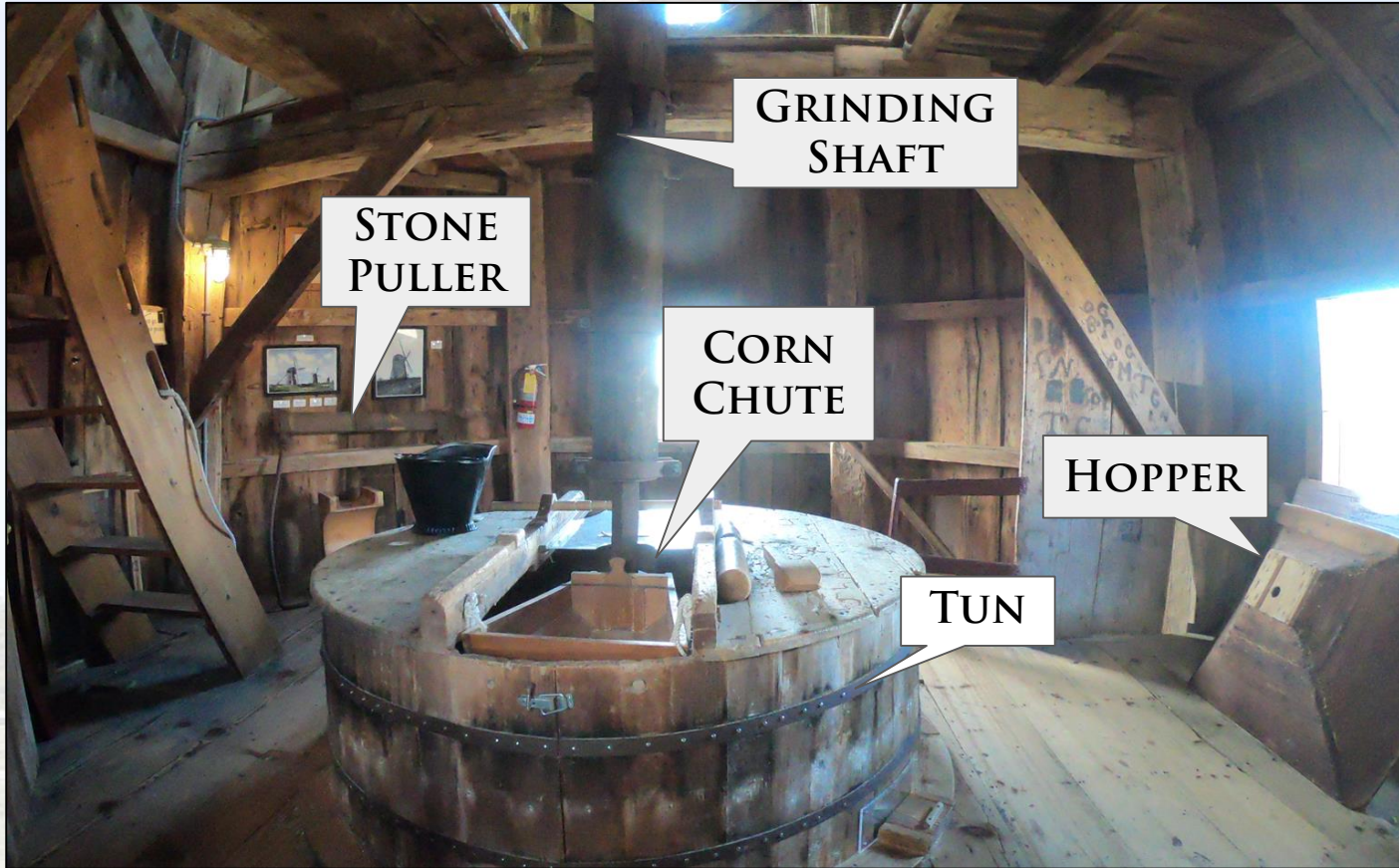




# THE SIMPLE MACHINE EXHIBITS CAN BE DISPLAYED IN THE DISCOVERY ROOM.



# NEW SIGNAGE WOULD IMPROVE VISITOR EDUCATION.





# SOCIAL MEDIA STORY POSTS WILL INCREASE ONLINE VISIBILITY OF THE OLD MILL.



THE  
OLD  
MILL





# SUMMARY





THANK YOU!

PROFESSOR SCOTT JIUSTO

JOE BEDELL

PROFESSOR FRED LOOFT

MELANIE HAJJAR

JAMES RUSSELL

NHA STAFF

ED RUDD

NANTUCKET YACHT CLUB

MARY LACOURSIERE

EVERYONE WHO HELPED  
US ALONG THE WAY

# THANKS FOR HANGING AROUND!

