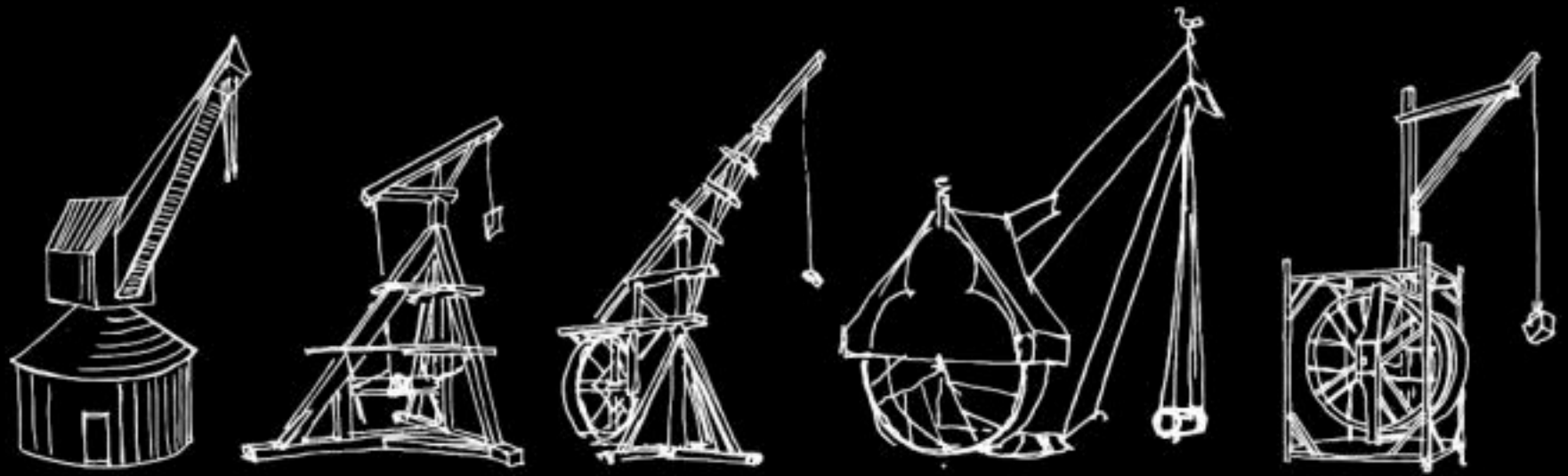


KRAN•GRUE•CRANE•KRAAN•JEŘÁBU

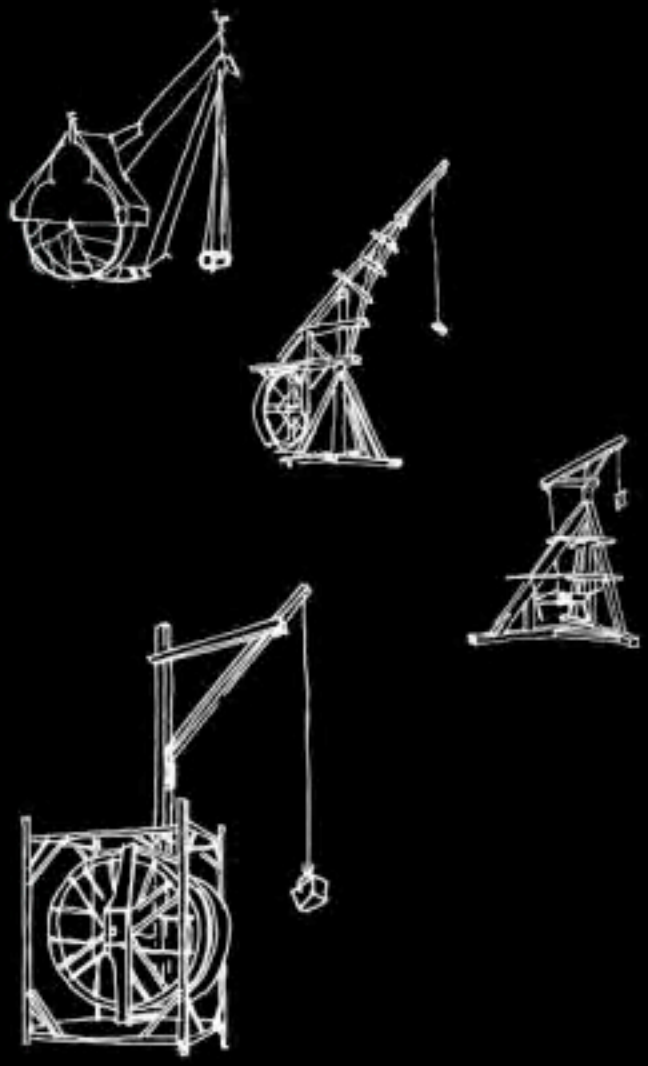
crane

handshouse

PRAGUE CASTLE 2006

Crane Building

2001 - Initial research into Great Crane of Bruges
2002 - Built a Perronet Crane Norwell MA
2003 - Built a Diderot T-crane MassArt
2003 - Crane Exhibit MassArt
2006 - Prague Castle Crane Czech Republic



Castle Tocnik

Castle Tocnik - aerial view

Existing 19c. Truss Reconstruction is incorrect structure.

Transport of the Materals using the Contemporary crane and equipment

Transport of the Materals using the Contemporary crane and equipment

Crane possibilities at Castel Karlstejn

Lifting by hand with a come-along.

Heliocopter crane technique at Castle Tocnik Great Palace 1992

Objectives of the Tocnik Crane experiment:

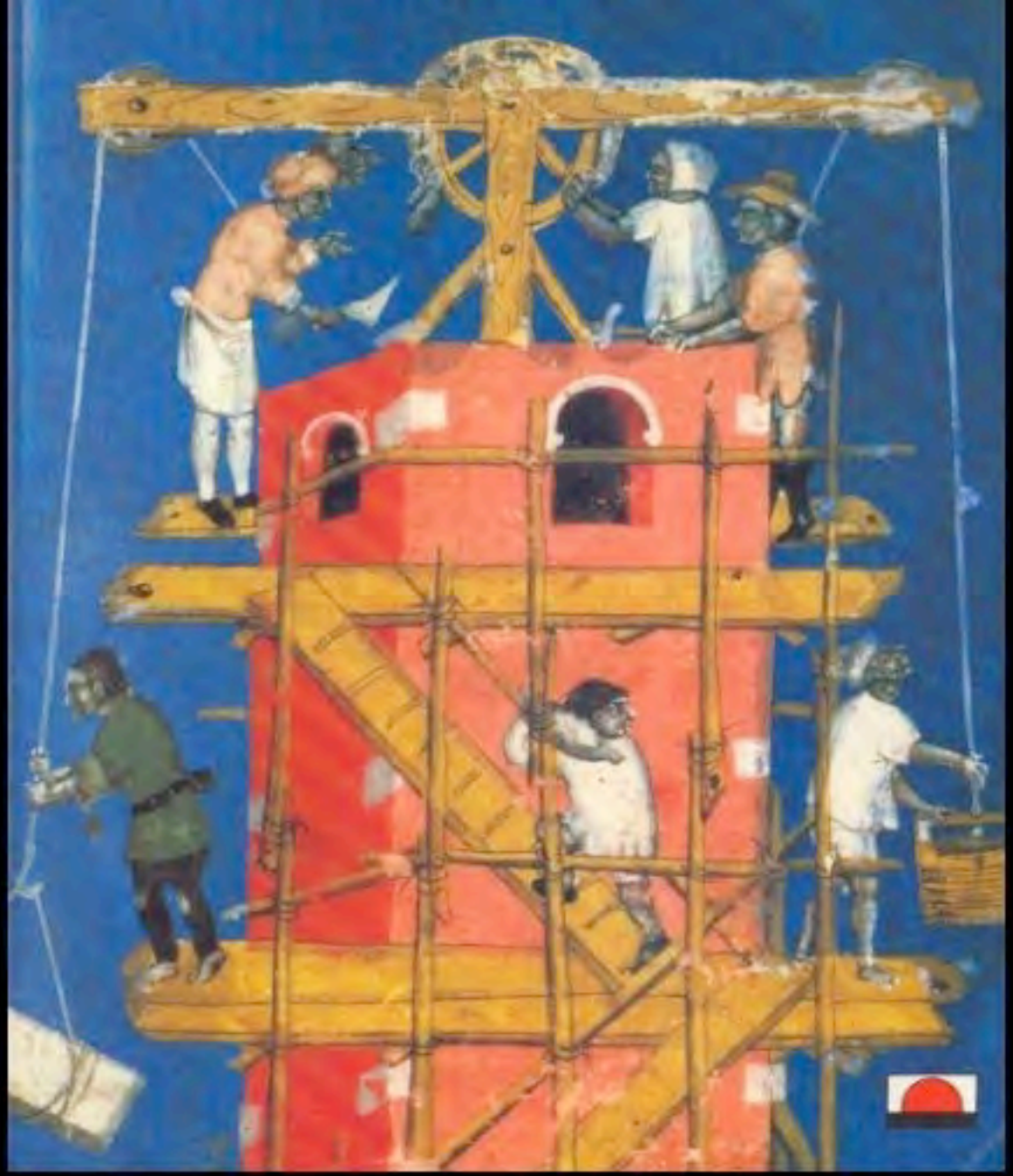
1. Verify the historic art sources

2. Demonstrate a forgotten construction skill of our ancestors
   - applied on a real functional object
   - create public interest in cultural heritage.

3. Check the technical parameters of the machine

4. Compare this machine with modern cranes
   - Productivity
   - Production and energy costs
   - Ecological impacts

Researching
Human Powered
Cranes through Art



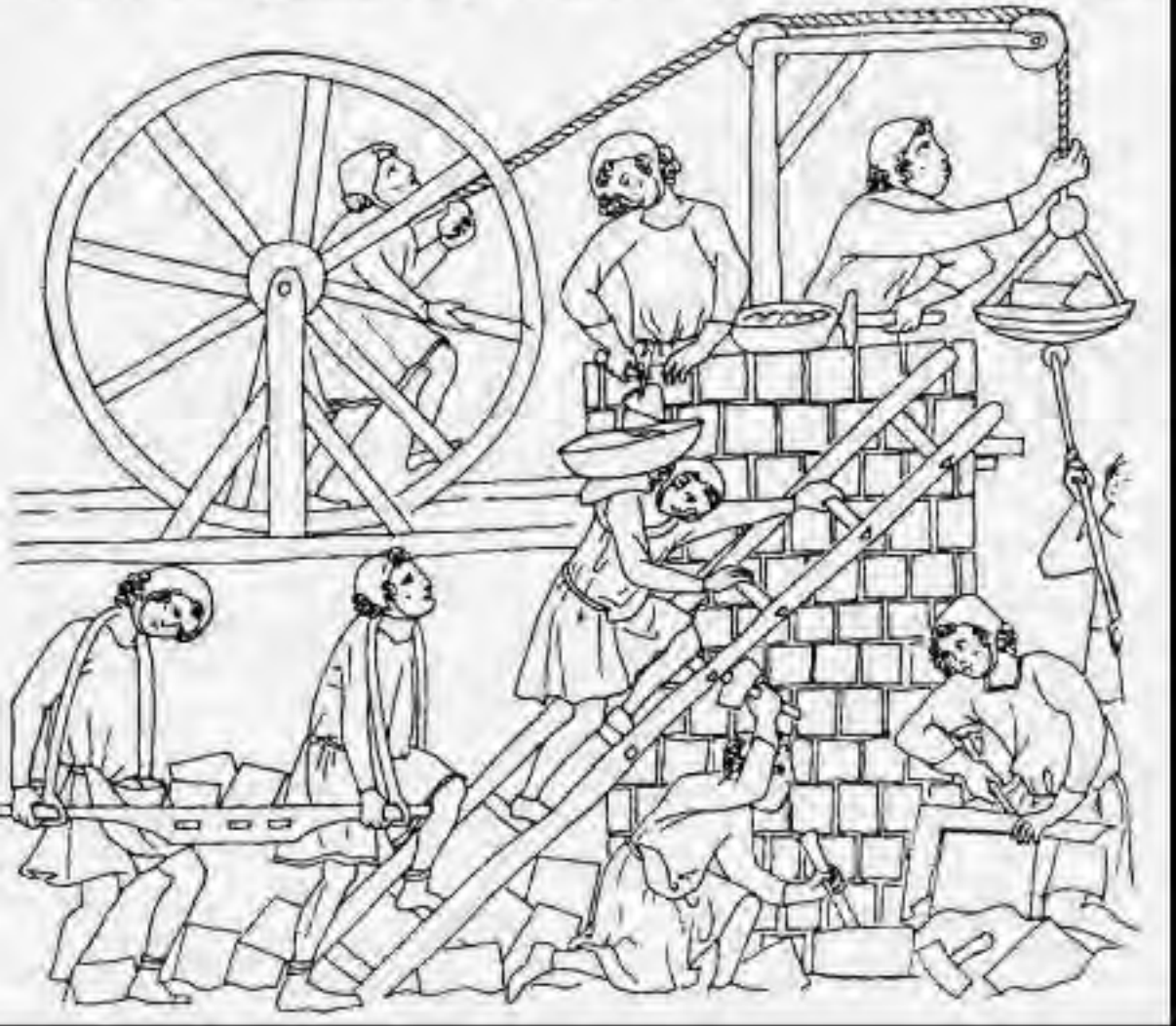
Crane with hand wheel
and without rotation.

Stavba v__e babylonské, Rudolf von Ems, Weltchronik

Lifting Arm with Windlass

Stavba velkého kostela v Bernu z r. 1420, Diebold Schilling, Bern Chronicle, 1484-5.

Wheel is independent of post and causes difficulty with rotation

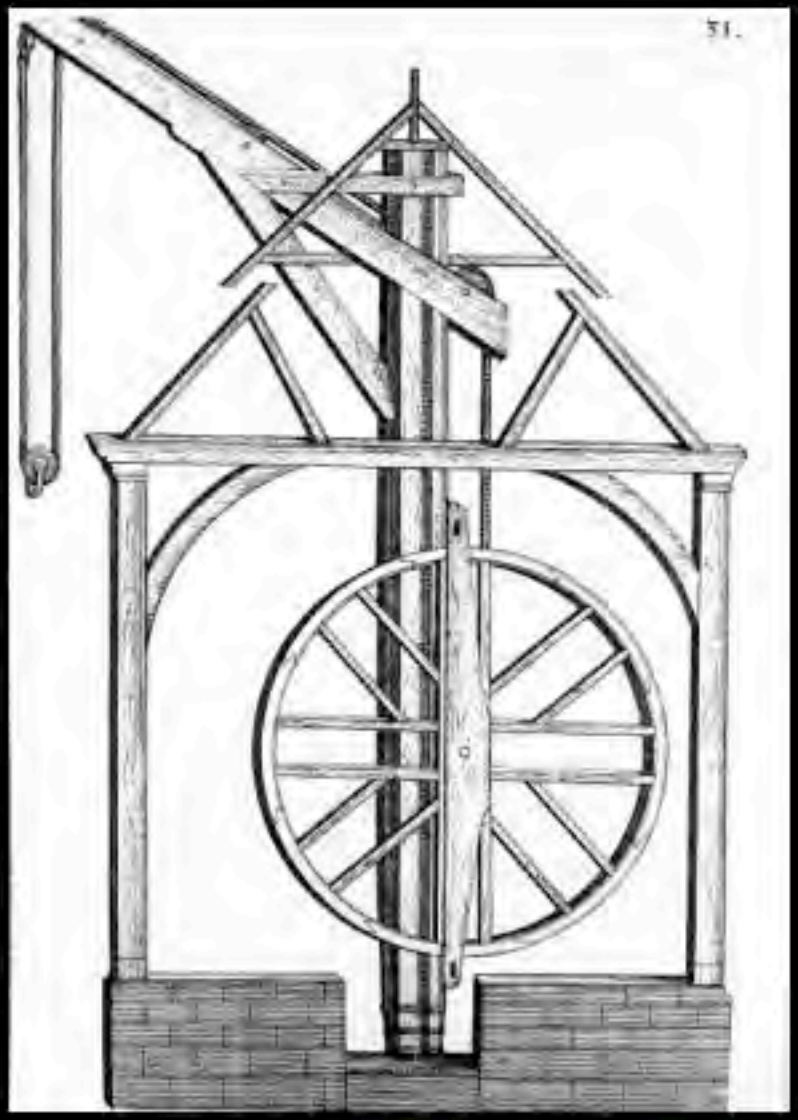


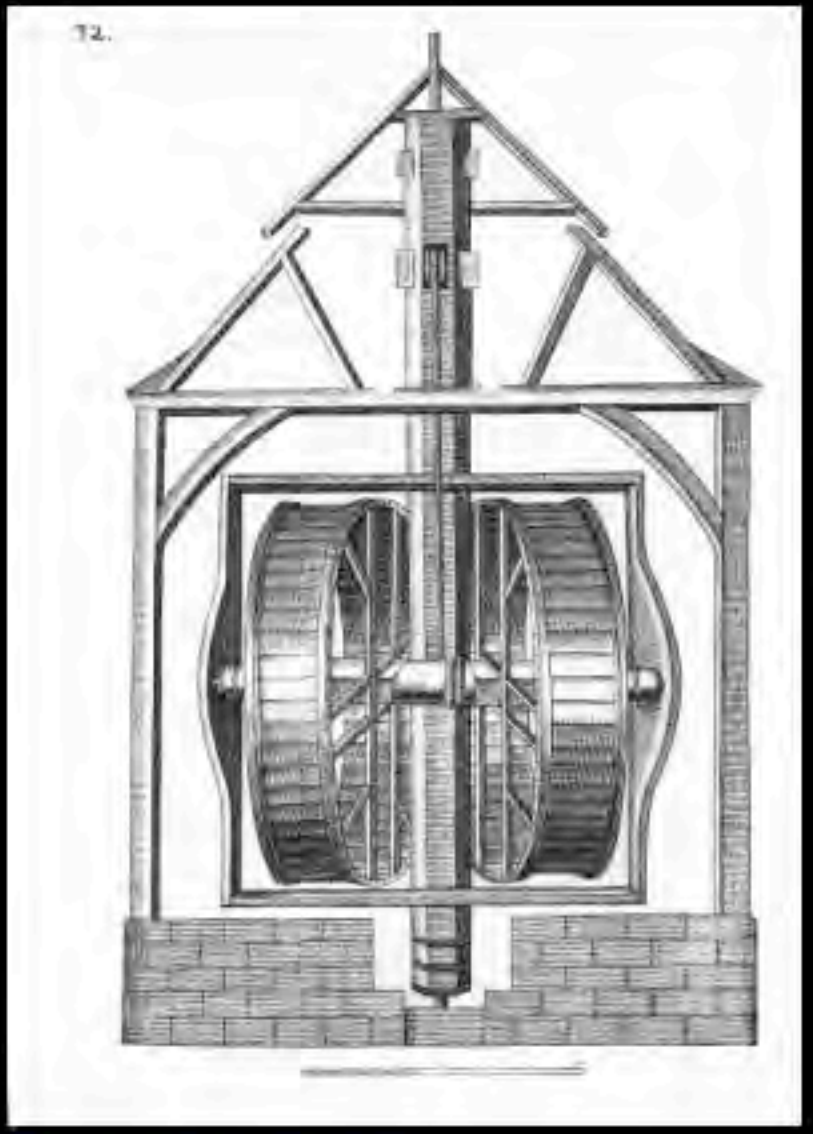
Maciejowsky – Starý zákon, New York,
Pierpont Morgan Library, 13. století.

Example of Cage Wheel

Wroclav,
Kunstgewerbemuseum
Barbara – Altar, 1447.

Drawing of the interior of the crane workings with offset wheel and post. All parts can rotate 360 degrees.

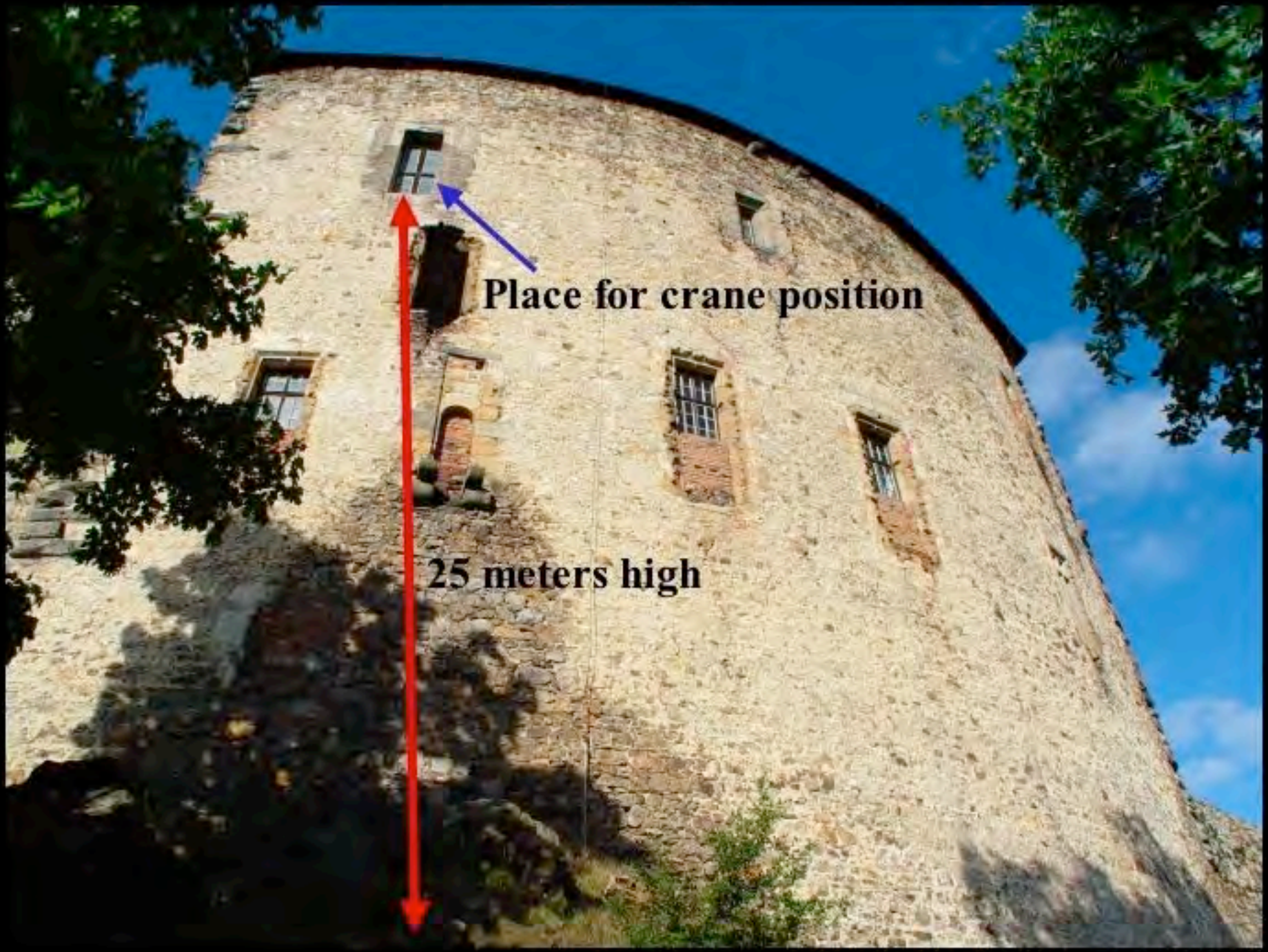


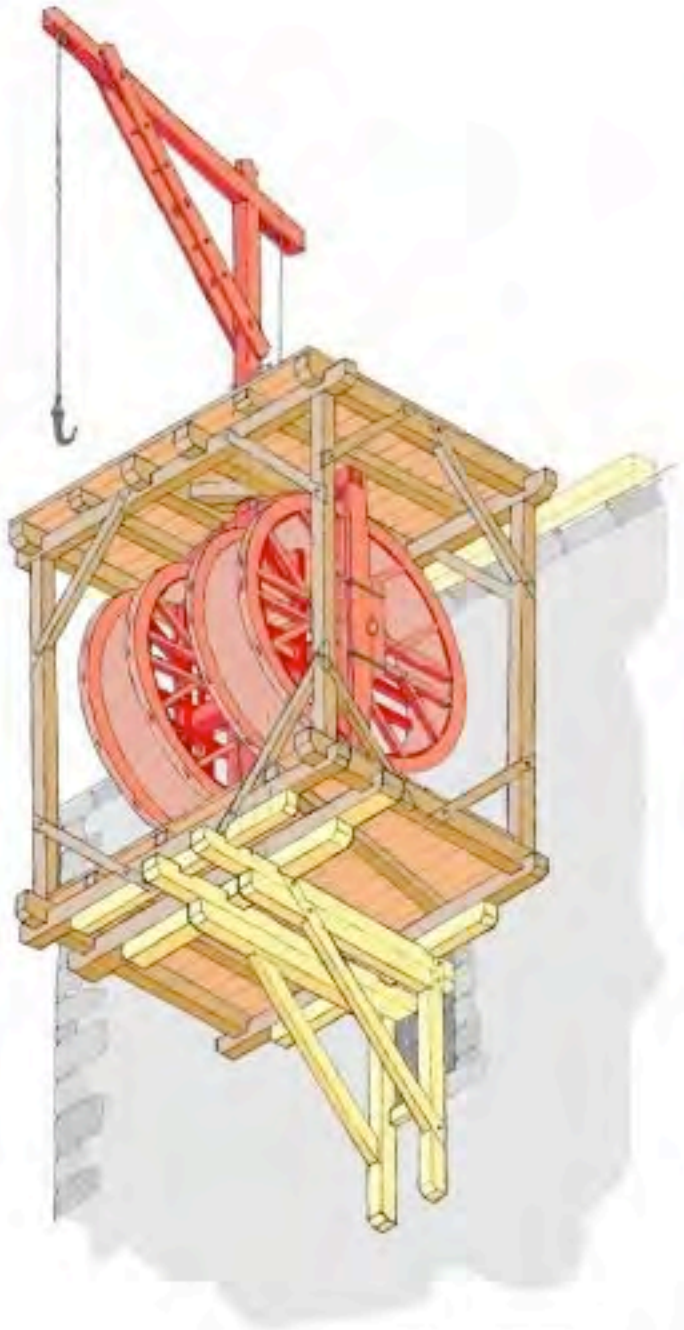


P_istavni je_áb, Architectura civilis, Johann Wilhelm, 1668.

Bible of Vaclav IV
14th c.

Václavova bible, National Bibliothek, Wien, 1390 – 1400.


Place for crane position
25 meters high

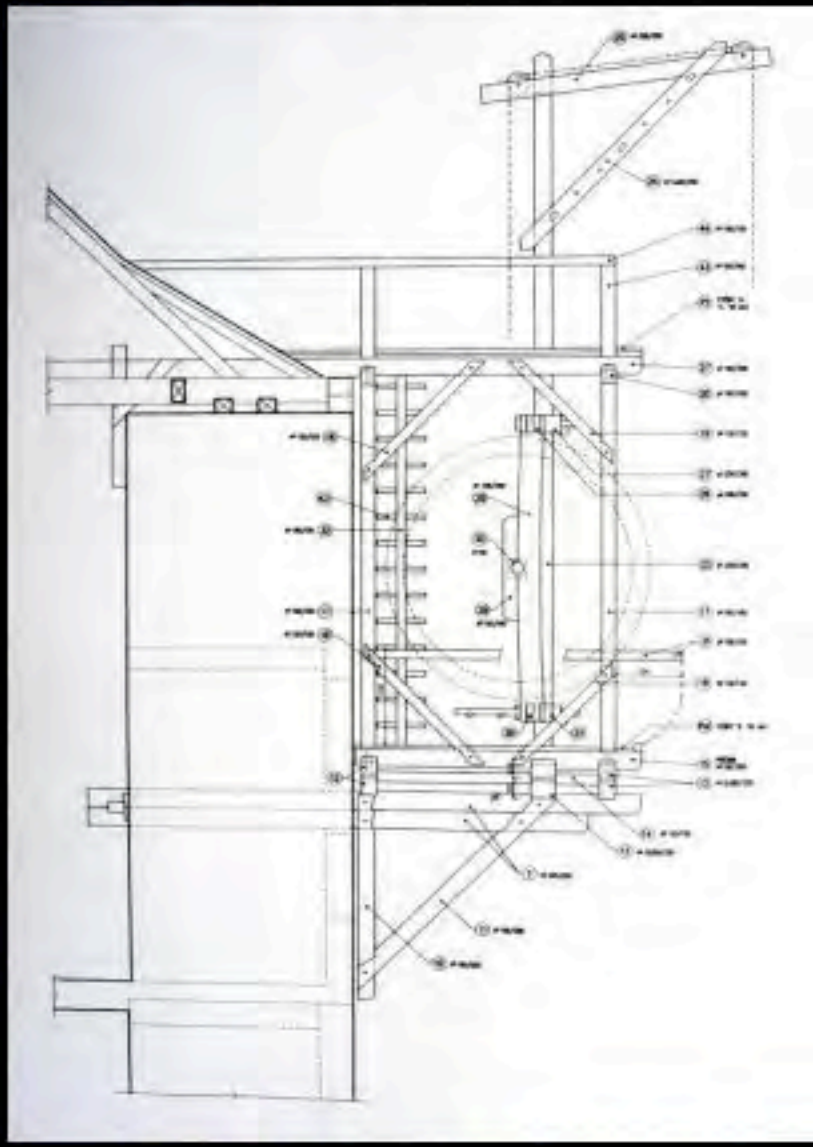


Red is crane

Orange is cage

Yellow is Foundation for
Cage set into existing window.

Drawings by Vít Mlázovsky



Detail of through wall connection

Construction of the Tocnik Crane at the Castle Prague using Medieval tool and techniques 2007


The Czech Team

Zimmermann









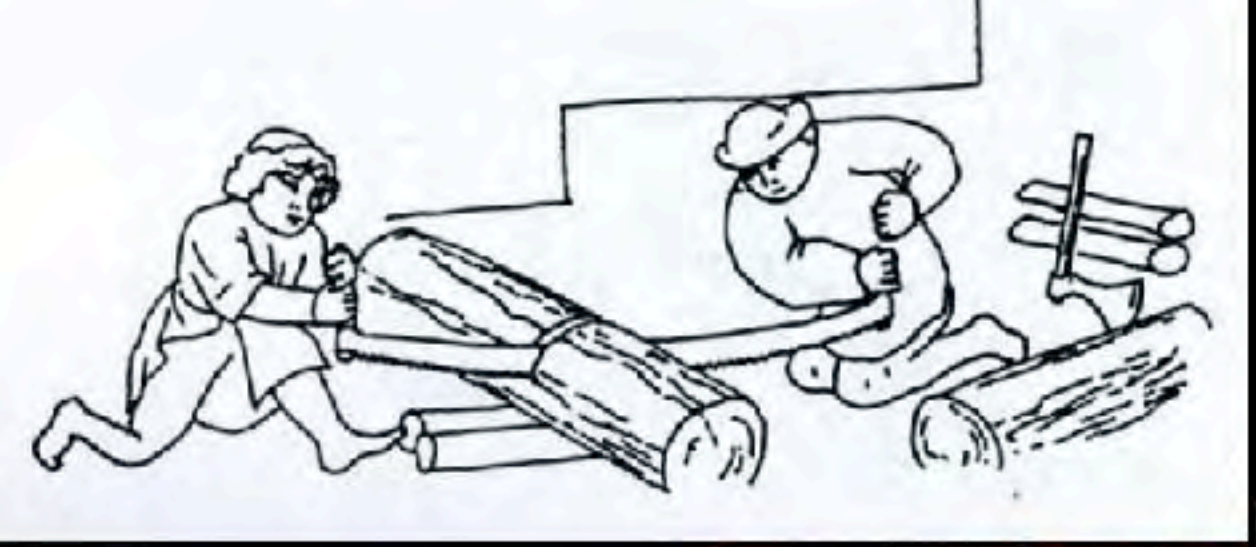
The American Team

Art as a resource of early tools and techniques

Bible Václava IV. ze 14. C.

Felling the trees with axes

Cologne, St Heribert Church, Medallion, 1160-70



Munich, Bayerische Staatsbibliothek, Simon Benning, Flemish Callendar, 1500

Cutting Logs with a two handled saw

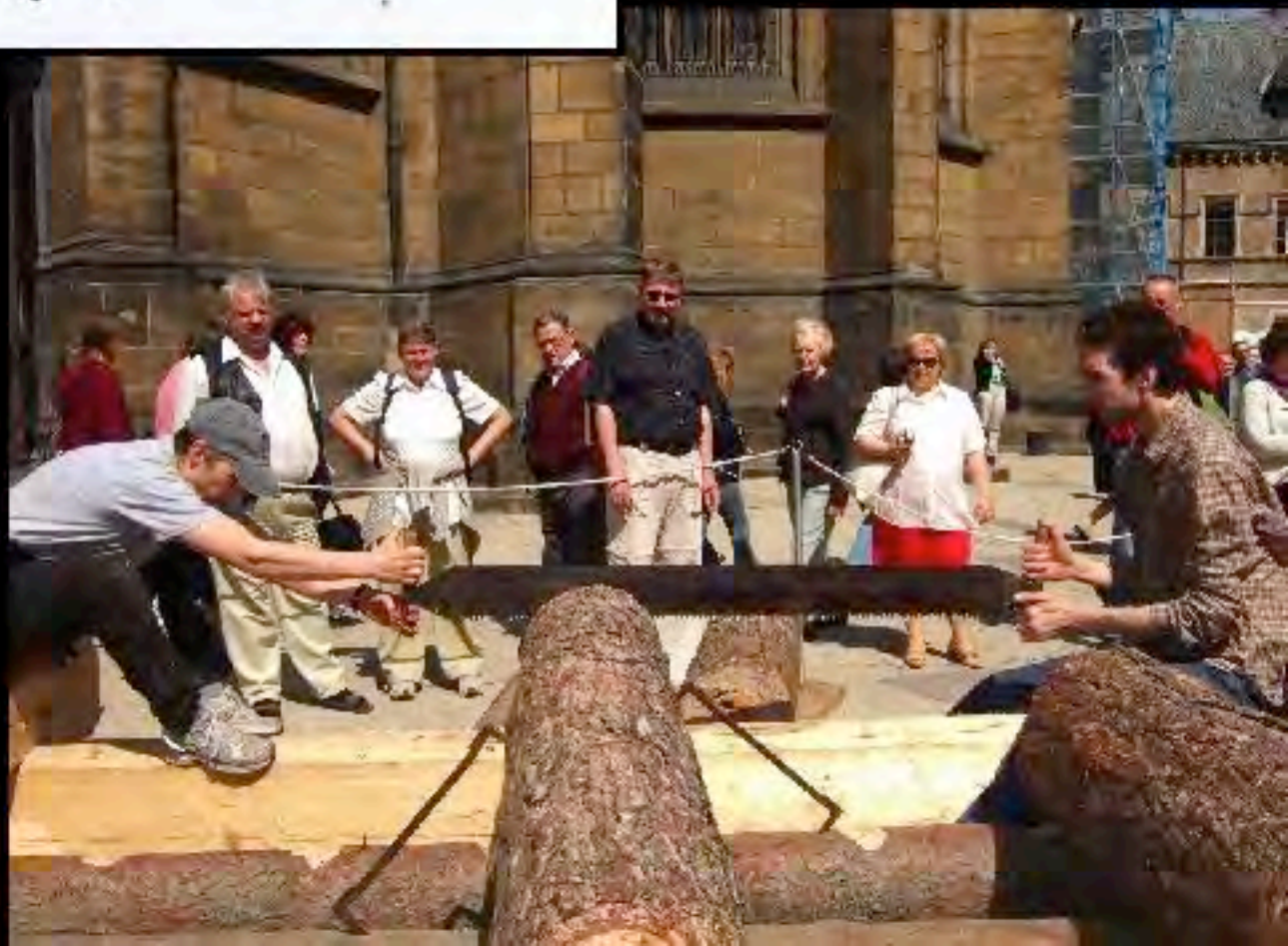


Abb. 27. Zimmerleute bei der Arbeit, im Hintergrund Kaiser Maximilian. Holzschnitt von Hans Schäufelin (?) (ca. 1492—1540) aus dem Weißkunig. Mather S. 134, 271.

WOODCUT BY HANS SCHAUFFLEIN, NURENBERG, C. 1500

HEWING TIMBER SQUARE WITH A BROAD AX

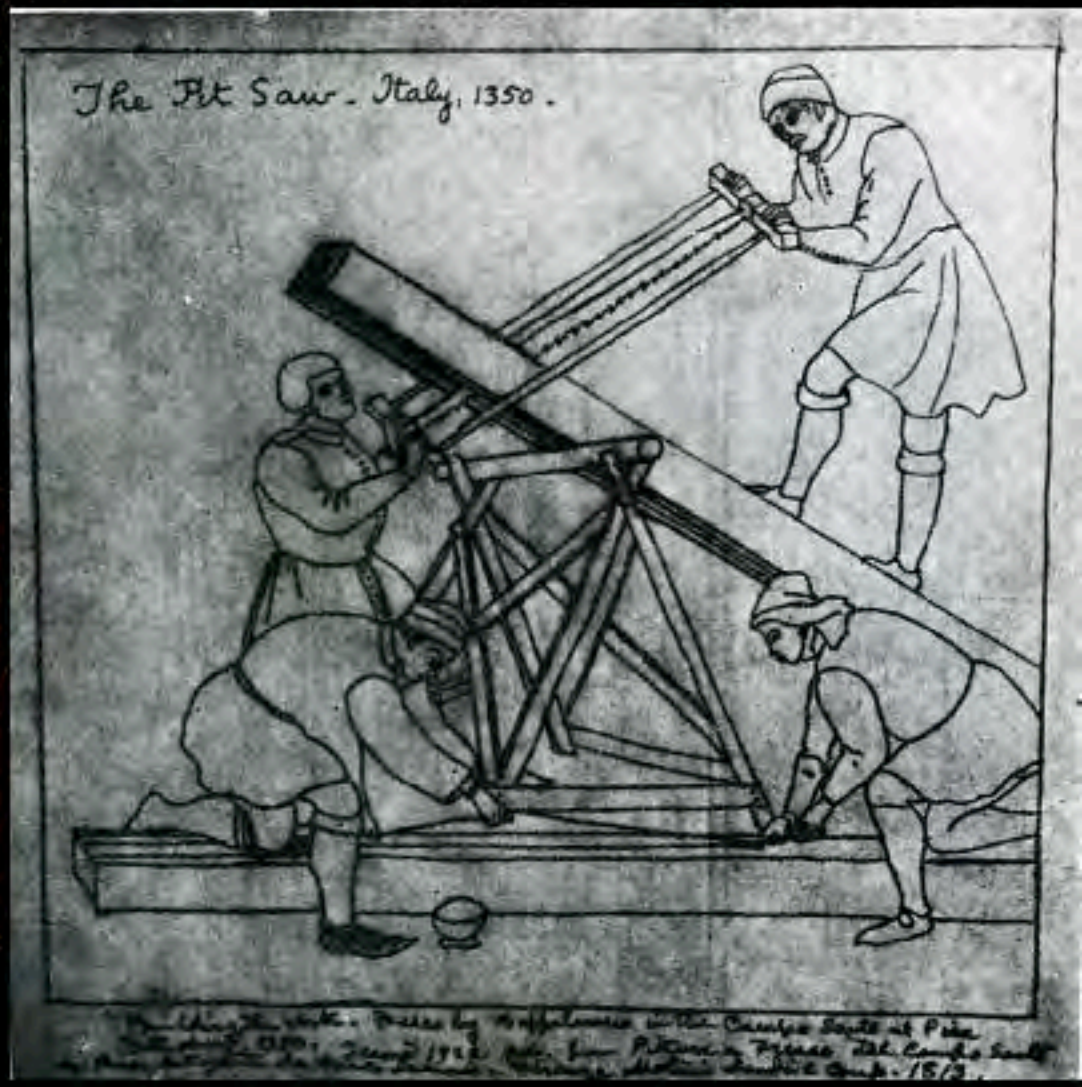
Paris, Bibliotheque Nationale,
Livres des Rois, 1448 -9

Hewing -
long handled ax low position

Nuremberg, Anton Koberger,
Woodcut, 1493

Hewing
short handle ax on trestles

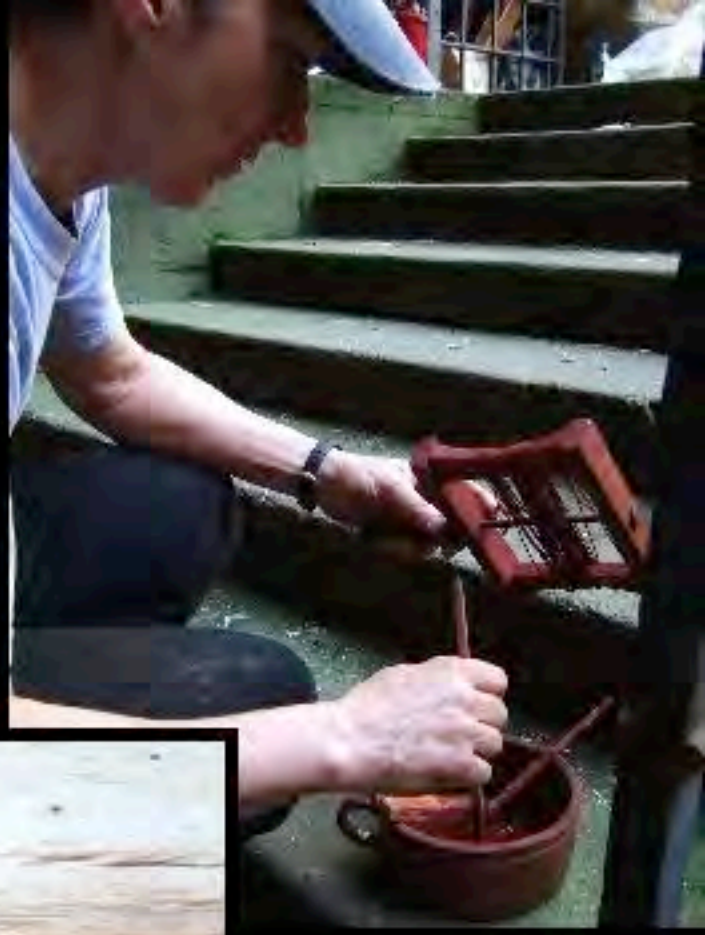
Cutting boards with pit saw.



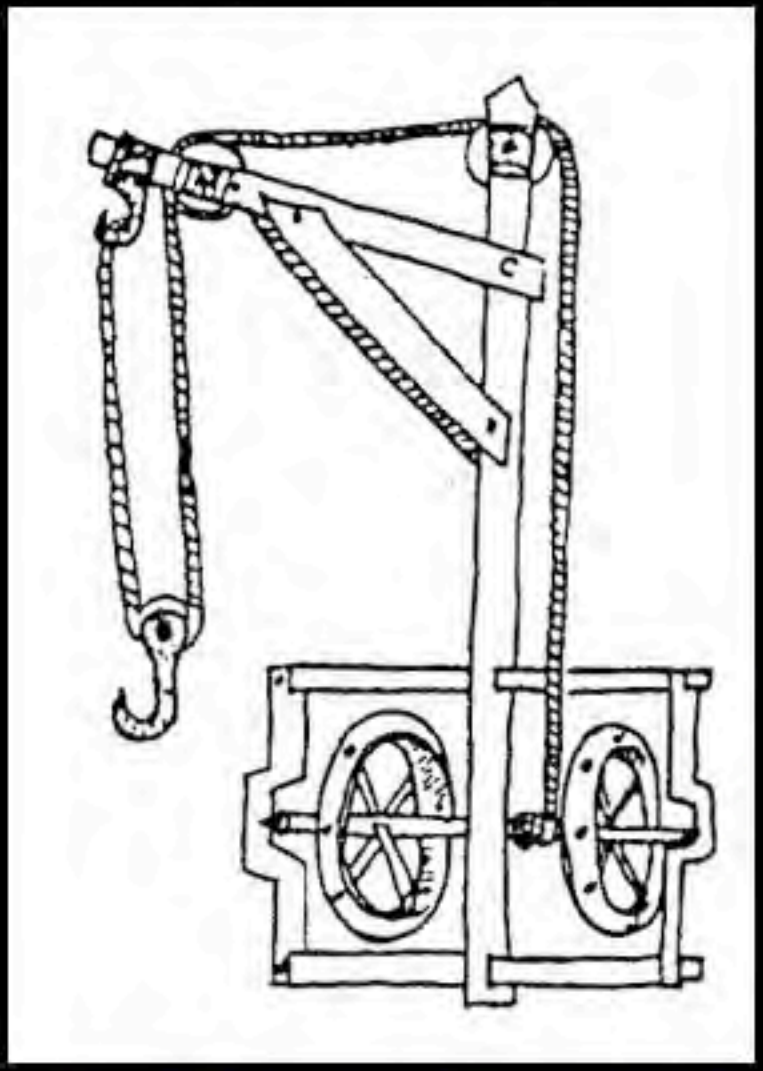
Building Noah's Ark, tracing from fresco by Christofano Buffalmacco, , Pisa, 1350

The Chalk Line

Brussels, Bibliotheque Royale
Illumination, Raoulet D'Orleans,1376

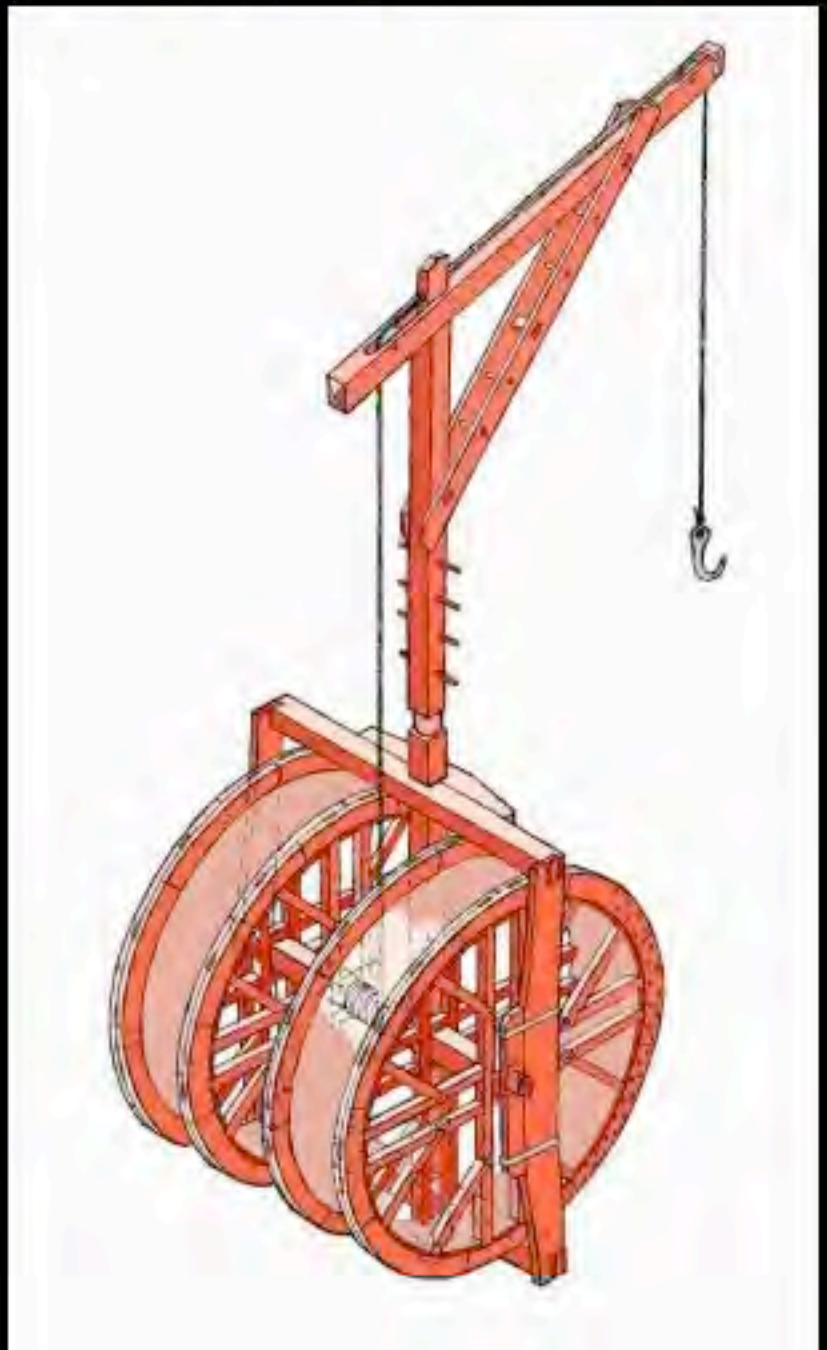


Dual Tread Wheels
Axel
Post and Lifting Arm

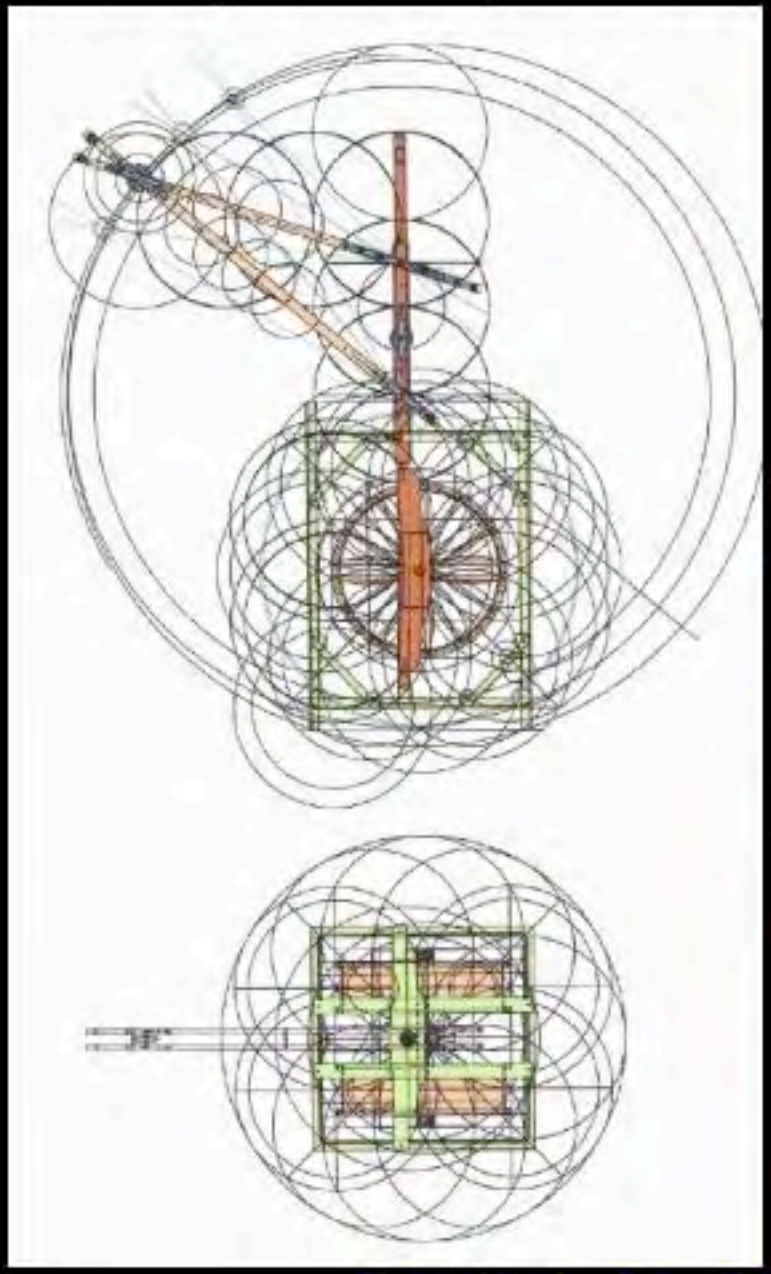


Crane - Munich, Bayer Staatsbibl., 1430

Designers Vít Mlázovsky and Petr Ruzicka, 2005



Design and layout of the crane using circle geometry



Drawing by Petr Ruzicka, 2006

Building the Tread Wheels

From Czech bible, 1411

Cutting the arcs of the rim with axes.

The rim arcs are
joined on a
wooden template
for consistent
wheel construction

Two overlapped
layered rims

drilled, pegged and glued.

Chalk and cheese glue

Rope and tourniquet clamps

Wheel glued, pegged and clamped

PŘÍBĚH PRAŽSK
E CASTLE

Wheel assembled on axel

Wheel rims aligned with spacers

secured by rope and tourniquet clamps .

Book of St. Albans, Trinity College Library, Dublin, 1245

Measuring and marking tread spacing

Treads scribed, trimmed and installed

Completed wheel

waiting in the shadow of the cathedral.

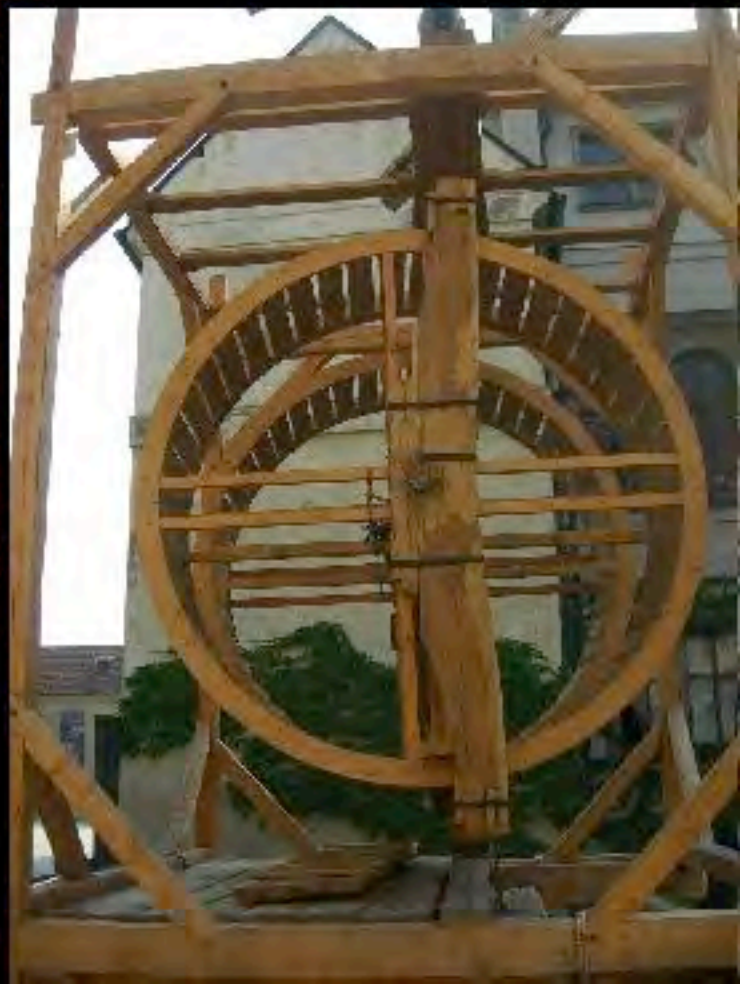
Intersection of time

culture

and technologies.

Building the axel and wheel frame stirrup.

Bridge bulding Diebold Schilling, Bern Chronicle, 1484-5.



Axel and wheel frame stirrup

with offset main post.

Axel and Wheel Frame Stirrup Connection -

sliding dove tail joint, pinned and secured with iron straps.

Sealing axel and frame with traditional pig fat and soap formula.

Iron banded and wedged

Greased and ready

Example of Cage Crane - Strasbourg 1482.

The Crane Cage

Medieval Mortising Machines

Spiefel Van Het Mense'yk Bedryf, Van Kornelis Van Der Lyn and J & K Luyken, 1718

Fitting joints and squaring

Connecting braces

Cutting brace joints with axes

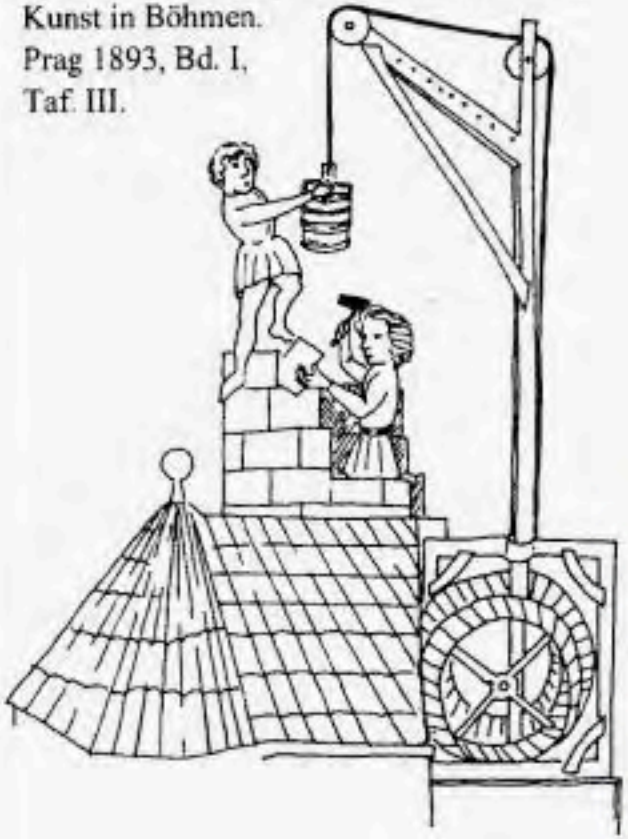
Fitting and pegging

Raising the cage

Raising the cage

The post and lifting art

482 14. Jh.
Prag, Archiv Prazského hradu, Cod. A 10, fol. 166ᵛ
Handschrift
Buchmalerei
Hammer, Lastkran mit Tretrad, Mörtelbottich
Neuwirth, Josef: Geschichte der bildenden Kunst in Böhmen. Prag 1893, Bd. I, Taf. III.

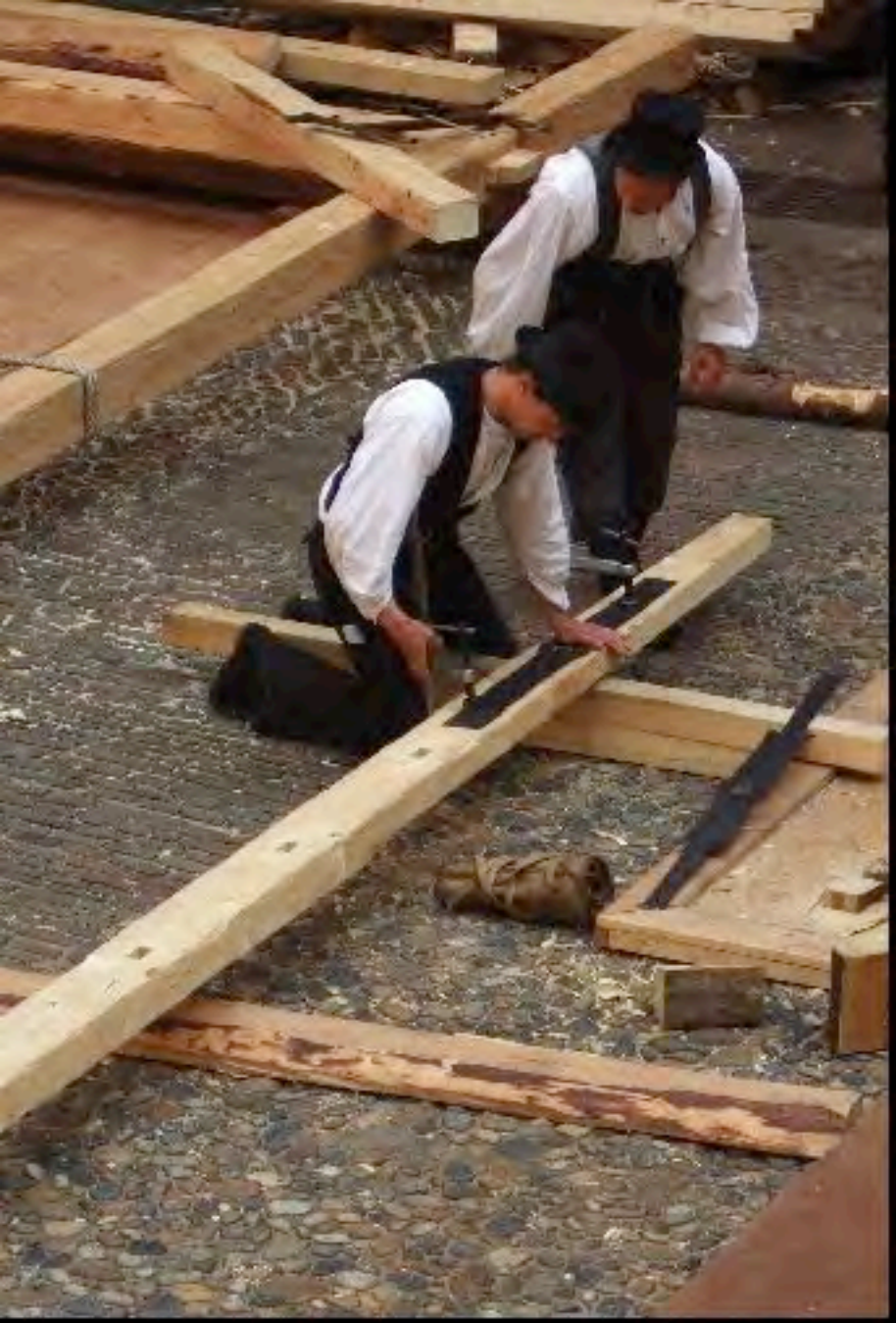


The Post

Sheeve at top of post
used for raising the crane.

Setting iron band on post

The Lifting Arm



Inlaying iron sisters

Setting in brass bushings in arm

these provide the ability for height and angle adjustment.

Connecting the lifting arm with the post.

Lower and upper arms
connected with spacers

Setting the Sheeve in the Lifting Arm

Setting post in crane cage

Post to Cage connection

Groove in post for rope to allow 360 degree rotation of post and axel frame.

Post and Axel Frame Connection

Raising and attaching the
Lifting Arm to the Post

Lifting Arm in place

The Team

Crane Technical Statistics

- Ground plan of the cage 3.50 m _ 3.50 m
- Pole length 8.0 m (with footstall 9.0 m)
- Radius of the lever arm 2.90 m – 4.70 m
- Crane weight without operators and ballast 3000 kg
- Max. weight of burden 700 kg