1822 Robeson Mills Water Levels and Waterpower Measurements

The 1822 documents in the Endnotes describe the Robeson Mills: A.) three waterwheels in the Flour Mill north of Ridge Road on the East Bank of the Wissahickon Creek, and B.) two or three mills on the West side of the Creek: a Sawmill, a **Nail Factory**, and a Rolling Mill, the latter being the mill nearest to the River. A map from 1816 by John Melish plots the locations of the mills, except for the Nail Factory is on the next page.

> The history of the large Flour Mill with three waterwheels just north of Ridge Road, on the East Bank of the Wissahickon Creek, is well established, and the mill was built by 1702. The history of the Sawmill is reasonably well documented, and its erection date is found in deeds from 1690 and 1691 as being between 1687 and 1690. The early history of the Rolling Mill is associated with the Sawmill and documented in the 1690 and 1691 deeds, the start of their building being in 1886 with a 101-year lease with Richard Townsend as Millwright[1]; the Rolling Mill[2] was originally a Corn Mill. The draft of Rolling Mill's entire history can be found here CTRL-CLCK: Robeson Rolling Mill - Philadelphia Canoe Club.pdf (wildapricot.org).

The Nail Factory: This mill is the focus of this paper & request for help as its existence has been reported elsewhere and reported as the Colony's "first nail factory"[3] and its history has not otherwise been documented until this time. A description of the Nail Factory's exact location and its critical dimensions have not been found in any other documents.

> The original measurement documents of all the mills are in the Endnotes and were found in the Philadelphia City Archives[i]. The originals are handwritten but very readable and clear, except for some terms. Please see and skim the Endnotes before going further; terms in the document are explained below, at least as currently understood. Measurements are reformatted into Excel below.

The Nail Factory **open questions** – help needed - are as follows:

1. Why would the critical dimension of the Nail Factory's waterwheel be missing, i.e., its diameter?
2. Could the Nail Factory be an add-on to the Sawmill, or was it more likely a separate building?
3. Could the Nail Factory's waterwheel have been just eight feet in diameter, given the other dimensions?[4]
4. Are the waterwheels all center shot/breastshot wheels? The elevations do not make it seem likely that they could have been overshot wheels.

Background and Terminology – The documents contain unusual terms, phrases, and abbreviations. At this point, it is assumed that wheels/sources of water were all "Center shot," but verification of this assumption is under review (versus Overshot or Undershot). Corrections or improvements to definitions are gladly welcomed.

> **Depth of Head**[5]: the distance the water falls before hitting the machine, be it a waterwheel, turbine, or whatever. A higher head means more potential energy.[ii]
>
> **Length of Gap**: Width of the 'buckets' on the waterwheel.
>
> "**do.**": Abbreviation for "ditto" and must mean "Depth of Gap," the wheels bucket width.
>
> **Depth of Gap**: Depth of each 'bucket' on the wheel

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[1] **1682** - Richard Townsend, a Millwright by trade, was a passenger on the "Welcome" with Wm. Penn and built the Colony's first mill (post Swedes) https://pilgrimsandpatriots.com/?tag=testimony-richard-townsend and in 1683 the Colony's 2nd Mill in Germantown – see page 7: The_Settlement_of_Germantown_in_1683.pdf (gfsnet.org).

[2] A deed from 1752, an Indenture Rudiman Robeson to Henry Shellenberg, states explicitly that the eight-acre parcel includes both the large Wissahickon Mill "with two pair of millstones" and also "Rolling Mills."

[3] AC Chadwick reference page 6 of 116 from James F Magee's Mills of the Wissahickon. Chadwick Papers Volume 36.pdf (wsimg.com) and here as **Cut Nail Factory on page 28 of 64**: Chadwick Papers Volume 74.pdf (wsimg.com)

[4] We understand that "hammer mills" used to produce nails required less power than a flour mill, and adding a small wheel to the end of the Saw Mill (its tail race) seems possible. AC Chadwick thought the Rolling Mill was the cut nail factory.

[5] See OVERSHOT WATERWHEEL

The recap of mill water flows and wheel dimensions is below. The Rolling Mill has two columns for Gap Depth as it was 10 or 11 feet wide per the two sources – picture follows, but it was not part of the 'measurements' document:

Mill Wheel	Wheel Diameter	Depth of Head Feet	Inches	Length Gap Feet	Inches	**Gap Total Inches**	Depth Inches Gap	INCHES of **WATER**	Formula **Gap x** Gap Depth
Lower	15.50	4	1.25	2	4	**28.00**	**3.75**	**107**	105.00
Middle	15.50	3	10.75	3	3	**39.00**	**4**	**156**	156.00
Upper	15.75	3	2	2	0	**24.00**	**3.75**	**90**	90.00

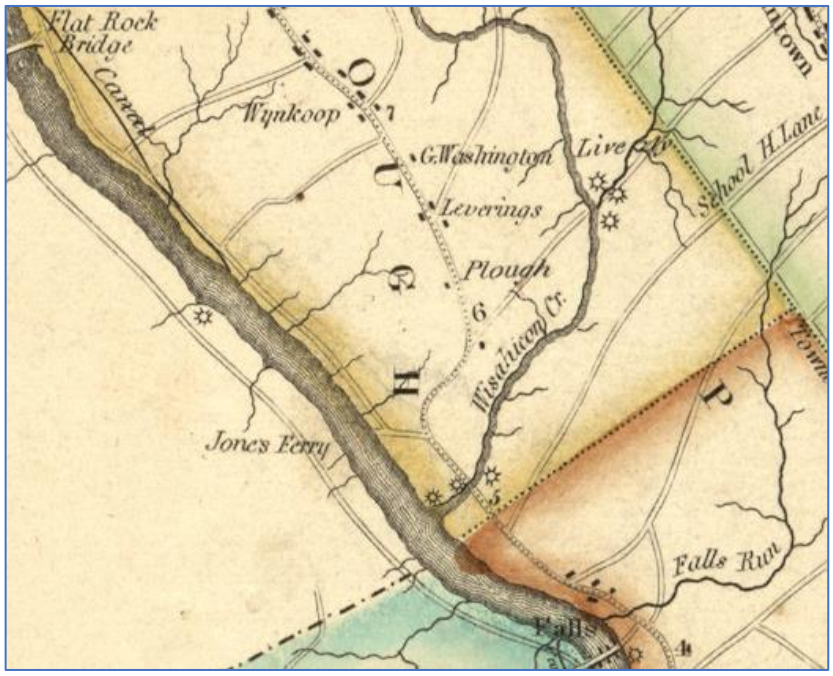
	Wheel Diameter	Depth of Head Feet	Inches	Length Gap Feet	Inches	**Gap Total Inches**	Gap Depth **West**	Gap Depth **East**	Total Depth Depth	Document INCHES of **WATER**	Check: Formula **Gap x Total Depth**
Sawmill	14.00	4	4	3	8	**44.00**	**2.75**	-	2.75	**121**	121.00
Nail Factory	*Missing*	4	10	3	6	**42.00**	**1.5**	-	1.5	**63**	63.00
Rolling Mill*	18.00	7	3.5	4	7.5	**55.50**	**5.5**	5.25	10.75	**596.5**	596.63
and its Head of the Wheel on its Face	11.00										

*Two Blade Buckets

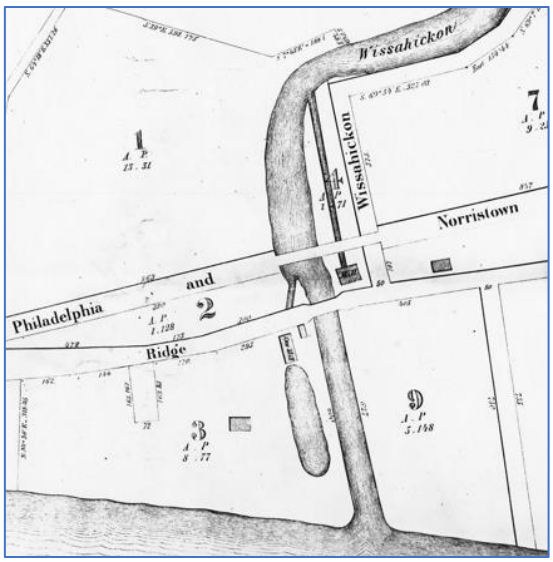
On the drawing **do.** = ditto

1816 Map – Critical portion by the Schuylkill River & Wissahickon Creek; for full map CTRL-CLCK: Map of Philadelphia County, by Melish | West Philadelphia Community History Center (upenn.edu)

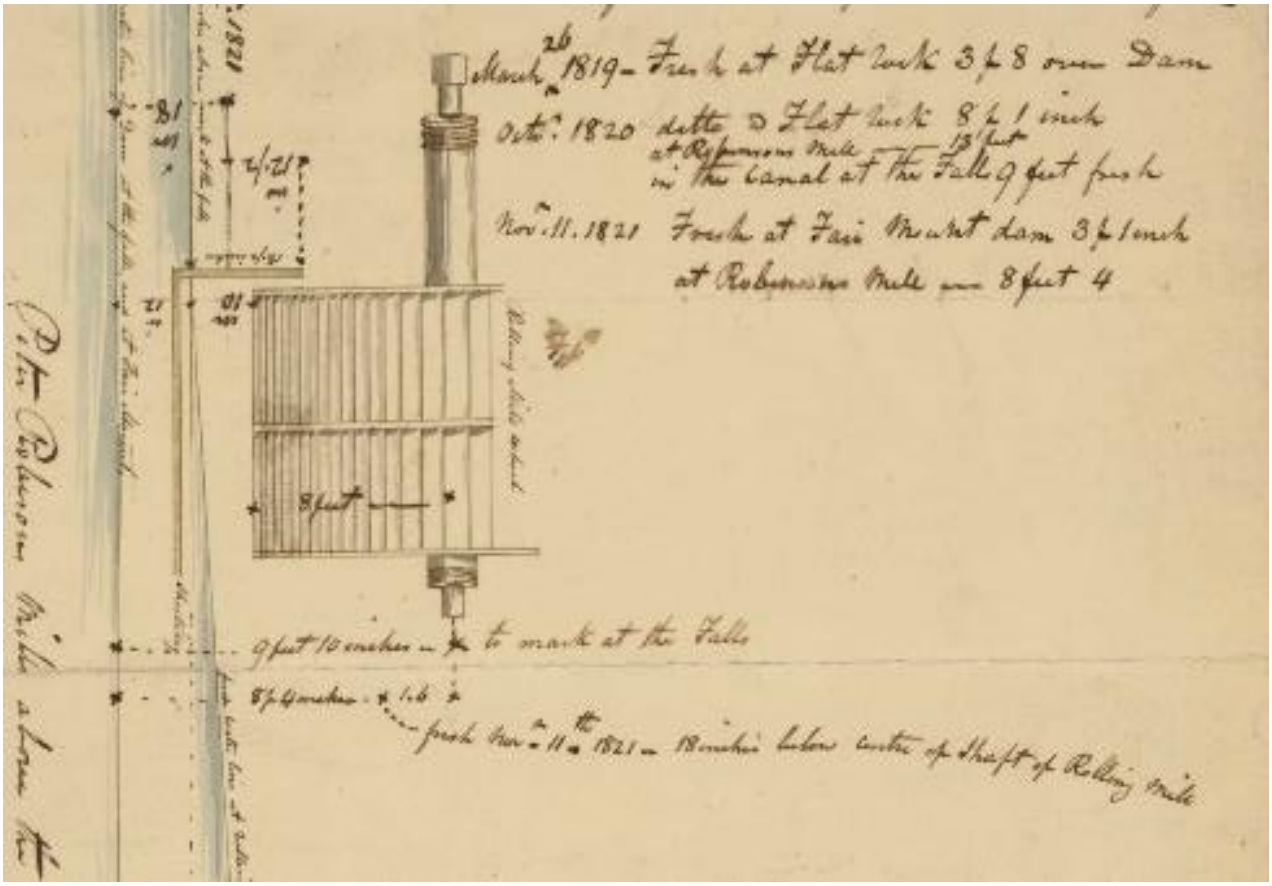
On the right, the **# 5** on the Creek by the Philadelphia Township Line means five miles to the center of Philadelphia, and the mill just above it was the large flour mill with three wheels. Mill to the left, just below Ridge Road, was Saw Mill and Mill on the Schuylkill River was/is the Rolling Mill.



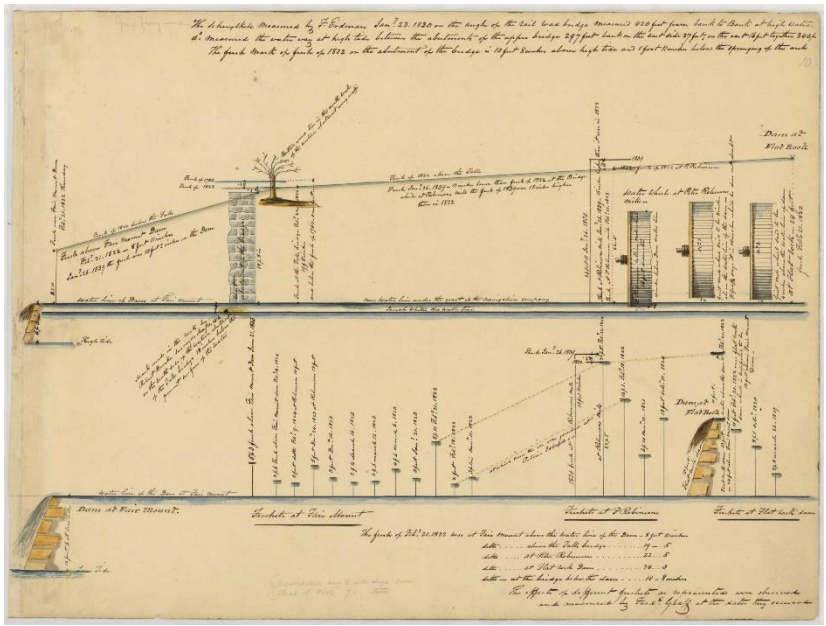
Below c. 1835 map; the rolling mill is not present as it could not be seen from Ridges Road, but the mill pond could be seen. The small print just South of Ridge Road says "Saw Mill." The Dam just above the bridge over the Creek is not shown either. Full map: CTRL+CLCK: 2010.303.6.1-3 - Print, Photographic (catalogaccess.com)



The 1822 Rolling Mill Drawing of its waterwheel is below - 18’ in diameter and 10’ wide from a different source; see the complete drawing here: [039\Graff0555.JPG - Graff05.55 | Philadelphia Water Department (pastperfectonline.com)]



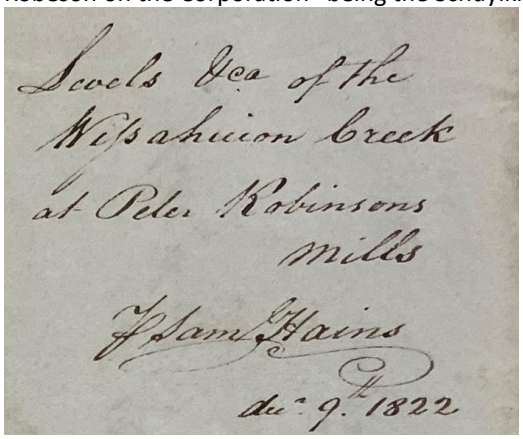
See also this 2nd drawing from the Philadelphia Water Department Archive, part of the Graff Collection, for an expanded context of the waterwheels and mills in the Robeson group near or at the confluence of the Wissahickon Creek and the Schuylkill River. Unfortunately, neither the above nor below documents had a picture/drawing of the Nail Factory waterwheel: [Profiles showing the heights of freshets on the Schuylkill River, at Fairmount Dam, Peter Robinson's Mill in East Falls, and Flat Rock Dam. - 1839 ca. | Philadelphia Water Department (pastperfectonline.com)]



Higher-quality copies of the drawings have been requested from the Franklin Institute, which curates the Graff Collection of PWD drawings.

Endnotes

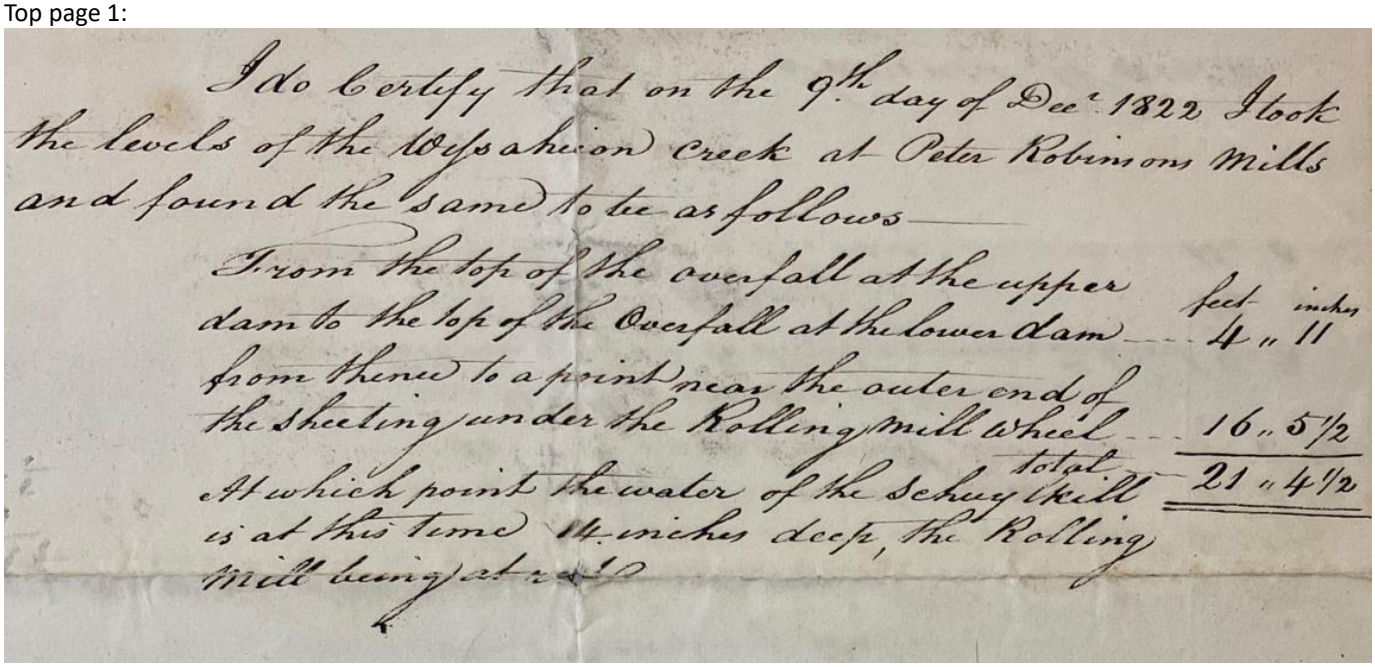
[i] From the Philadelphia City Archives Fairmount Park purchases, Dobson Files: "Levels &, etc…" 1822 Claims of the Peter Robeson on the Corporation" being the Schuylkill River Navigation Corporation for raising the dam.



Levels &c. of the
Wissahiccon Creek
at Peter Robinsons
mills
J. Sam. Hains
dec. 9. 1822

Peter Robeson filed a successful claim vs. the Schuylkill Navigation Company (SNC) c. 1821 after SNC built/rebuilt the lower dam on the Creek and lessened the water flow to the Saw Mill and Rolling Mill.

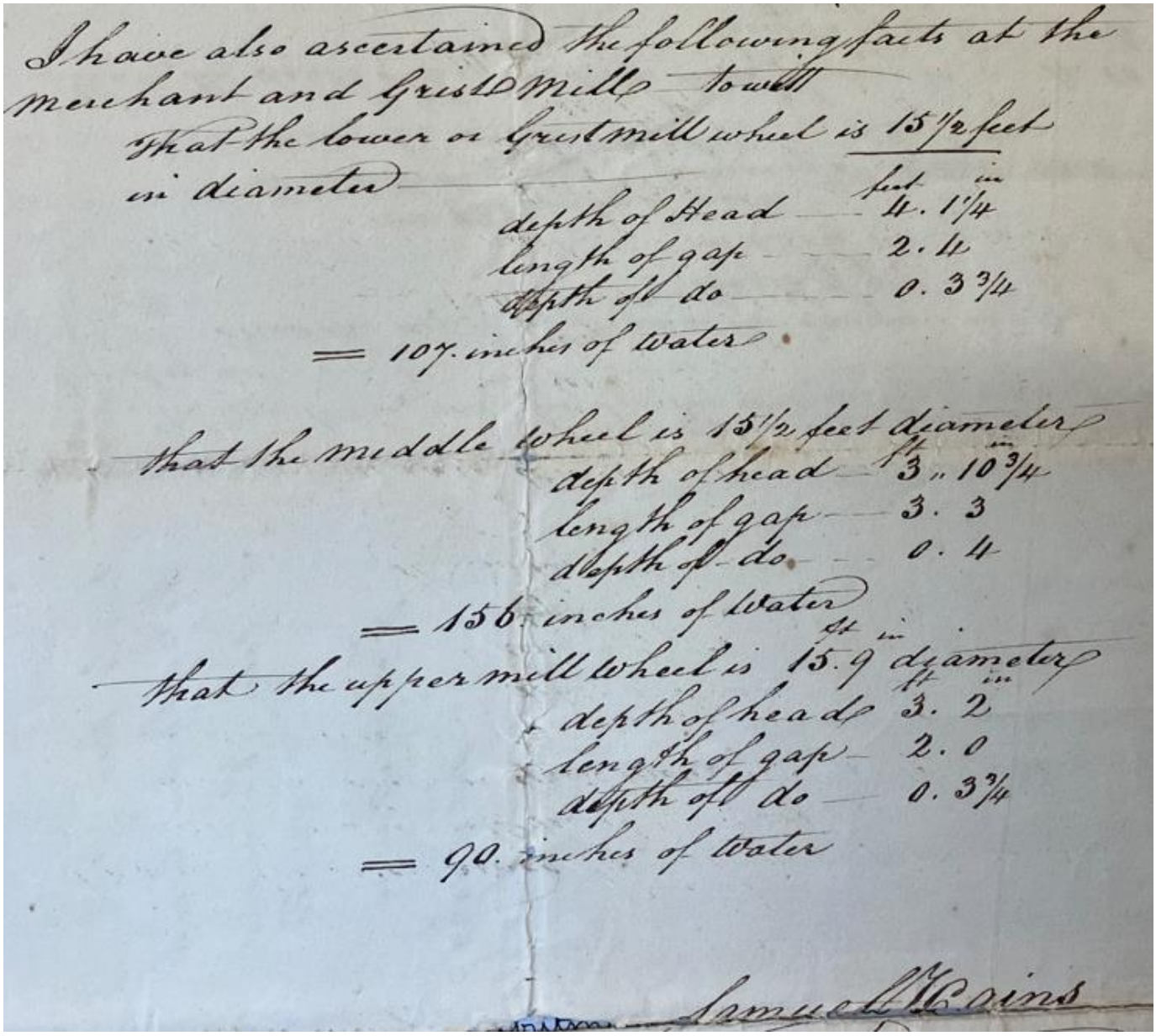
Top page 1:



I do Certify that on the 9th day of Dec. 1822 I took the levels of the Wissahiccon Creek at Peter Robinsons Mills and found the same to be as follows

	feet	inches
From the top of the overfall at the upper dam to the top of the Overfall at the lower dam	4	11
from thence to a point near the outer end of the Sheeting under the Rolling mill wheel	16	5½
At which point the water of the Schuylkill total is at this time 14 inches deep, the Rolling mill being at rest	21	4½

Bottom page 1 - three wheels "under the same roof" on East band of the Wissahickon Creek



I have also ascertained the following facts at the merchant and Grist Mills to wit

That the lower or Grist mill wheel is 15 1/2 feet in diameter

	feet	in
depth of Head	4.	1 1/4
length of gap	2.	4
depth of do	0.	3 3/4

= 107. inches of Water

That the middle wheel is 15 1/2 feet diameter

	ft	in
depth of head	3	10 3/4
length of gap	3.	3
depth of do	0.	4

= 156. inches of Water

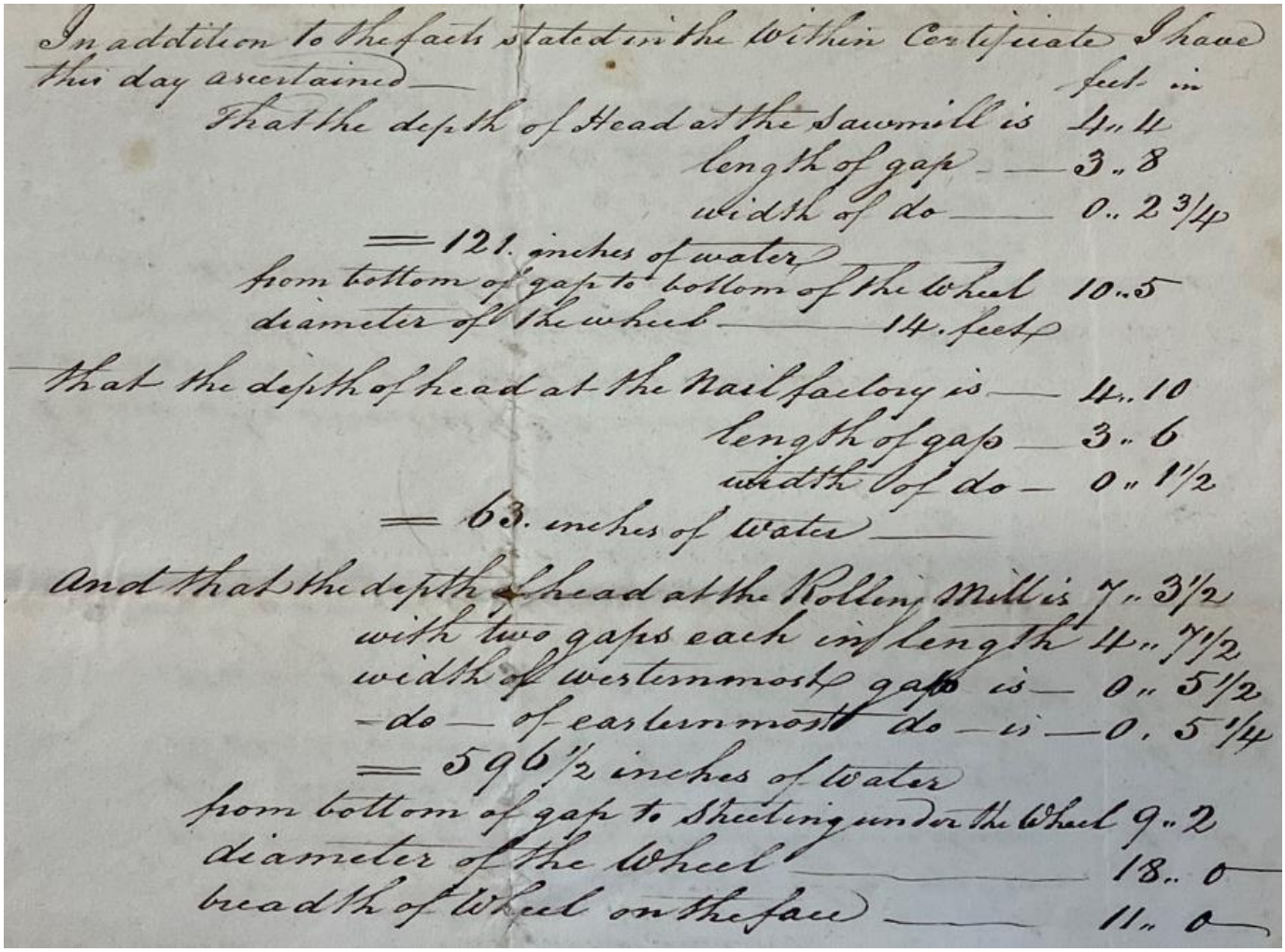
That the upper mill wheel is 15. 9 diameter

	ft	in
depth of head	3.	2
length of gap	2.	0
depth of do	0.	3 3/4

= 90. inches of Water

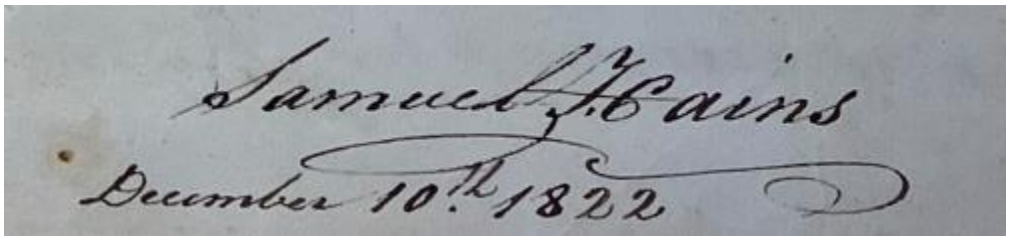
Samuel Cains

Page 2 – three other mills on the West bank of the Wissahickon Creek: a Sawmill, a Nail Factory, and a Rolling Mill
The measurements were taken the day after the above measurements.



In addition to the facts stated in the within Certificate I have this day ascertained—

	Feet	in
That the depth of Head at the Sawmill is	4	4
length of gap	3	8
width of do	0	2 3/4
= 121. inches of water		
from bottom of gap to bottom of the Wheel	10	5
diameter of the wheel	14.	feet
That the depth of head at the Nail factory is	4	10
length of gap	3	6
width of do	0	1 1/2
= 63. inches of Water		
And that the depth of head at the Rolling Mill is	7	3 1/2
with two gaps each in length	4	7 1/2
width of westernmost gap is	0	5 1/2
do — of easternmost do — is	0	5 1/4
= 596 1/2 inches of Water		
from bottom of gap to Shelving under the Wheel	9	2
diameter of the Wheel	18	0
breadth of Wheel on the face	11	0



Samuel J. Cains

December 10th 1822

[ii] Head - From the footnote/reference: Head" is the distance the water falls before hitting the machine, be it waterwheel, turbine, or whatever. A higher head means more potential energy. Head--Measurement of the difference in depth of a liquid at two given points (see Appendix I).
See also and compare for quality of reference and diagrams: OVERSHOT WATERWHEEL (cd3wdproject.org)

Another reference for “Head of Water” is “260. Head of Water. — The velocity due to a head of water is equal to that which a heavy body would acquire in falling through a space equal to the depth of the orifice below the free surface of the fluid”: Full text of "Instructions by Sir R. Griffith, 1853, to valuators and surveyors in tenement valuation of Ireland; and instructions by Land Commission (Ireland) to Assistant Commissioners, concerning valuation of agricultural holdings" (archive.org)