



2023 Fall Conference at Ashore Resort & Beach Club
Ocean City, Maryland

**Resolving the Greatest Boundary Dispute of them All
The amazing Survey of Mason and Dixon**

David S. Thaler, PE, LS, DFE, D.WRE, EWRI, FRGS, F.ASCE, F.NSPE

September 28, 2023

COL. (MD ret.) David S. Thaler PE, LS, DFE, D.WRE, EWRI, FRGS, F.ASCE, F.NSPE

Is the Managing Principal of D.S. Thaler & Assoc., LLC; a civil and environmental engineering firm that he founded in 1978. In 2019 he won the award as the top Professional Engineer in the United States given by the National Society of Professional Engineers.

Thaler is a Fellow of the National Society of Professional Engineers, the American Society of Civil Engineers and the Royal Geographical Society. He is a Board Certified Diplomate of both the National Academy of Forensic Engineering and the American Academy of Water Resources Engineering. He has been honored numerous times by many organizations, has received several Lifetime Achievement awards, and holds Maryland's highest military honor, the Distinguished Service Cross.

Thaler is involved with projects of extraordinary complexity and his firm has designed more than 4,000 residential, commercial, industrial and institutional land development assignments throughout the Mid-Atlantic region. The firm has extensive experience with large, difficult, and environmentally complex projects and has created many innovative designs. For instance, Thaler invented "Super Silt Fence," a technique that is now an international standard.

Extremely active in professional affairs, Thaler has served on the Board of Directors of the Maryland Society of Professional Engineers for over 30 years, including as President. He represented the professional engineering community in legislation on numerous matters before the General Assembly of Maryland and on regulatory issues before the Maryland Board for Professional Engineers and the Maryland Department of Labor. He was the founding president of the Land Development Council of Maryland, Chair of the Baltimore County Chamber of Commerce and is an active member of numerous professional and technical societies. He has been a member of what is now the Maryland Building Industry Association (MBIA) since 1975 and is a Life Director. In 2023 he was appointed by the Governor to the Maryland Board of Examiners of Landscape Architects.

Thaler has been a highly visible and vocal advocate for well-engineered and designed communities and has been a tireless voice of the engineering profession. He has published more than 250 articles and five books on a wide variety of subjects, and has lectured at more than a dozen colleges and universities. Among others, he has taught at Lehigh University, the University of Maryland School of Architecture, The Johns Hopkins University, and the University of Baltimore School of Law where he was Visiting Scholar.

Internationally, Thaler participated in the Rule of Law Project in 2000 in St. Petersburg, Russia where after Glasnost he lectured on documenting and transferring real property at the Northwest Cadastral Land Institute in the Leningrad Oblast.

He also identified the original instrument used by Charles Mason and Jeremiah Dixon in their iconic survey of 1762-1767, proved its provenance, raised the funds for its restoration and organized an event where he ceremonially presented the restored instrument to the National Park Service as a "Gift to the Nation" from the engineers and surveyors of America.

Thaler is also an accomplished bagpiper and for many years served as the Pipe Major of the Baltimore Police Department Ceremonial Unit where he performed at civic events and the funerals of many police, firefighters, and servicemembers killed in action including at Arlington National Cemetery.



ABSTRACT

How a Surveying Error in 1608 by Capt John Smith
Led to the Longest Running Case in British Judicial History

Penn vs. Lord Baltimore

that was only Settled by the Greatest Engineering and Scientific
Achievement of the 18th Century

The Mason Dixon Survey

and

The amazing discovery of Mason and Dixon's Transit Instrument
an adventure right out of a National Treasure movie

2023 Fall Conference
County Engineers Association of Maryland

The Survey of Mason and Dixon

Resolving the greatest title dispute of them all
and

The Greatest Engineering and Scientific Achievement of the Age

Presented by:

David S. Thaler, PE, LS, DFE, D.WRE, EWRI, FRGS, F. ASCE, F. NSPE

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September 28, 2023







King James I of England



George Calvert, 1st Lord Baltimore (1580-1633)

“...unto the true meridian of the first fountain of the River Potowmack” and all land “which lieth under the **Fortieth Degree** of North latitude.”

William Penn





The General Historie of Virginia





MSA SC 5666-1-1

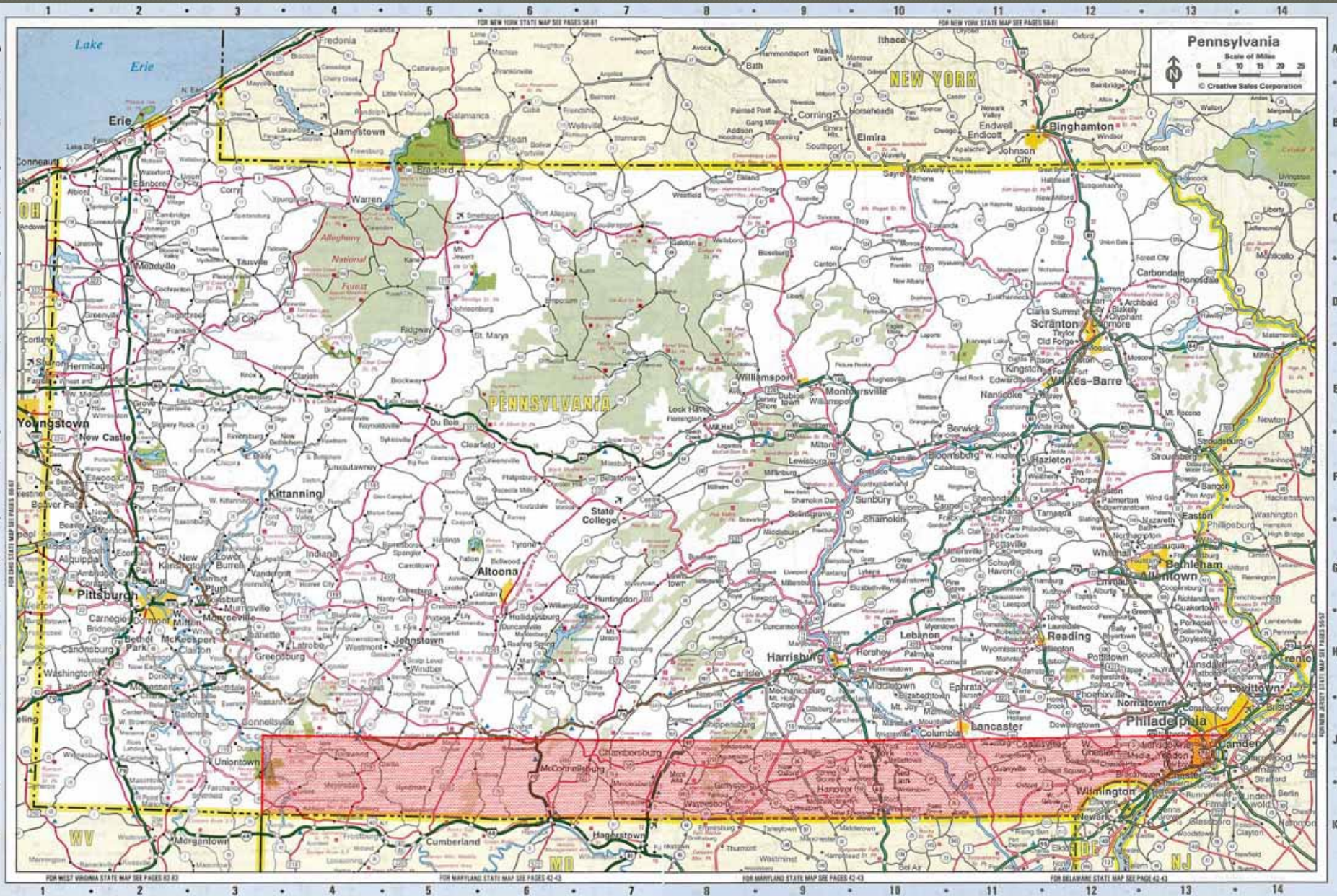


40th Parallel



MSA SC 5666-1-1

The Disputed Territory





While arrested and being dragged through the streets of Philadelphia

“Damn...this is one of the prettiest towns
in Maryland”

Col. Thomas Cresap

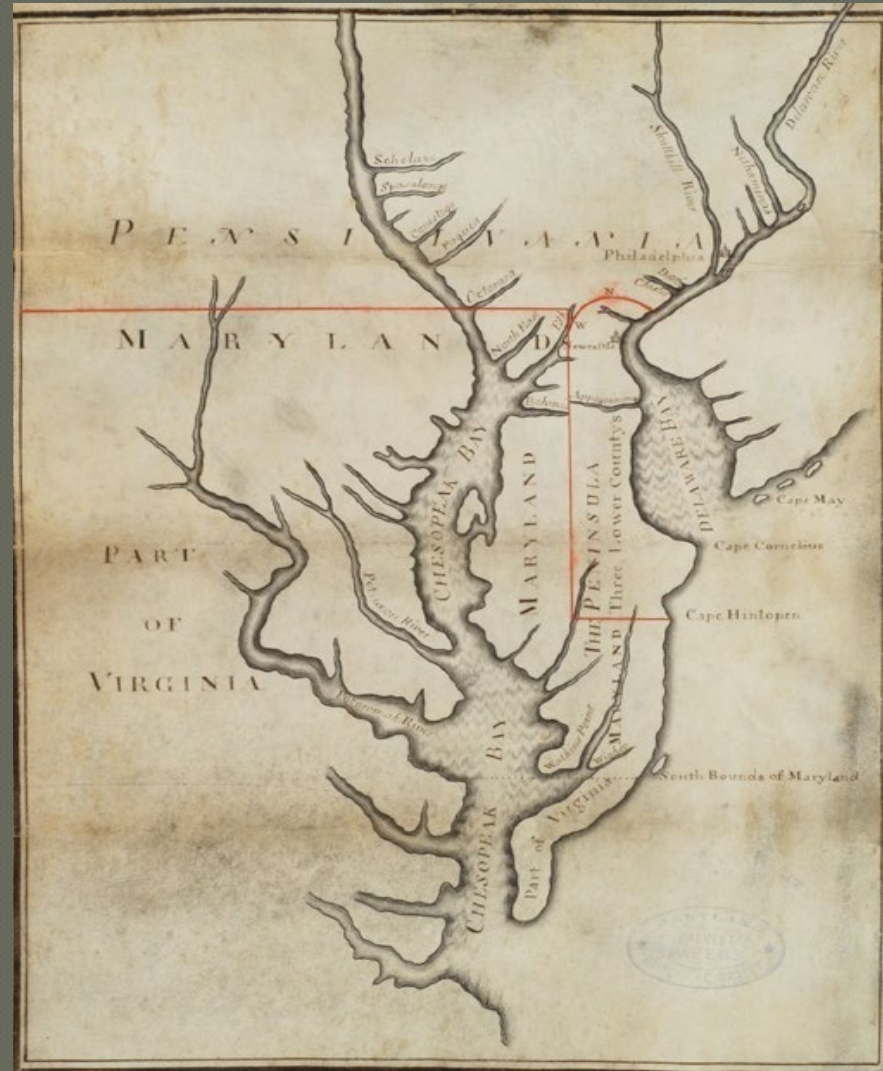
East-West Line
15 miles south of Philadelphia



Tangent Line

Transpeninsular Line

The Exhibit to the Agreement



Bill
 Penn
 agt
 Lord Baltimore
 & Co.
 Ex: T. ... J. B. ...

MARVELAND
 CALVERT
 PAPER
 HISTORICAL SOCIETY

531

The Great Chancery Suit

Penn v. Lord Baltimore
 3 Ves. Sen 194, 1735

Dec. 1734
 Whittington
 Am. by order dated 16
 May 1735

To the Right Honble
 Philip Earl of Sandwich
 Lord High Chancellor of
 Great Britain

MARVELAND
 CALVERT
 PAPER
 HISTORICAL SOCIETY

Humbly complaining shew unto your
 Wisdom Your Orators and Petitioners Tho:
 Penn and Rich: Penn Esq^r the
 two only surviving Sons of W^m
 Penn Esq^r heretofore proprietor and Governor
 of the Province of Pennsylvania in
 America but since deceased and W^m
 Penn an Infant the only Son
 of the said Tho: Penn and
 Deceased in Trust under the will
 of Sa^d Penn Esq^r deceased herein

J.

New Castle Courthouse

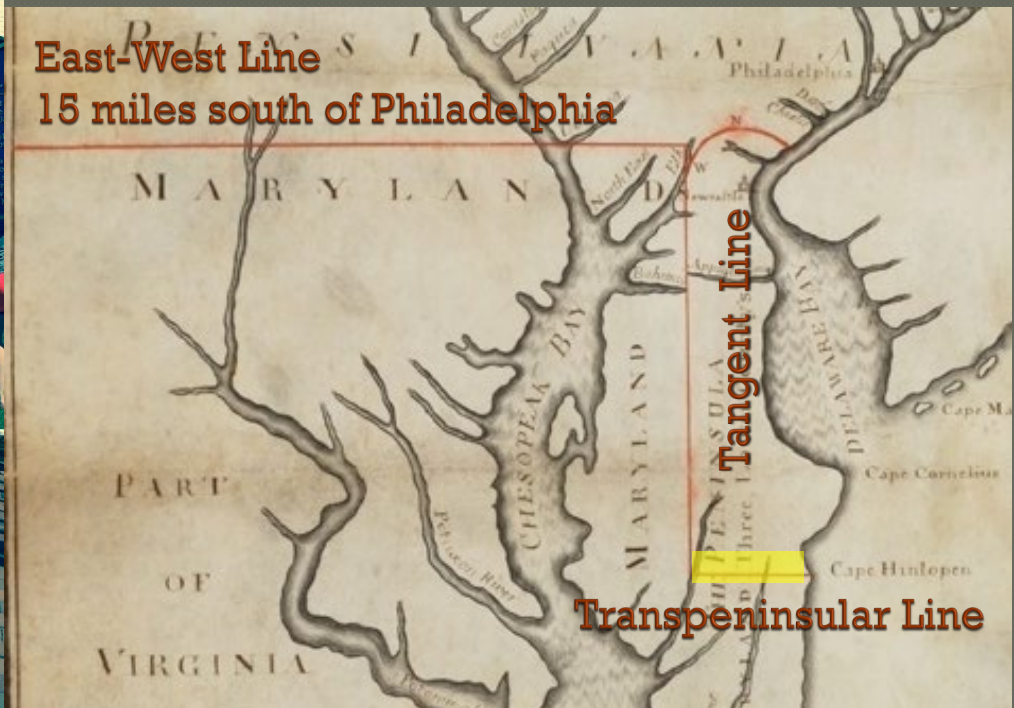


Fenwick Island

The beginning of the
trans-peninsular line



East-West Line
15 miles south of Philadelphia

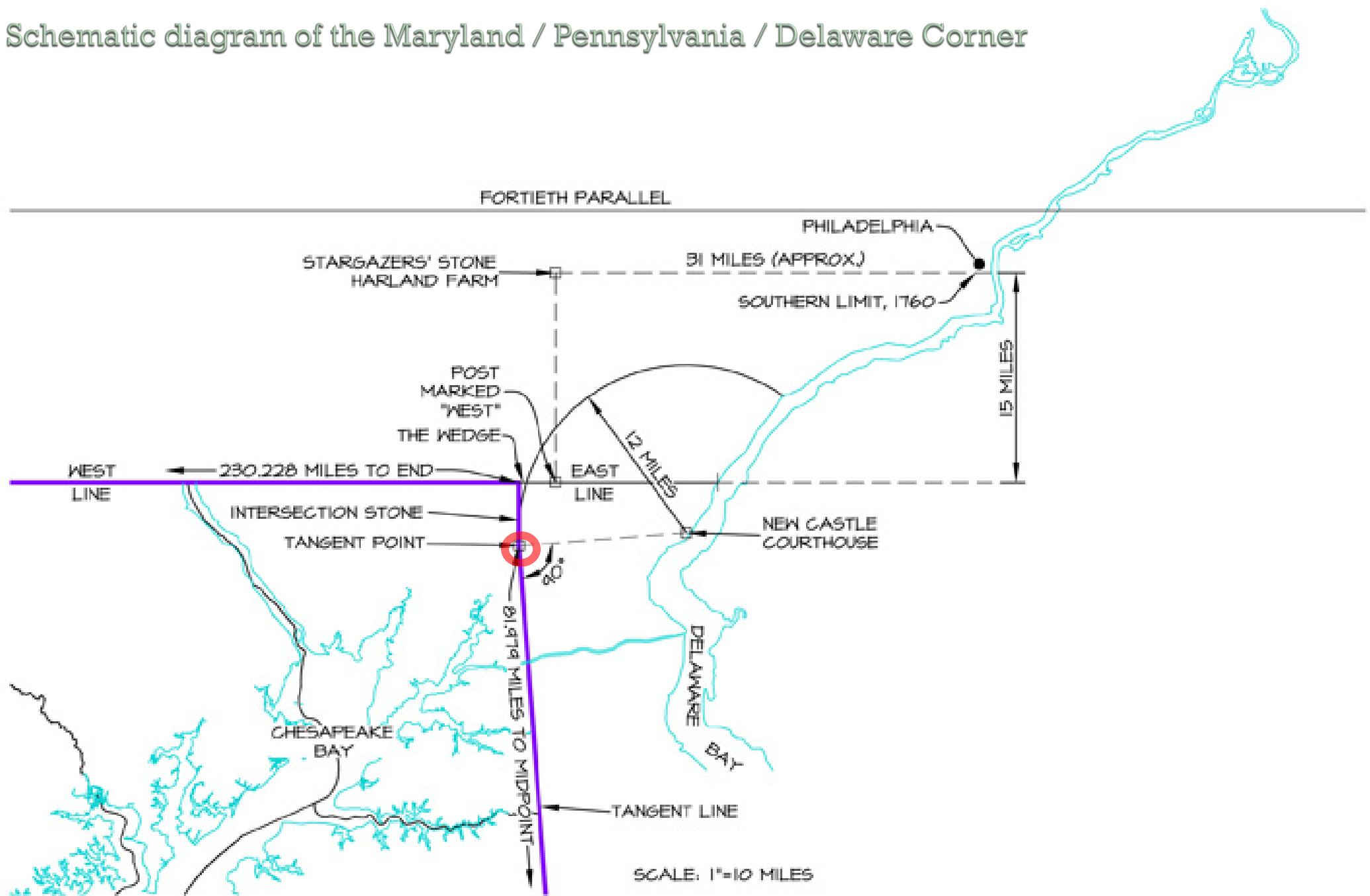


The Mid-Point Stone

The southwest corner of,
what is now, Delaware
set on
April 26, 1751



Schematic diagram of the Maryland / Pennsylvania / Delaware Corner



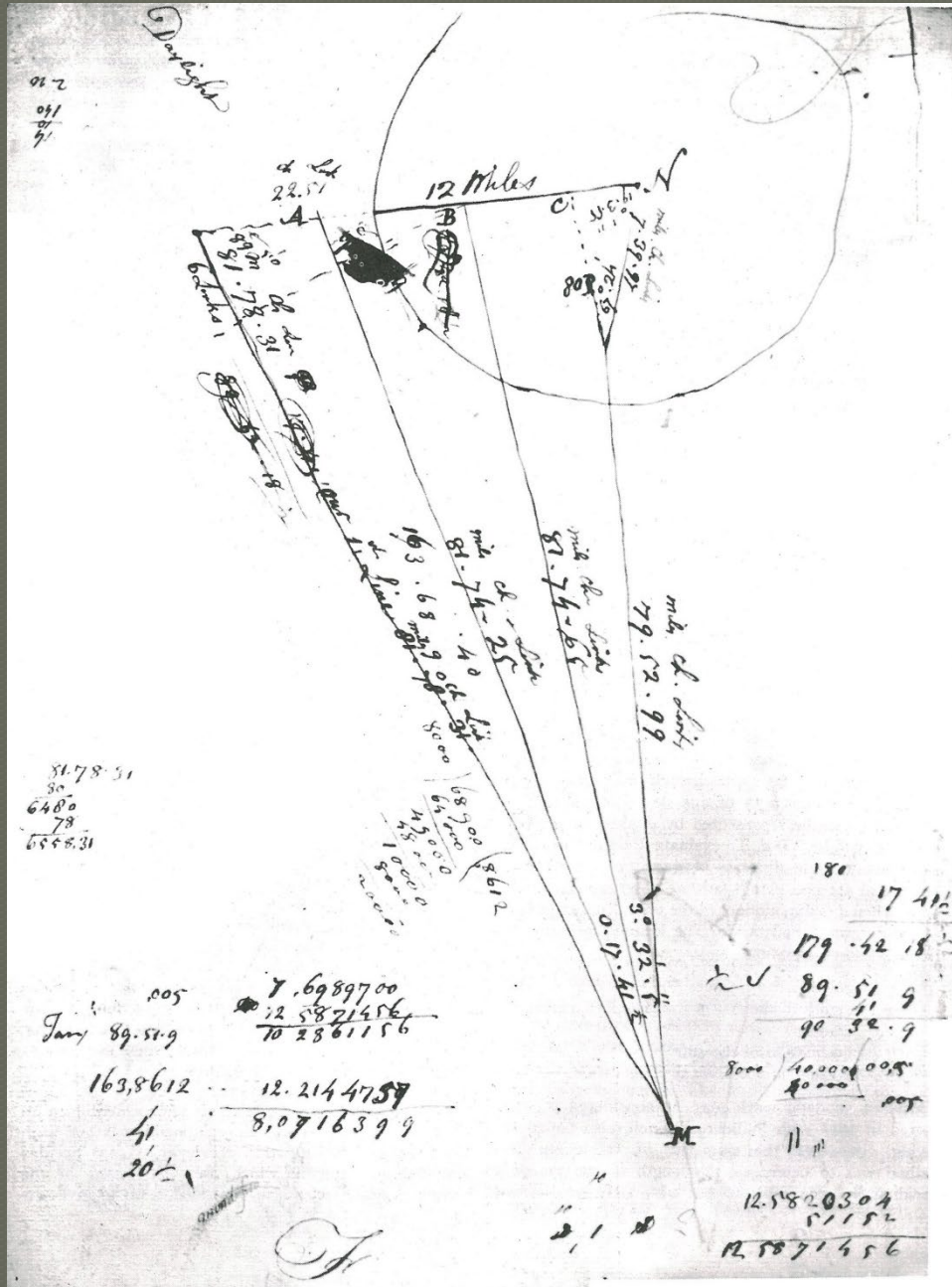
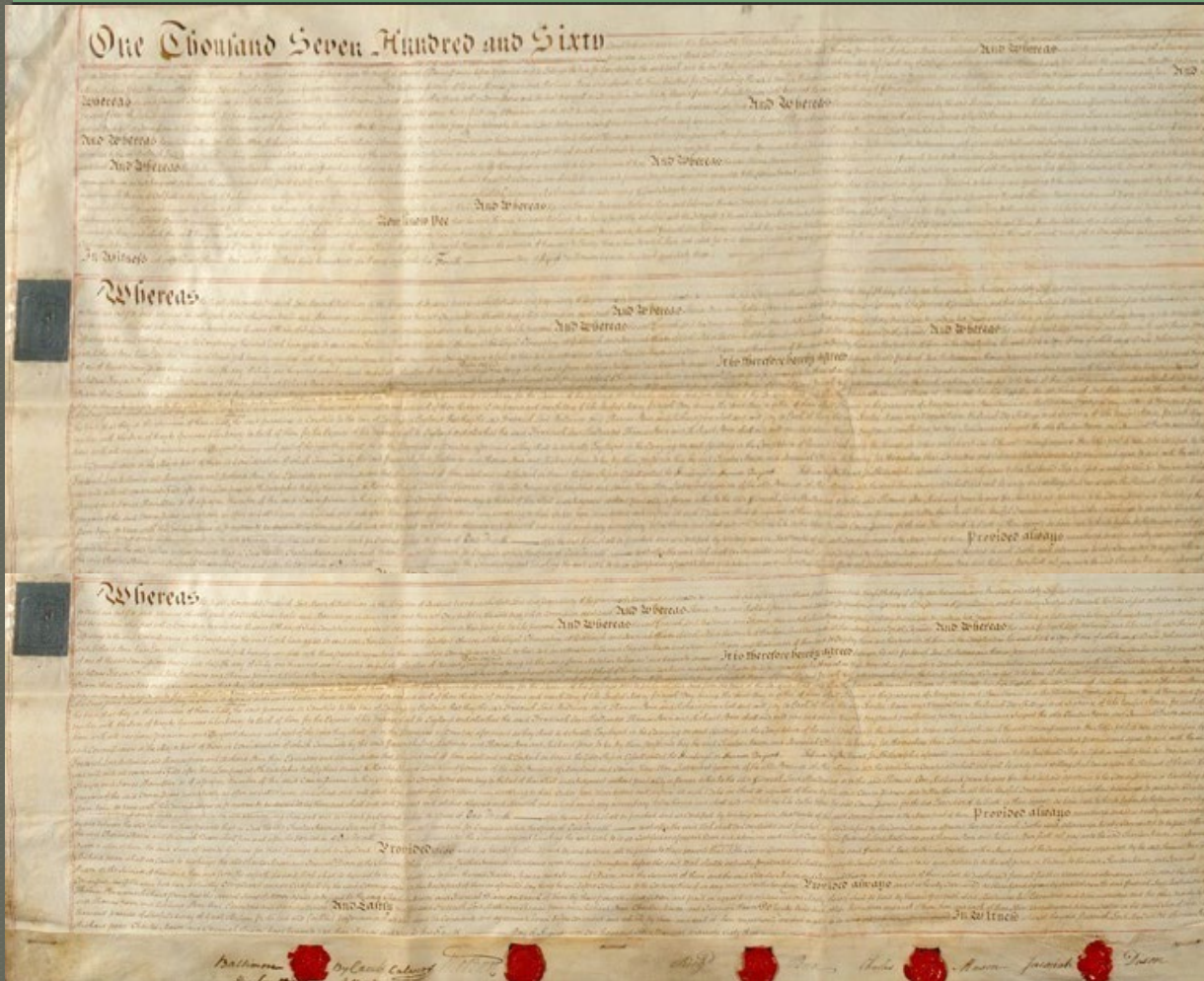


Diagram from
Mason and
Dixon's journal

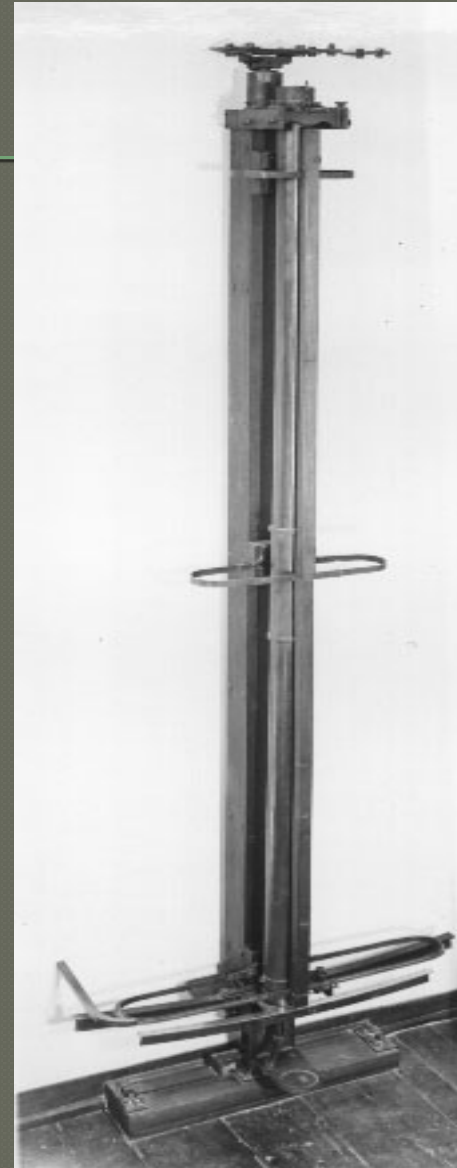
The Contract to do the Survey



Signed by:

- Cecilius Calvert
- Richard Penn
- Thomas Penn
- Charles Mason
- Jeremiah Dixon

Zenith Sector by John Bird, 1773,
Oxford, Museum of the History of Science.



Octant or Hadley Quadrant



Invented in 1731 and used for celestial navigation. It can measure angles up to 90 degrees.

Transit and Equal Altitude Instruments National Museum of American History

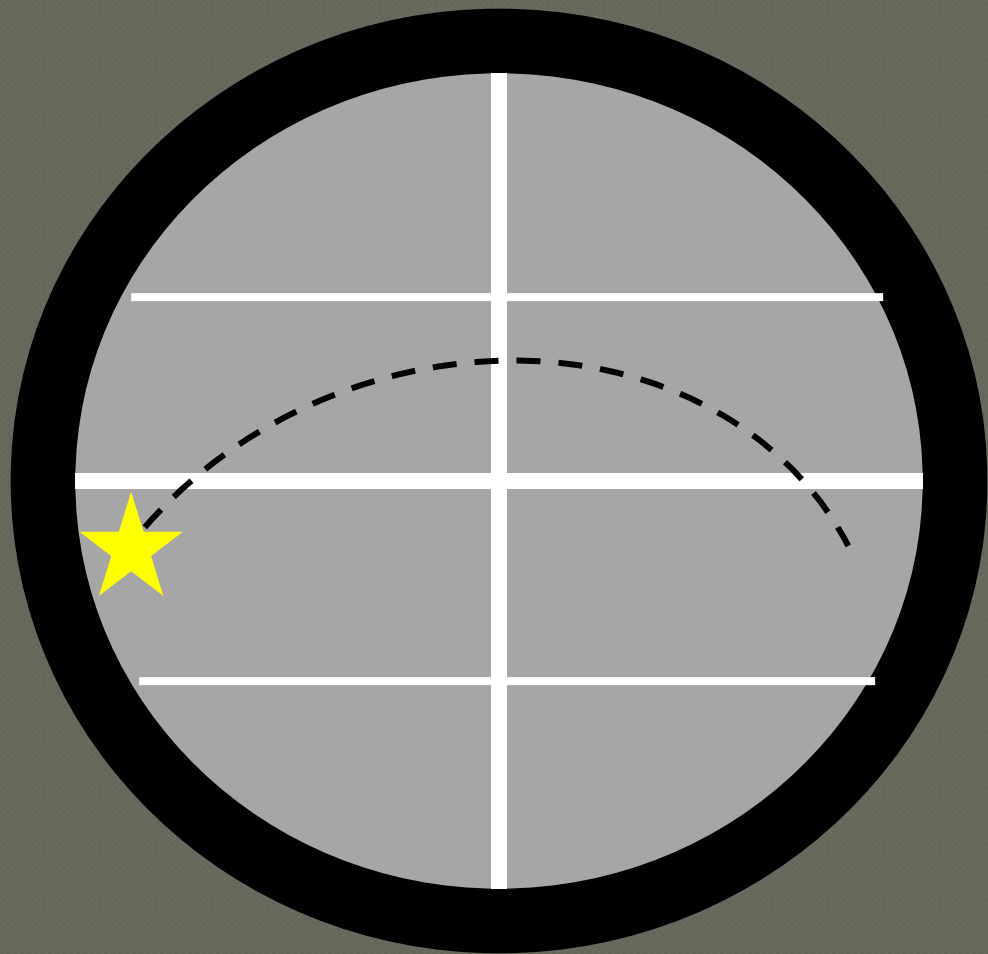


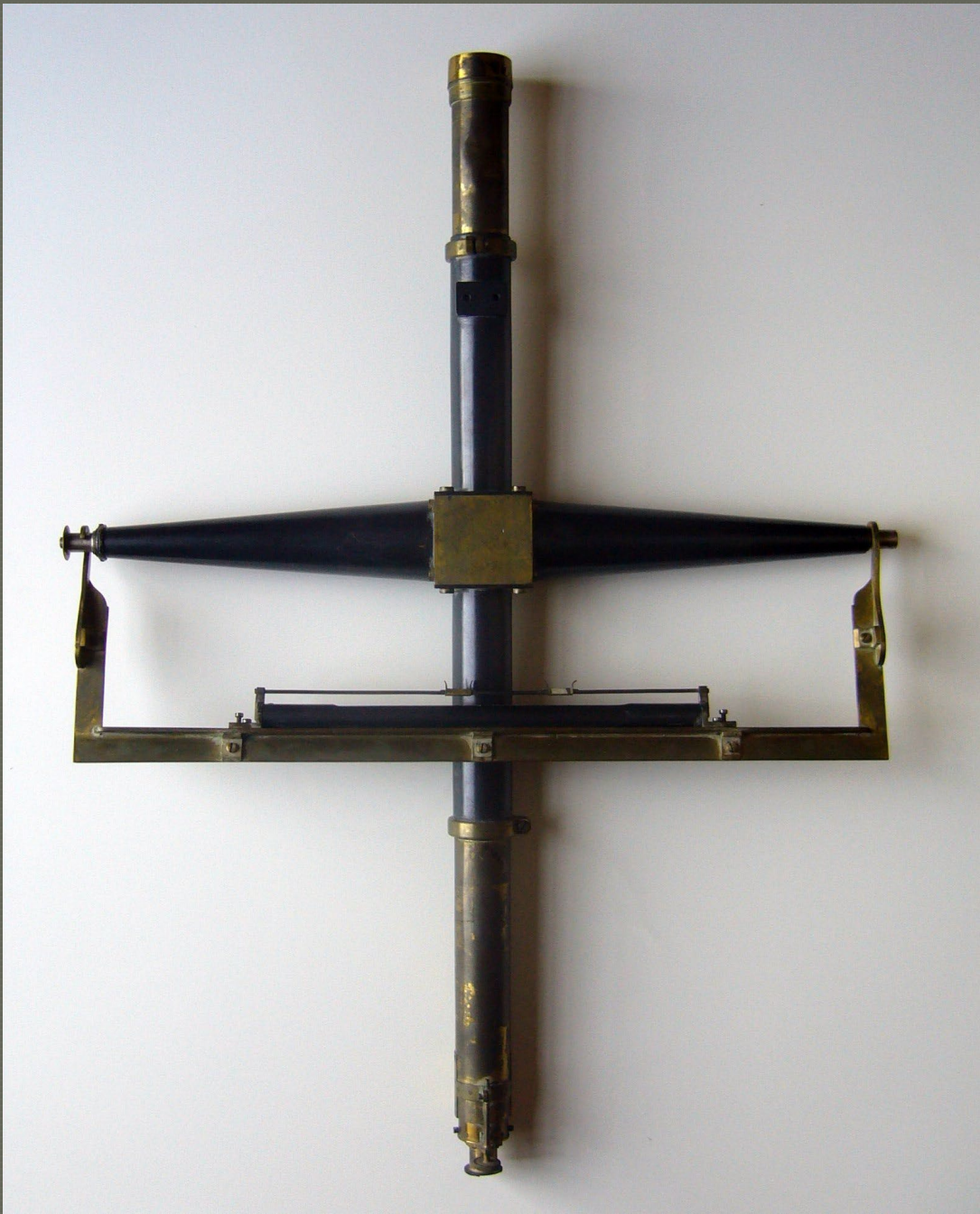
Made by Andrew Ellicott in 1789.
Modeled on the Bird instrument



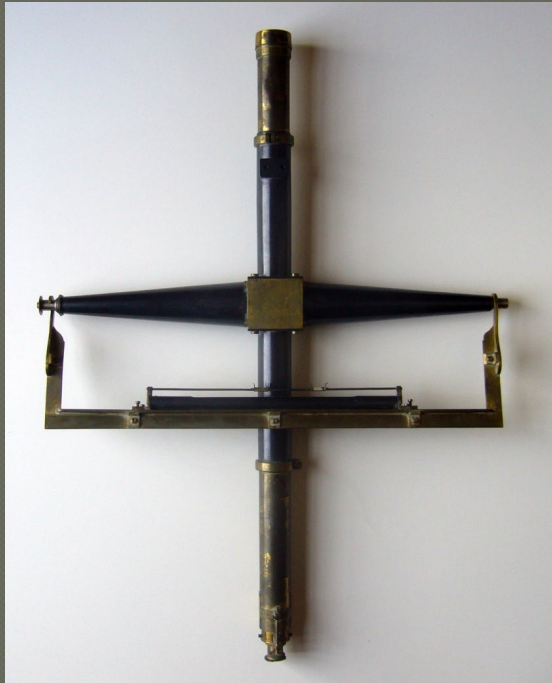
Henry Voigt's instrument used in the survey of
the Louisiana Purchase

N





The Transit and Equal
Altitude Instrument in
Independence Hall



Traughton's 10 ft Transit
Royal Observatory Greenwich
1816-1856

John Bird's engraved signature



18th Century Surveying Measurement

1 chain = 66 feet = 100 links

80 chains = 1 mile = 5280 feet

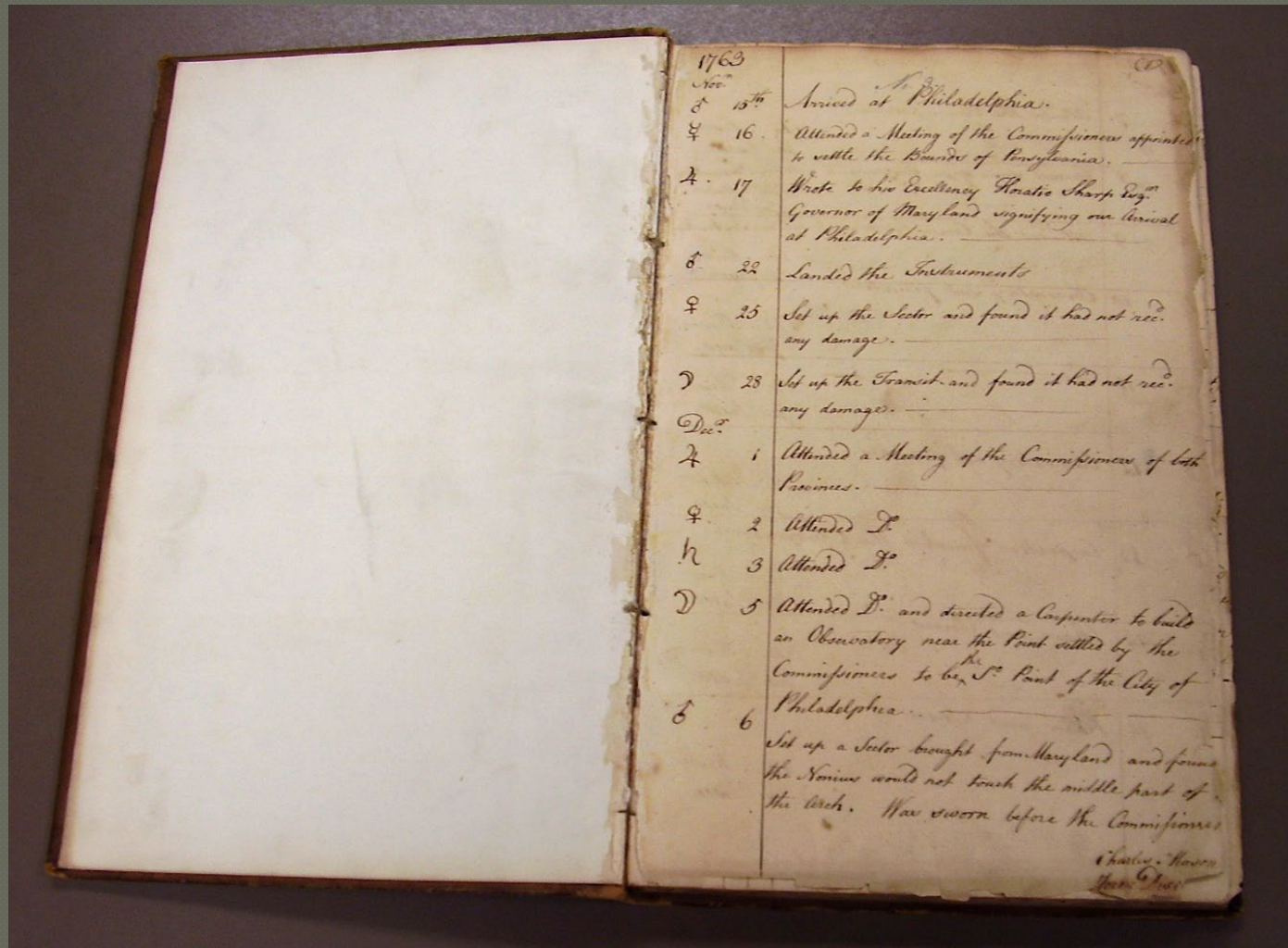
1 link = 7.92 inches

10 square chains = 1 acre



Gunter's Chain

Journal of Mason Dixon



Nov 15, 1763,
"Arrived at
Philadelphia"

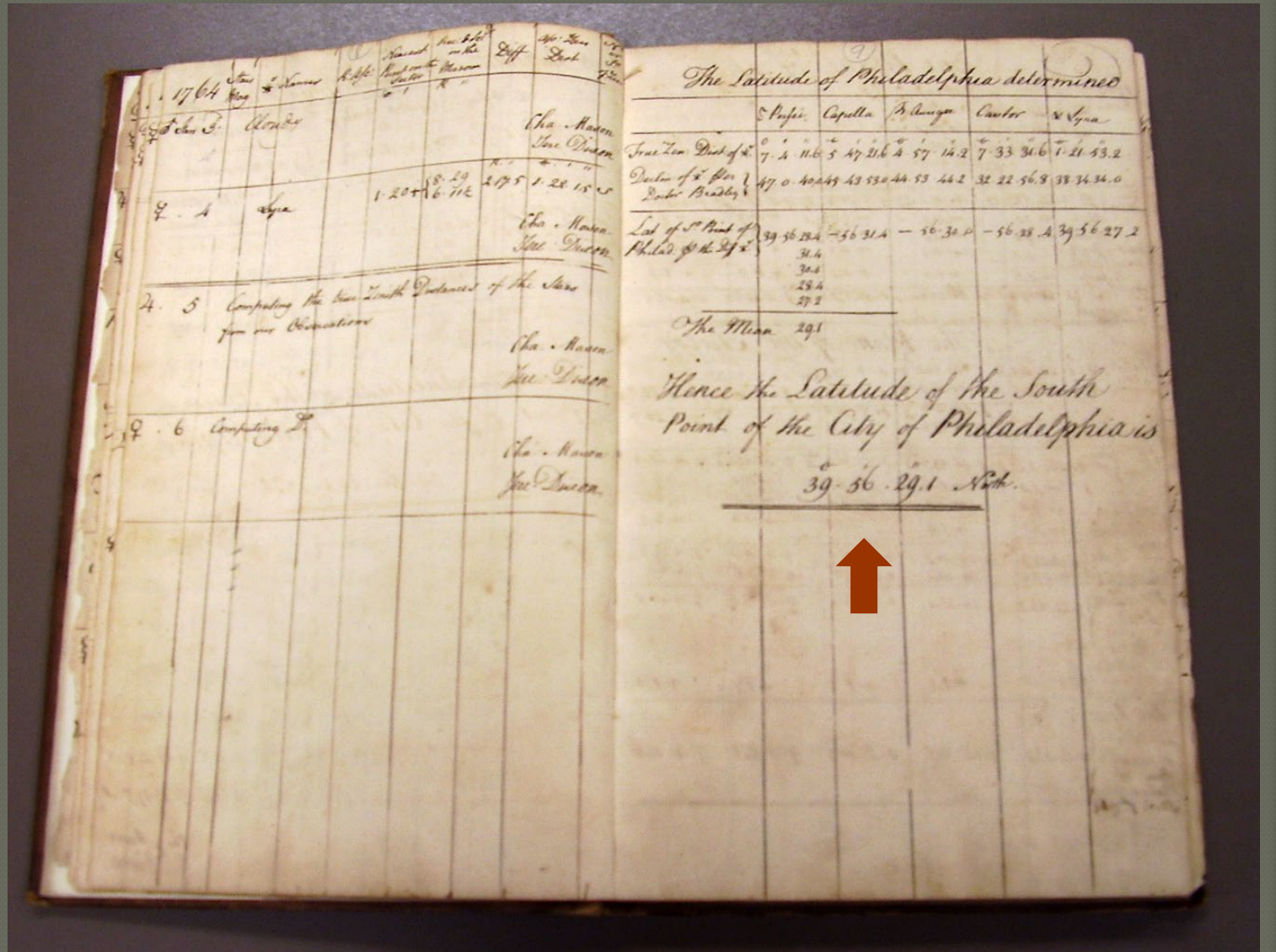


Replica of Observatory
from Transit of Venus
Observation
1761



Latitude of Philadelphia

39° 56' 29.1" North



FORTIETH PARALLEL

PHILADELPHIA

STARGAZERS' STONE
HARLAND FARM

51 MILES (APPROX.)

SOUTHERN LIMIT, 1760

15 MILES

POST
MARKED
"WEST"
THE WEDGE

EAST
LINE

12 MILES

230.228 MILES TO END

INTERSECTION STONE

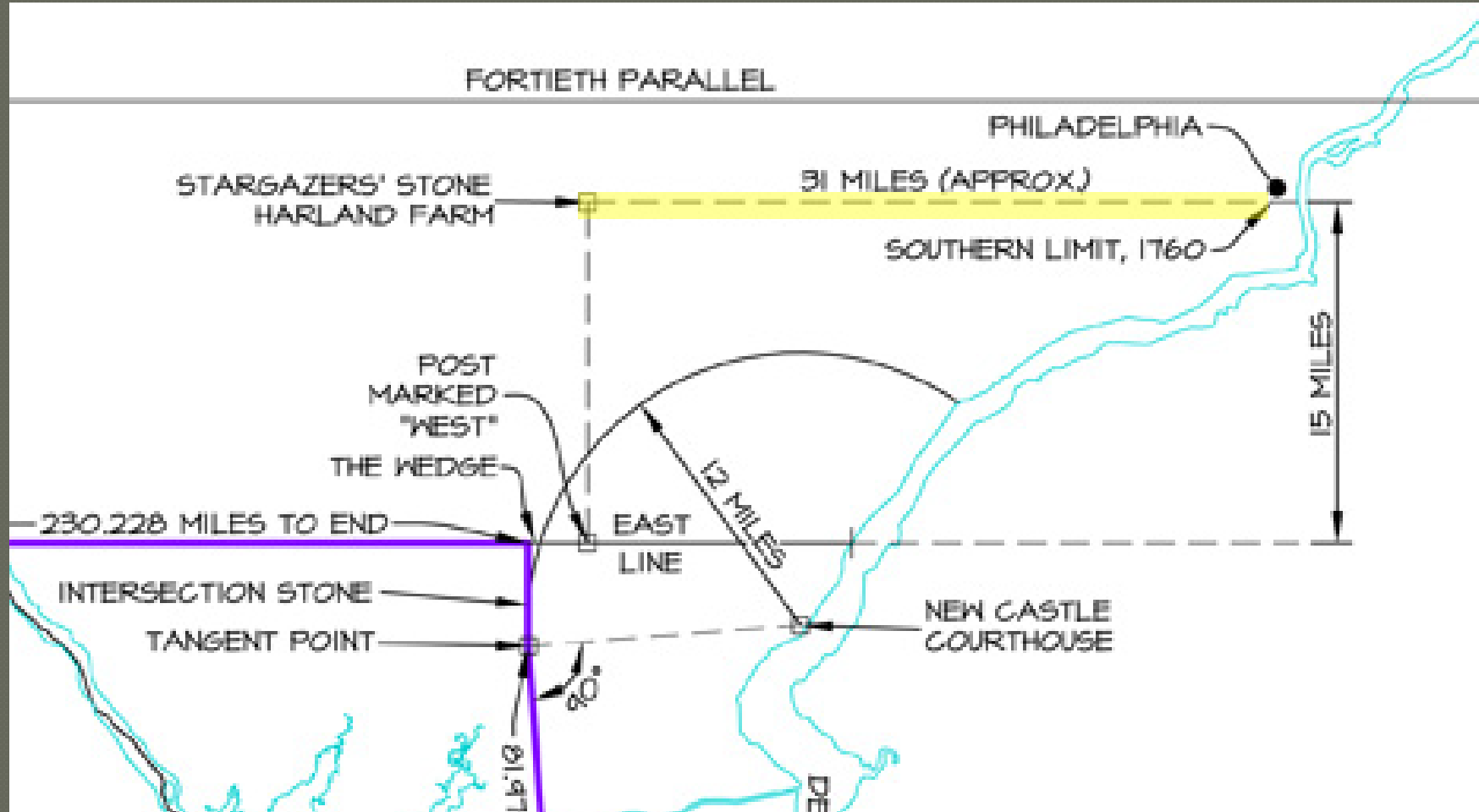
TANGENT POINT

NEW CASTLE
COURTHOUSE

90°

31.97

DE



John Harland house Embreeville, Pa.





The Stargazers' Stone





Mason and Dixon at the Stargazers' Stone

as envisioned by Brian Tucker



37/1500

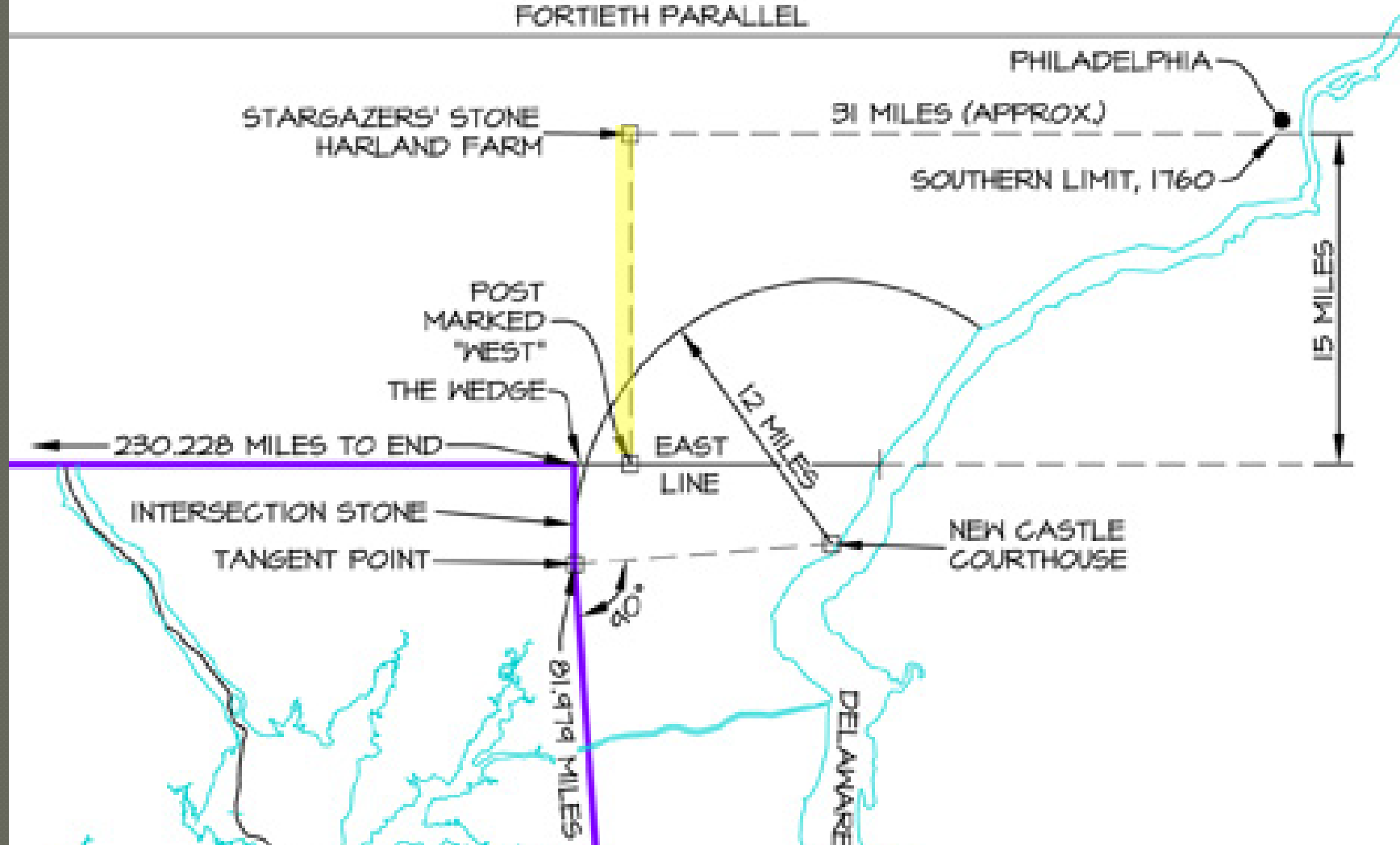
Mason and Dixon at the Stargazer's Stone - April 1764.

Brian Tucker



• MASON DIXON SURVEY •

FORTIETH PARALLEL



Mr. Bryan's Field
Near Newark, Delaware

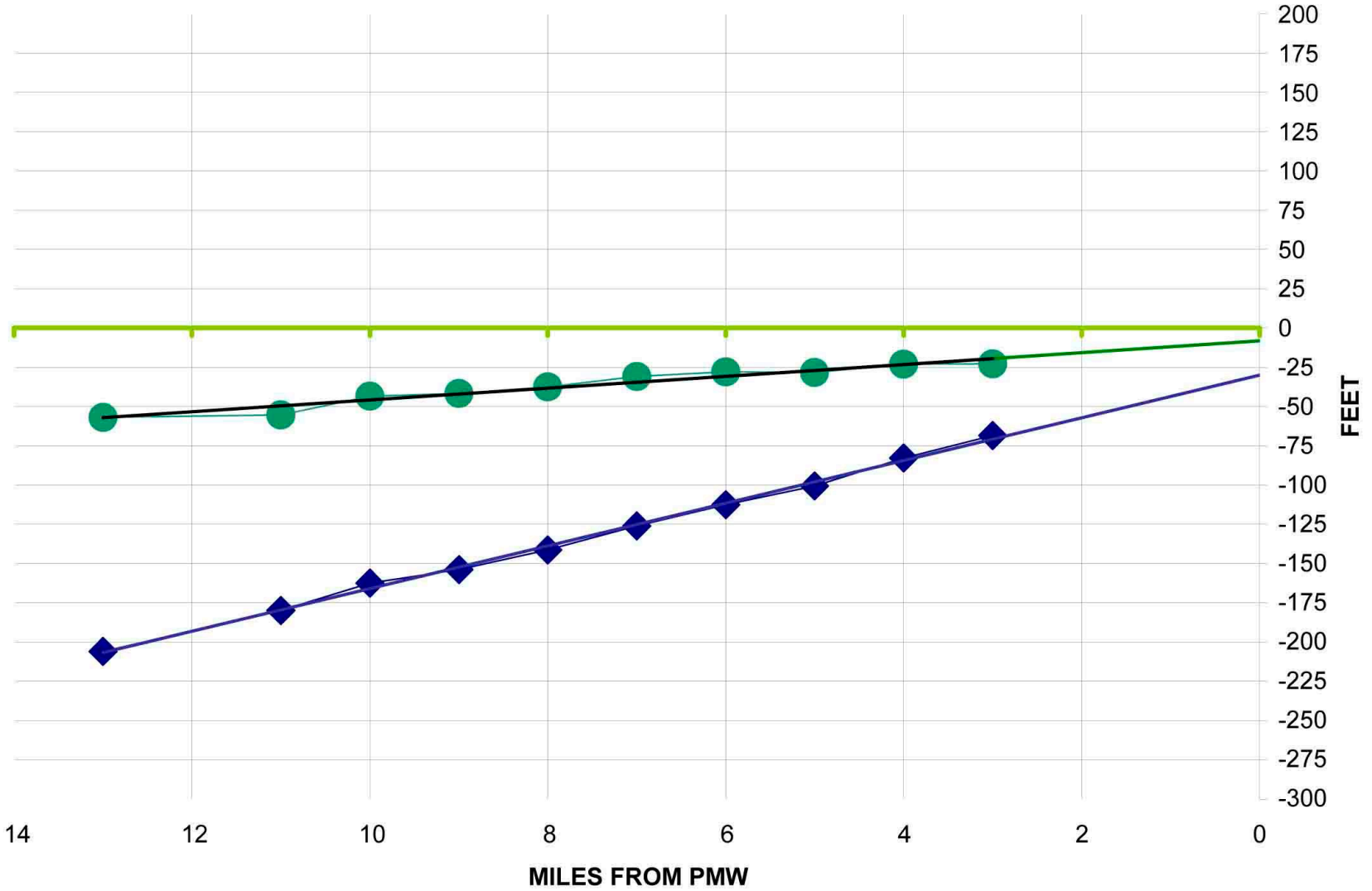




Monument
at the site of
The Post Mark'd West

Latitude of PMW

◆ Stones ● ORIGINAL LINE — Linear (ORIGINAL LINE) — Linear (Stones) — Linear (ORIGINAL LINE)



Archaeology – looking for the actual Post Mark'd West



Supervising the Dig!



The Post Mark'd West
in Mr. Bryan's field





Mile Stones





Crown Stones



"WE [King Charles I]...do grant Unto the
said Baron [Cecil Calvert, Lord Baltimore]...
and to his Heirs...free, full and absolute
Power,...to Ordain, make and Enact LAWS...
relating to the Public State of the PROVINCE...
with the Advice, Assent and Approbation of
the FreeMen of the same PROVINCE"

Lord Chamber of
Westmore, 1632

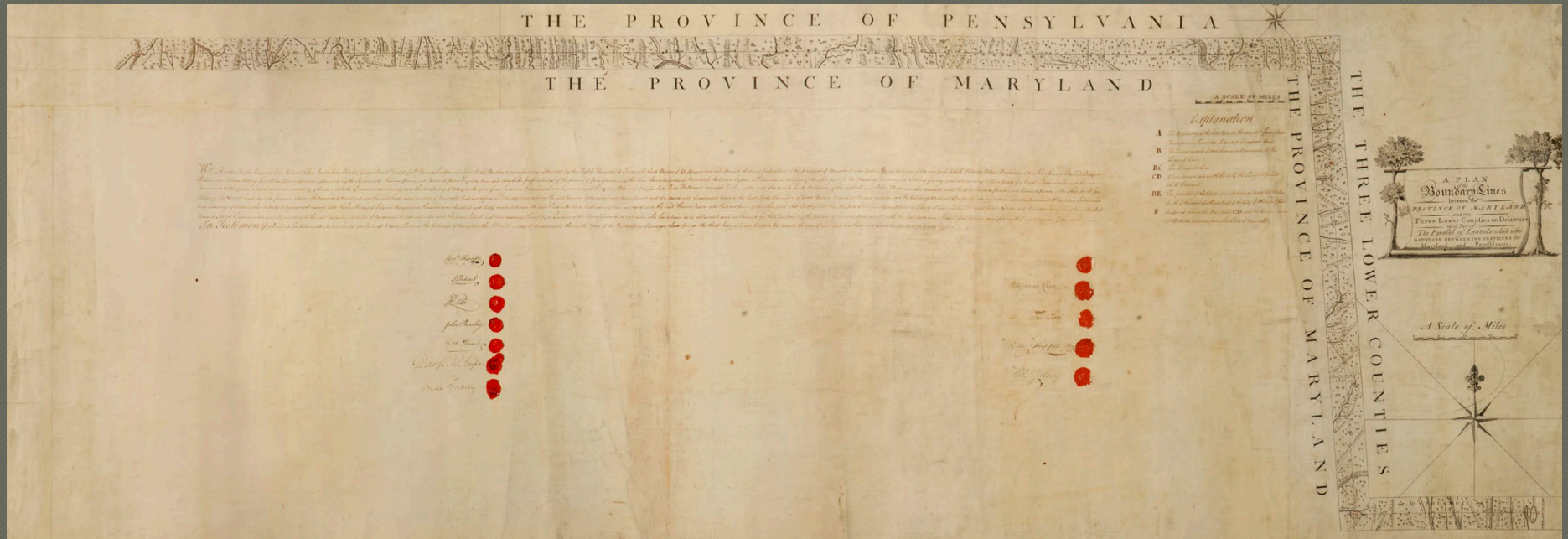


Dunkard Creek

Brown's Hill - end of the line



The final map, signed and sealed by the 12 boundary Commissioners.



Mason-Dixon Line



The Bill

827

D^o The Right Hon^{ble}: Lord Baltimore & the Hon^{ble}: Tho: Penn & Rich: Penn Esq: *vs* Contra C^o

To Charles Mason & Jere Dixon for Wages from
the 26th of June 1763. to Nov: 15th 1763 at 10/6. p Day } 119^l 2^s 0

to each of them . . . 142 Days . . . }
From the 15th of Nov: 1763. to the 26 of Dec: 1767. } 315^l 14^s 0

at £1. 1. 0. per Day to each . . . 152 Days . . . }
From the 21st of June 1768. to the 21st of July 1768. at } 63^l 0

£1. 1. 0. p Day to each . . . 30 Days . . . }
From the 21st of July 1768. to the 27th of Aug: 1768. } 38^l 17^s 0

at 10/6. to each . . . 37 Days . . . }
From the 11th of Sep: 1768. to the 7th of Oct: 1768. } 27^l 6^s 0

at 10/6. p Day to each . . . 26 Days . . . }
For Our Passage to America, and Passage } 8^l 0

hence to England . . . }
Total £ 3516^l 9^s 0

By Cash paid said Mason and Dixon before
their Departure from England . . . } 142^l 0

By Cash paid us by the Commissioners in
America as appears by Our Certificate . . . } 928^l 7^s 7

By Ballance 2446^l 1^s 5



£ 3516^l 9^s 0

*W*e Do hereby Acknowledge to have this Day Received of the Right Hon^{ble}: Frederick Lord Baltimore the sum
of One thousand Two hundred and Twenty Three Pounds and Eight Pence half Penny being One Moiety of the above Ballance
of Two thousand Four hundred and Forty six ^{Pounds} One Shilling and Five Pence which we do hereby Acknowledge and Declare
to be in full of the Share and Proportion of the said Frederick Lord Baltimore of the Ballance of the above Account and of
all other Demands whatsoever due from him to us under and by Virtue of certain Articles of Agreement bearing date the
fourth Day of August 1763 which we have this Day delivered up and cancelled ~~at~~ As Witnesses our
hands this twenty fourth day of February in the Year of Our Lord One thousand Seven hundred and Sixty Nine.

Witness to the Signing and Payment of the above sum of
One thousand Two hundred & Twenty Three Pounds & Eight Pence
half Penny.
Jere Dixon

Cha: Mason
Jere: Dixon

“...at 11h 30m A.M. went on Board the
Halifax Packet Boat for Falmouth.
**Thus ends my restless progress in
America.”**

Charles Mason,
September 11, 1767

Christ Church burial ground







Probable location of the Observatory behind Independence Hall





Dr. Silvio Bedini 1917-2007

Independence Hall

HISTORIC DISCOVERY MADE IN INDEPENDENCE HALL

Instrument With Which the Transit of Venus Was Observed in 1769 Accidentally Found in Tower by Curator Wilfred Jordan

By ERIC DOOLITTLE

A MOST interesting addition has been made to the many objects of priceless historical interest which are daily viewed by thousands in the rooms of old Independence Hall. This is no less than the astronomical transit instrument employed in this city on the memorable afternoon of June 3, 1769, when the disc of the planet Venus was seen to pass across the bright face of the sun, an important phenomenon long anticipated, the full and accurate observation of which by a band of eminent men in and around Philadelphia attracted the attention of foreign societies and of learned men abroad to the spirit of scientific inquiry in this new world.

It is to the American Philosophical Society that the credit of the successful planning of these observations is due. Realizing the importance of this most unusual phenomenon, the society early appointed committees and resolved to secure as many observations at different places as was permitted by its own funds and by the public assistance which it expected. The most valuable results which were secured constitute the first great contribution of the society to exact science.

The importance of securing these observations arose from the fact that in that day a transit of Venus furnished the most accurate known means of finding the exact distance from the earth to the sun in miles, and this distance is, so to speak, the yardstick by which all other distances

among the heavenly bodies are measured. Were this distance in error, not only would all other distances be similarly in error, but the computed sizes of all the planets and of the sun itself would be proportionately wrong. But the transits of Venus occur with great infrequency, and never before had observations been made with instruments of the high precision then available. At present and for several centuries they will occur in pairs, the two transits of each pair being but eight years apart, but the pairs themselves separated by a no less interval than 113 or 129 years. Thus the dates for the first transits of each pair are 1761, 1874 and 2004; those for the second are 1769, 1882 and 2012. There are very few people now living who will see the next transit of Venus, 91 years from the present time.

The whole story of the months of preparation, of the anxious waiting, of the serene and perfectly cloudless sky and of the complete success of the early observations is told in the papers published in the Transactions of the Society nearly a century and a half ago. A rainy day, or even a passing cloud, would have made all the preparatory labor useless. So great was the delight of David Rittenhouse at the entire success of the work and so great his relief from the preceding days and weeks of anxiety that, immediately after the observations were completed, he swooned away.

This work was of special value because it happened that throughout northern Europe this important day was a cloudy one. A high authority said of the results achieved here: "The first approximately accurate results in the measurement of the spheres were given to the world, not by the schooled and salaried astronomers who watched from the magnificent royal observatories of Europe, but by unpaid

amateurs and devotees to the science in the youthful province of Pennsylvania."

For observing the transit, the American Philosophical Society decided to establish three stations in the vicinity of Philadelphia. The first of these was at the home of David Rittenhouse in Norriton; the second was at an observatory erected by it for the purpose in Independence Square, and the third was near the town of Lewes, Delaware. The observations were to consist in ascertaining the exact times when the planet Venus first touched the sun's edge, and also the times at which it occupied various other positions during the six hours of its transit. It was therefore necessary to have suitable telescopes for watching the sun itself and also accurate clocks and instruments for determining the errors of these timepieces.

At the Norriton observatory, Rittenhouse had an excellent transit instrument made by himself which is now preserved in the rooms of the American Philosophical Society. At the Lewes station a so-called equal altitude instrument was employed, while at the society's observatory in Independence Square there was an astronomical transit made by the well-known instrument maker, John Bird, of London. It is this last instrument which has just been recovered; that used at Lewes has probably long since disappeared.

The astronomical transit is a small telescope, very firmly attached at its centre to a rigid axis which rests upon two firm supports in such a way that the axis always extends in an east and west direction. The axis is also always kept horizontal by means of a delicate level, so that whenever the telescope is turned to different heights in the sky its centre line, which is marked by a fine spider thread, will always lie exactly in the astronomical meridian. Hence when a star, or the sun, is seen on the thread we know that this body is at that instant crossing the meridian, and as the time when this occurs is known with high accuracy the observation furnishes a most accurate means of ascertaining the error of the clock from which the observed time is taken. One thus compares his clock directly with the ever-turning celestial sphere above him, which is, in fact, im-

mensely the most accurate timepiece in existence.

was while having the tower of Independence Hall cleaned that Wilfred Jordan, curator of the building, made the discovery of this historic transit. The instrument was found beneath the flooring, of a platform beside the old supports on which the Liberty Bell formerly hung, but how it originally got there is a mystery. It is evident that for many years it has been mounted on the heavy stone sill of the south window of the tower, in a position to take the meridian passage of the sun at noon, and from here it is very probable that the official Philadelphia time was obtained. But of its history after its use in the transit of Venus and before it was mounted in the tower of the State House nothing is at present known.

From a search of the early records, an interesting reference to the instrument is found in the account of the transit of Venus submitted to the society in 1769 by

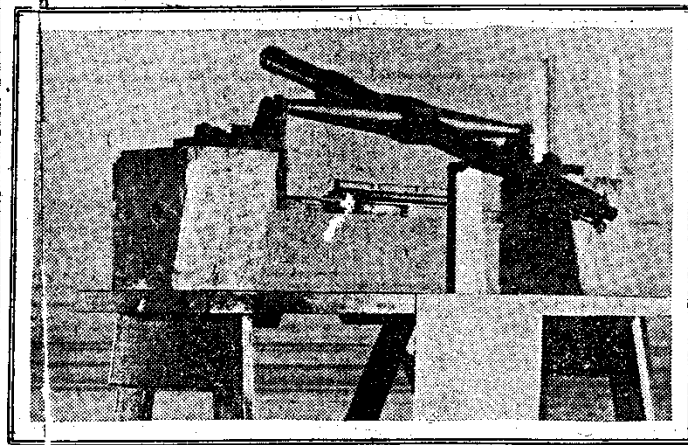
John Ewing, who had charge of the society's observatory in the State House yard. It appears that the instrument belonged to the Proprietaries of the Province, and was generously lent to the society for use on this special occasion. It is probable that very soon after the transit of Venus was over it was removed to the State House tower, where for many years it furnished time to the city of Philadelphia.

This most interesting instrument may now be seen, mounted on its original pier, in a corner of the west chamber of Independence Hall. The name of its most eminent maker, John Bird—itsself a historical name, connected with the names of Bradley, Halley, Maskelyne and others—may be seen upon the tube, and within the telescope some parts of the original spider threads even yet remain.

It is indeed fortunate that this interesting and long forgotten instrument has reappeared, and that it will hereafter be preserved among the other relics of the early history of our country.

ERIC DOOLITTLE.

The Flower Observatory, Sept. 13, 1912.



The transit resting on supports.

Instrument
reported found
on this level





Independence Hall







PRESENTED TO THE
CITY OF PHILADELPHIA
— JULY 4TH 1870. —
FOR THE STEEPLE OF INDEPENDENCE HALL
BY A CITIZEN.



MADE BY
SETH THOMAS
OF PHILADELPHIA
REVISED 1870

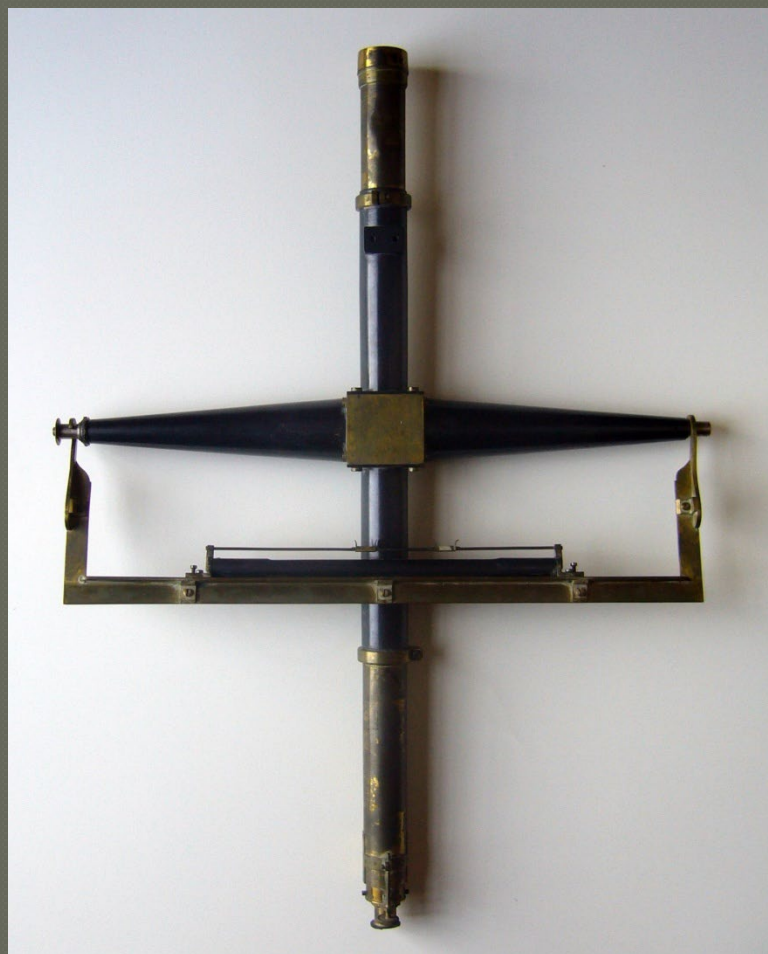






PLEASE
DON'T PUT ANYTHING
HERE.
MUSEUM OBJECT BELOW.
THANKS.

Before restoration

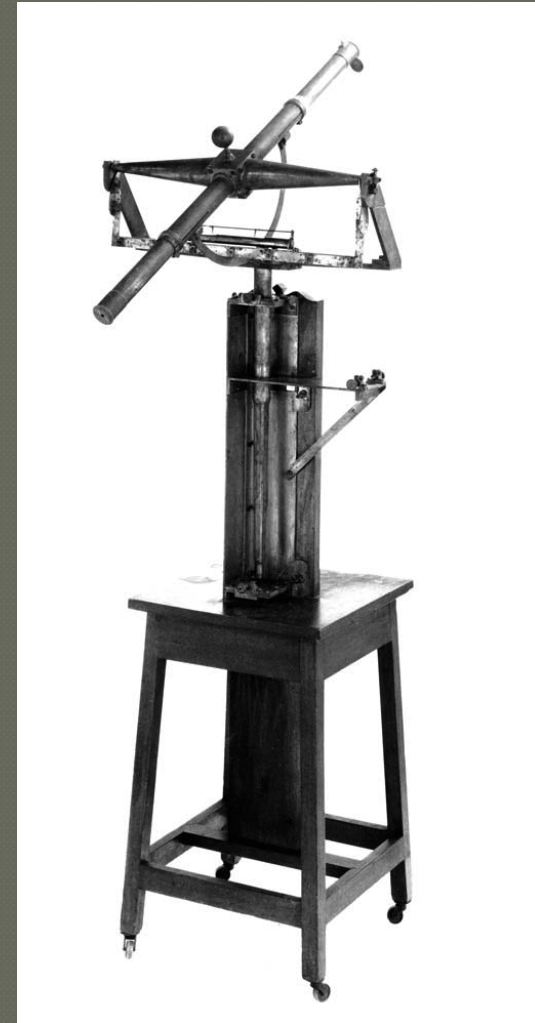




Bird Instrument
Dresden State Art Collection



Bird Instrument Harvard University
Stolen 1979



Transit and Equal Altitude Instrument
Made by Andrew Ellicott in 1789.
Modeled on the Bird instrument
National Museum of American History
Smithsonian Institute







Unveiling the restored instrument
Maryland Historical Society
October 12, 2015



A Gift to the Nation

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Resolving the greatest title dispute of them all
and

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September 28, 2023



QUESTIONS?

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• **The End**