# XXXVI. *Aſtronomical Obſervations made at the* North Cape, *for the Royal Society. By Mr.* Bayley.

1769 April 28, 29, and 30, got the obſervatory and dwelling-houſe built, and inſtruments on ſhore.

☽ May 1 Set up an oak plank $4\frac{3}{4}$ inches thick, and 14 inches wide. This plank was ſet a little more than 2 feet in the ground, and well rammed with earth and ſtones ſo that it was very ſteady and firm; to which I ſcrewed the aſtronomical clock truly perpendicular (by which means it was independant of the obſervatory and its ſhaking by the wind) and ſet it going nearly with ſidereal time.

☿ 3 Set up the tranſit inſtrument nearly in the meridian.

♃ 4 Examined the line of collimation of the quadrant, and found it correct.

Examined the clock, and found the pendulum to vibrate $1^{\circ}\frac{1}{2}$ on each ſide of nothing.

Here follow ſome correſponding altitudes of the Sun, from which the going of the clock is determined.

| | | ′ ″ | h ′ ″ | ′ ″ | | | Z. D. ° ′ | |
|---|---|---|---|---|---|---|---|---|
| ♄ | 6 | 27 13 | 23 34 37 | 42 22 | Morning | Sun's upper limb | 61,30 | |
| | | 20 58 | 6 13 30 | 5 48 | Afternoon | | | |
| | | 5 57 | 0 14 31 | 23 8 | Morning | Sun's upper limb | 50,0 | |
| | | 42 6 | 5 33 32 | 24 55 | Afternoon | | | |
| ☉ | 7 | 29 16: | 0 38 39: | 48 24: | Morning | Sun's upper limb | 57,36 | very hazy |
| | | 26 24: | 5 16 59: | — — — | Afternoon | | | |
| | | 39 20: | 0 49 17: | 59 44: | Morning | Sun's lower limb | | |
| | | 16 18: | — — — — — | — — — | Afternoon | | | |
| ☽ | 8 | 29 53 | 23 | 44 29 | Morning | Sun's upper limb | 61,20 | |
| | | 34 0 | 6 | 19 25 | Afternoon | | | |
| | | 37 39 | 23 45 13 | — — — | Morning | Sun's lower limb | | |
| | | 26 16 | 6 18 44 | — — — | Afternoon | | | |
| ♄ | 13 | 26 46 | 21 33 0 | 38 59 | Morning | Sun's upper limb | 71,20 | |
| | | 33 23 | 39 35 | 45 34 | Afternoon | | | |

This day ſet up a meridian poſt nearly in the meridian, by help of the quadrant, at about half a mile from the obſervatory. Examined the pendulum of the clock, and found it to vibrate $1^{\circ}\frac{1}{2}$ on each ſide of nothing.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ☽ | 15 | — — — | 1 9 25 | 18 54 | Morning | Sun's upper limb | 55,40 | |
| | | — — — | 5 49 26 | 39 54 | Afternoon | | | |
| | | 9 59 | 1 19 46 | — — — | Morning | Sun's lower limb | | |
| | | 48 48 | 5 39 0 | — — — | Afternoon | | | |
| ♃ | 18 | 48 56 | 21 55 4 | 1 8 | Morning | Sun's upper limb | 70,5 | |
| | | 55 31 | 22 1 42 | — — — | Afternoon | Sun's lower limb | | |
| ♄ | 20 | — — — | 1 36 21 | 46 20 | Morning | Sun's upper limb | 54,12 | |
| | | — — — | 6 1 48 | 51 50 | Afternoon | | | |
| | | 37 3 | 1 47 16 | — — — | Morning | Sun's lower limb | | |
| | | 1 10 | 5 50 56 | — — — | Afternoon | | | |

1769

1769 — Corresponding Altitudes of the SUN.

| | | | | | | | Z. D. ° ′ |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | h ′ ″ | ′ ″ | | | |
| ☉ | 21 | – – – | 22 6 2 | 12 6 | Morning | Sun's upper limb | 69,27 |
| | | 6 28 | 12 38 | – – – | Morning | Sun's lower limb | |
| ☿ | 26 | At 7h 22′ per clock, clock ſtopped, but by what cauſe I cannot find, it not being down. | | | | | |
| | | At 9½ ſet it going again, as near as I could gueſs, with ſidereal time. | | | | | |
| | | Pendulum vibrates 1°½ on each ſide of nothing. | | | | | |
| ♃ | June 1 | Wound up the clock | The pendulum vibrates 1°½ on each ſide of nothing. | | | | |
| ♄ | 3 | 49 45 | 22 55 59 | 2 3 | Morning | Sun's upper limb | 67,40 |
| | | – – – | 10 34 52 | 28 47 | Afternoon | | |
| | | 56 23 | 23 2 34 | – – – | Morning | Sun's lower limb | |
| | | 34 28 | 10 28 14 | – – – | Afternoon | | |
| | | – – – | 23 6 16 | 12 19 | Morning | Sun's upper limb | 66,50 |
| | | – – – | 10 24 31 | 18 26 | Afternoon | | |
| | | 6 40 | 23 12 53 | 18 51 | Morning | Sun's lower limb | |
| | | 24 4: | 10 17 52: | 11 56 | Afternoon | | |
| | | – – – | 23 49 31 | 55 38 | Morning | Sun's upper limb | 63,20 |
| | | – – – | 9 41 12: | 35 5: | Afternoon | | |
| | | 49 56 | 23 56 14 | 02 18 | Morning | Sun's lower limb | |
| | | 40 47: | 9 | 28 24: | Afternoon | | |
| | | – – – | 0 7 30 | 13 42 | Morning | Sun's upper limb | 61,54 |
| | | – – – | 9 23 13: | 17 2: | Afternoon | | |
| | | 7 55 | 14 16 | 20 30 | Morning | Sun's lower limb | |
| | | 22 48: | 9 16 26: | 10 12: | Afternoon | | |
| | | – – – | 0 48 51 | 55 26 | Morning | Sun's upper limb | 58,42 |
| | | – – – | 8 41 50 | 35 13 | Afternoon | | |
| | | 49 19 | 0 56 2 | – – – | Morning | Sun's lower limb | |
| | | – – – | 8 34 37 | – – – | Afternoon | | |
| | | – – – | 1 16 46 | 23 47 | Morning | Sun's upper limb | 56,40 |
| | | – – – | 8 13 51 | 6 50 | Afternoon | | |
| | | 17 14 | 1 24 26 | – – – | Morning | Sun's lower limb | |
| | | 13 23 | 8 6 11 | – – – | Afternoon | | |
| | | – – – | 1 39 55 | 47 29 | Morning | Sun's upper limb | 55,5 |
| | | – – – | 7 50 41 | – – – | Afternoon | | |
| | | 41 27 | 1 48 11 | – – – | Morning | Sun's lower limb | |
| | | – – – | 7 42 29:: | – – – | Afternoon | | |
| | | – – – | 2 13 44 | 22 27 | Morning | Sun's upper limb | 53,0 |
| | | – – – | 7 16 52 | 8 7 | Afternoon | | |
| | | 14 18 | 2 23 19 | – – – | Morning | Sun's lower limb | |
| | | 16 18 | 7 7 18 | – – – | Afternoon | | |
| | | – – – | 2 30 20 | 39 56 | Morning | Sun's upper limb | 52,5 |
| | | – – – | 7 0 16 | 50 39 | Afternoon | | |
| | | 30 56 | 2 40 52 | 51 8 | Morning | Sun's lower limb | |
| | | 59 40 | 6 49 45 | 39 24 | Afternoon | | |
| | | – – – | 2 56 16 | 7 58 | Morning | Sun's upper limb | 50,50 |
| | | – – – | 6 34 20 | – – – | Afternoon | | |
| | | 57 2 | 3 9 6 | – – – | Morning | Sun's lower limb | |
| | | 33 33 | 6 21 31 | – – – | Afternoon | | |
| ♃ | 8 | at | 11 15 52,5 | a mean of four obſervations Z. D. ☉ L. L. = 69° 26′ 15″ | | | |
| ☿ | 9 | – – – | 23 21 46 | 27 57 | Morning | Sun's upper limb | 67,0 |
| | | – – – | 10 58 14: | 52 6: | Afternoon | | |
| | | 22 11 | 23 28 26 | – – – | Morning | Sun's lower limb | |
| | | 57 49: | 10 51 39: | – – – | Afternoon | | |

1769 — Corresponding Altitudes of the SUN.

| | | | | | | | | | Z. D. ° ′ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ′ | ″ | h | ′ | ″ | ′ | ″ | | | | |
| ♀ | June 9 | 33 | 43 | 23 | 0 | 0 | 46 | 0 | Morning | Sun's upper limb | 65,32 | |
| | | 46 | 18 | 10 | 40 | 9 | 34 | 0 | Afternoon | | | |
| | | 40 | 16 | 23 | 46 | 34 | – | – – | Morning | Sun's lower limb | | |
| | | 39 | 45 | 10 | 33 | 27 | – | – – | Afternoon | | | |
| | | – | – – | 1 | 28 | 43 | – | – – | Morning | Sun's upper limb | 57,0 | |
| | | – | – – | 8 | 51 | 10 | – | – – | Afternoon | | | |
| | | 29 | 12 | 1 | 36 | 9 | 42 | 56 | Morning | Sun's lower limb | | |
| | | 50 | 40 | 8 | 43 | 42 | 36 | 54 | Afternoon | | | |
| ♄ | 10 | – | – – | 23 | 28 | 22 | 34 | 32 | Morning | Sun's upper limb | 66,44 | |
| | | – | – – | 10 | 56 | 36 | – | – – | Afternoon | | | |
| | | 28 | 45 | 23 | 34 | 56 | – | – – | Morning | Sun's lower limb | | |
| | | 0 | 0 | 11 | 0 | 0 | – | – – | Afternoon | | | |
| | | – | – – | 0 | 59 | 30 | 5 | 50 | Morning | Sun's upper limb | 59,26 | |
| | | – | – – | 9 | 28 | 43 | 22 | 22 | Afternoon | | | |
| | | 59 | 56 | 1 | 6 | 27 | – | – – | Morning | Sun's lower limb | | |
| | | – | – – | 9 | 21 | 44 | – | – – | Afternoon | | | |
| | | – | – – | 1 | 20 | 57 | 27 | 32 | Morning | Sun's upper limb | 57,48 | |
| | | – | – – | 9 | 7 | 16 | – | – – | Afternoon | | | |
| | | 21 | 26 | 1 | 28 | 12 | – | – – | Morning | Sun's lower limb | | |
| | | 6 | 47 | 9 | 0 | 0 | – | – – | Afternoon | | | |
| ☿ | 11 | – | – – | 1 | 42 | 4 | 48 | 39 | Morning | Sun's upper limb | 57,30 | |
| | | – | – – | 9 | 27 | 34 | 21 | 1 | Afternoon | | | |
| | | 42 | 31 | 1 | 49 | 18 | – | – – | Morning | Sun's lower limb | | |
| | | 27 | 8 | 9 | 20 | 20 | – | – – | Afternoon | | | |
| | | – | – – | 2 | 9 | 8 | 16 | 15 | Morning | Sun's upper limb | 55,32 | |
| | | – | – – | 9 | 0 | 28 | – | – – | Afternoon | | | |
| | | 9 | 38 | 2 | 16 | 58 | 24 | 8 | Morning | Sun's lower limb | | |
| | | 0 | 0 | 9 | 0 | 0 | – | – – | Afternoon | | | |
| | | – | – – | 3 | 24 | 23: | 34 | 14: | Morning | Sun's upper limb | 50,54 | hazy |
| | | – | – – | | 45 | 8: | 35 | 15: | Afternoon | | | |
| | | 25 | 6: | 3 | 35 | 12: | 45 | 48: | Morning | Sun's lower limb | | |
| | | 44 | 23: | 7 | 34 | 16: | 23 | 38: | Afternoon | | | |
| ☉ | 18 | 17 | 16 | 0 | 23 | 28 | 29 | 30 | Morning | Sun's upper limb | 64,36 | |
| | | 17 | 13 | 11 | 11 | 3 | 4 | 58 | Afternoon | | | |
| | | 23 | 50 | 0 | 30 | 6 | 36 | 8 | Morning | Sun's lower limb | | |
| | | 10 | 40 | 11 | 4 | 2 | 58 | 20 | Afternoon | | | |
| | | – | – – | 0 | 39 | 11 | 45 | 17 | Morning | Sun's upper limb | 63,20 | |
| | | – | – – | 0 | 0 | 0 | 49 | 16:: | Afternoon | | | |
| | | 39 | 37 | 0 | 45 | 51 | – | – – | Morning | Sun's lower limb | | |
| | | – | – – | 10 | 48 | 43:: | – | – – | Afternoon | | | |
| | | – | – – | 2 | 22 | 1 | 29 | 5 | Morning | Sun's upper limb | 55,25 | |
| | | – | – – | 9 | 12 | 22 | 5 | 24 | Afternoon | | | |
| | | 22 | 30 | 2 | 29 | 49 | – | – – | Morning | Sun's lower limb | | |
| | | 11 | 54 | 9 | 0 | 0 | – | – – | Afternoon | | | |
| | | – | – – | 3 | 32 | 20 | 41 | 56 | Morning | Sun's upper limb | 51,3 | |
| | | – | – – | 8 | 2 | 7 | 52 | 26 | Afternoon | | | |
| | | 32 | 58 | 3 | 42 | 50 | 53 | 6 | Morning | Sun's lower limb | | |
| | | 1 | 27 | 7 | 51 | 35 | 41 | 20 | Afternoon | | | |



From

From the above correſponding Altitudes the going of the Clock is determined.

| | | Apparent noon per clock, per equal altitudes. | Clock too ſlow for ſidereal time. | Rate of clock with reſpect to ſidereal time. | |
|---|---|---|---|---|---|
| | | h ′ ″ | ′ ″ | ″ | |
| May | 6 | 2 53 31,0 | 1 1,0 | +4,6 | |
| | 8 | 3 1 25,2 | 0 52,3 | +1,2 | |
| | 15 | 3 28 59,2 | 0 43,2 | —1,3 | |
| | 20 | 3 48 43,9 | 0 49,6 | | |
| ♄ June | 3 | 4 45 5,1 | 1 13,6 | —0,5 | Clock ſtopped. |
| | 9 | 5 9 46,4 | 1 16,6 | +1,3 | |
| | 10 | 5 13 56,9 | 1 15,3 | +2,1 | |
| | 11 | 5 18 7,3 | 1 13,2 | —0,2 | |
| | 15 | 5 34 42,5 | 1 14,0 | +0,07 | |
| | 18 | 5 47 10,3 | 1 14,2 | | |
| | | | Mean rate of clock | +0,91 | |

TRANSITS taken with a Tranſit Inſtrument over the Meridian, on the Iſland of Maggeroe, or the North Cape of Europe.

1769

♄ May 20 | $3^h$ 49′ 30″,7 tranſit of Sun's center at tranſit inſtrument, it being adjuſted to the meridian mark, which was put nearly in the meridian. ——— And $3^h$ 48′ 43″,9 apparent noon per equal altitudes. By this it appears, the meridian mark is weſt of the true meridian.

☉ 21 | Shifted the meridian mark nearer to the true meridian.

| | | 1 Wire. | 2 Wire. | 3 Wire. | 4 Wire. | 5 Wire. | |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | h ′ ″ | ′ ″ | ′ ″ | |
| ♄ June | 3 | | 43 11½ | 4 44 1½ | | | ☉ 1 L. |
| | | | | 46 17 | 47 7½ | | ☉ 2 L. |
| ♀ | 9 | | | 5 10 58,6 | | | ☉ 2 L. paſſed the merid. |
| | | 11⅝ | 27 8+ | 18 28 5— | 29 2— | 58— | ∝ Lyræ. |
| | | 59— | 43⅝ | 19 38 28+ | 13⅜ | 58 | ∝ Aquilæ. |
| ♄ | 10 | 47 8 | 47 54 | 10 48 39 | 49 24½ | | ☽ 1 L. |
| | | | | 12 45 14 | | | Polaris S. P. |
| | | 32 v | 19— | 14 4 6— | 53½ | | Arcturus. |
| | | 14 v | 11— | 18 28 7+ | 4+ | 0⅝ | ∝ Lyræ. |
| ☉ | 11 | 15 24— | 16 12+ | 5 17 0½ | | | ☉ 1 L. |
| | | | | 19 18½ | 20 7⅝ | 20 55½ | ☉ 2 L. |
| ♃ | 15 | | 32 46½ | 5 33 34½ | | | ☉ 1 L. |
| | | | | 35 53+ | 36 41½ | | ☉ 2 L. |
| ♀ | 16 | 17 52+ | 18 39— | 4 19 26— | 20 13+ | | ♀ 2 L. |
| ♄ | 17 | 40 18 | 41 6+ | 5 41 54+ | | | ☉ 1 L. |
| | | | | 44 15½: | 45 2½ | 45 50⅝ | ☉ 2 L. |
| | | 33+ | 3 20½ | 14 4 7½ | 4 55 | | Arcturus. |
| | | 42 22+ | 43 11— | 17 43 59+ | | | ☉ 1 L. |
| | | | | 46 17½ | 47 5⅝ | 47 54+ | ☉ 2 L. |
| | | 26 14 | 27 11 | 18 28 7½ | 4½ | | ∝ Lyræ. |
| | | | 17 31— | 4 10 17½ | 19 4⅜ | | ♀ 2 L. |
| ☉ | 18 | 44 28— : | | 5 46 24½ | | | ☉ 1 L. } flying clouds. |
| | | | 47 35— : | 48 23½ | 49 12½ | | ☉ 2 L. } |
| | | | | 12 45 30: | | | Polaris S. P. |

TRANSITS compared with equal Altitudes, for finding the Error of the Meridian Mark.

| | Tranſits of Sun at tranſit inſtrument. | Noon per equal altitudes. | Differences. |
|---|---|---|---|
| | h ′ ″ | h ′ ″ | ″ |
| June 3 | 4 45 9,3 | 4 45 5,1 | 4,2 W. |
| 11 | 5 18 9,9 | 5 18 7,3 | 2,6 W. |
| 15 | 5 34 43,9 | 5 34 42,5 | 1,4 W. |
| 18 | 5 47 13,0 | 5 47 10,3 | 2,7 W. |
| | | Mean difference | 2,7 Weſt. |

Hence it appears, that the Sun paſſed at the tranſit inſtrument too late 2″,7 by a mean of theſe obſervations, which ſhews the mark was weſt of the true meridian; which gives the azimuth of mark = 50″ ſouth weſterly.

## TRANSIT of VENUS, obſerved at the NORTH CAPE.

1769
♀ June 3 At 13h 46′ 40″ per clock, or 9h 0′ 2″, apparent time, the Sun came out from under a cloud, with Venus on it, about $\frac{1}{4}$th of her diameter; and at 14h 0′ 41″ or 9h 14′ 1″, apparent time, Venus's outer limb ſeemed to be in contact with the Sun's limb; but no light of that part of the Sun's limb could be ſeen, Venus being apparently joined to the Sun's limb by a black ligament, which gradually diminiſhed in breadth; and at 14h 1′ 36″, or 9h 14′ 56″, the Sun's light broke through it, and Venus and the Sun were to appearance perfect (this was certain to about 10 or 15 ſeconds of time), and the black ligament contracted itſelf, ſo that Venus was conſiderably within the Sun's limb, ſuppoſe $\frac{1}{20}$th of her diameter.

During theſe obſervations the air was red and hazy, and the Sun's limb very tremulous, and the ſpots in the Sun very indiſtinct, and Venus ſeemed very ill defined when on the Sun. But a better idea will be formed of the bad appearance of Venus at the internal contact, owing to the very hazy ſtate of the air, from the repreſentation of it, plate XIII.

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Here follow ſome meaſures I was able to take during the time the clouds were off the Sun.

| Time per clock. | App. time. | Meaſures of microm. in inches, &c. | Meaſures of microm. in degrees, &c. |
|---|---|---|---|

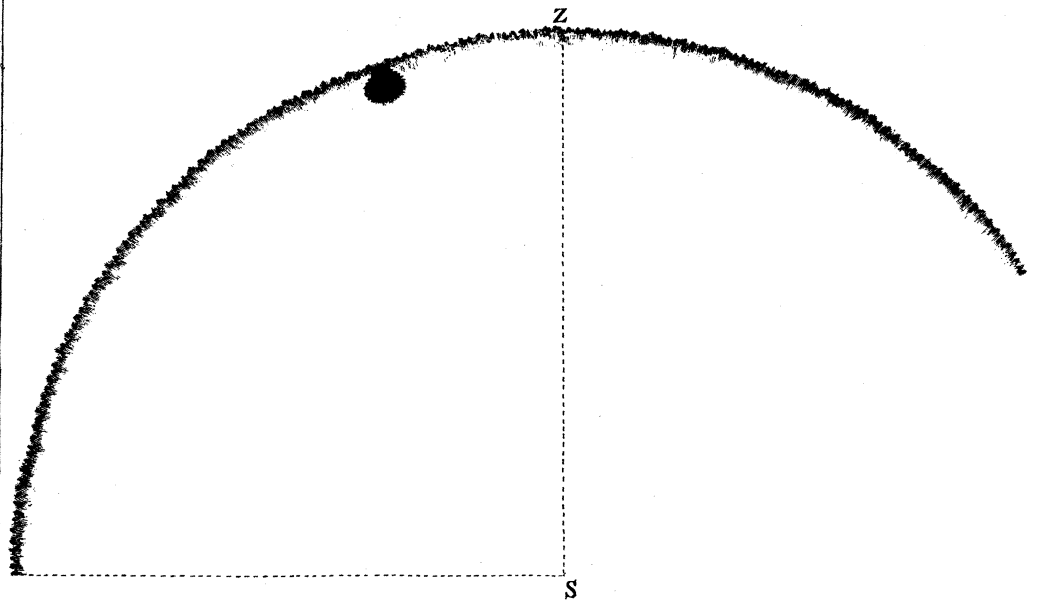
Soon after the internal contact, meaſures of Venus's diameter.

| | | | |
|---|---|---|---|
| | | 0,1 24 | |
| | | 0,1 23 + | |
| | | 0,1 23 — | |
| | | 0,1 22 + | |
| | | 0,1 22 | |
| | | 0,1 22 | |
| | | 0,1 23 — | |
| | | 0,1 24 — | |
| | | 0,1 23 — | |
| | | 0,1 23 | |
| | | 0,1 23 — | |
| | | 0,1 23 — | |
| Mean of | = 12 | 0,1 22,8 | = 55″,32 |

Meaſures of the Sun's horizontal and vertical diameters, taken immediately after Venus's diameter.

| | Horizontal Diameter. | | | Vertical Diameter. | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | 4,9½ 21½ | | | 4,8½ 12 | | |
| | 4,9½ 23 | | | 4,8½ 10 | | |
| | 4,9½ 23 | | | 4,8½ 11 | | |
| | 4,9½ 21½ | | | 4,8½ 9 | | |
| Mean | 4,9½ 22,2 | 31′ 37″,61 | | 4,8½ 10,5 | 30′ 50″,73 | |

Difference




J. Wyatt Sc.

## Difference of Declinations of the North Limbs of the Sun and Venus.

| Time per clock. | | | App. time. | | | Meaſures of microm. in inches, &c. | | Meaſures of microm. in degrees, &c. | |
|---|---|---|---|---|---|---|---|---|---|
| h | ′ | ″ | h | ′ | ″ | | | ′ | ″ |
| 14 | 38 | 37 | 9 | 51 | 50 | 0,5½ | 1 | 3 | 29,7 |
| | 44 | 30 | | 57 | 32 | 0,5½ | 9 | 3 | 35,8 |
| | 46 | 56 | 10 | 0 | 8 | 0,5½ | 13 | 3 | 38,8 |
| | 52 | 45 | | 5 | 56 | 0,5½ | 23 | 3 | 46,4 |

## Difference of Declination of the South Limbs of the Sun and Venus.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14 | 54 | 50 | 10 | 8 | 1 | 4,2½ | 5 | 26 | 58,6 |
| | 57 | 43 | | 10 | 53 | 4,2½ | 0 | 26 | 54,8 |
| | 59 | 32 | | 13 | 2 | 4,2 | 20 | 26 | 51,0 |
| 15 | 2 | 0 | | 15 | 9 | 4,2 | 16 | 26 | 48,0 |

## Equatoreal Diſtances of the Weſtern Limbs of the Sun and Venus.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 8 | 5 | 10 | 21 | 13 | 3,1 | 17 | 19 | 50,8 |
| | 10 | 28 | | 23 | 36 | 3,1 | 2 | 19 | 39,4 |
| | 12 | 15 | | 25 | 23 | 3,0½ | 20 | 19 | 34,1 |
| | 13 | 48 | | 26 | 56 | 3,0½ | 12 | 19 | 27,9 |

## Equatoreal Diſtances of the Eaſtern Limbs of Venus and the Sun.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 15 | 50 | 10 | 28 | 57 | 6,8½ | 8½ | 11 | 49,4 |
| | 17 | 38 | | 30 | 45 | 1,8½ | 20 | 11 | 58,1 |
| | 19 | 33 | | 32 | 40 | 1,9 | 8 | 12 | 8,0 |
| | 22 | 0 | | 35 | 6 | 1,9 | 19 | 12 | 16,4 |
| | 24 | 5 | | 37 | 11 | 1,9½ | 7 | 12 | 26,2 |

## Greateſt and leaſt Diſtances of Venus's neareſt Limbs from the Sun's Limbs, for finding the neareſt Diſtance of their Centers.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 49 | 3 | 11 | 2 | 4 | 0,6½ | 17 | 4 | 19,9 |
| | 51 | 22 | | 4 | 23 | 4,0 | 2 + | 25 | 21,3 |
| | 54 | 24 | | 7 | 25 | 0,7 | 7 | 4 | 31,3 |
| | 58 | 1 | | 11 | 1 | 3,9½ | 10 | 25 | 8,4 |
| 16 | 0 | 40 | | 13 | 39 | 3,9½ | 7 | 25 | 6,1 |
| | 4 | 4 | | 17 | 3 | 0,7 | 23 | 4 | 43,4 |
| | 6 | 24 | | 19 | 22 | 0,7½ | 5 | 4 | 48,8 |
| | 9 | 55 | | 23 | 53 | 3,9 | 14 | 24 | 52,5 |
| | 16 | 29 | | 29 | 26 | 0,7 | 12 | 4 | 35,1 |
| | 21 | 31 | | 34 | 27 | 0,7 | 8 | 4 | 32,1 |
| 16 | 25 | 55 | 11 | 38 | 51 | 3,8½ | 20 | 24 | 38,0 |

## A Table for reducing the Scale of the micrometer to Degrees, &c.

| Inches. | Value. | | Tenths. | Value. | | Vernier. | Value. |
|---|---|---|---|---|---|---|---|
| | ′ | ″ | | ′ | ″ | | ″ |
| 1 | 6 | 19,95 | 1 | 0 | 37,99 | 1 | 0,76 |
| 2 | 12 | 39,91 | 2 | 1 | 15,99 | 2 | 1,52 |
| 3 | 18 | 59,86 | 3 | 1 | 53,98 | 3 | 2,28 |
| 4 | 25 | 19,81 | 4 | 2 | 31,98 | 4 | 3,04 |
| 5 | 31 | 39,77 | 5 | 3 | 9,97 | 5 | 3,80 |
| | | | 6 | 3 | 47,97 | 6 | 4,56 |
| | | | 7 | 4 | 25,97 | 7 | 5,32 |
| | | | 8 | 5 | 3,96 | 8 | 6,08 |
| | | | 9 | 5 | 41,96 | 9 | 6,84 |
| | | | | | | 10 | 7,60 |
| | | | | | | 11 | 8,36 |
| | | | | | | 12 | 9,12 |
| | | | | | | 13 | 9,88 |
| | | | | | | 14 | 10,64 |
| | | | | | | 15 | 11,4 |
| | | | | | | 16 | 12,16 |
| | | | | | | 17 | 12,92 |
| | | | | | | 18 | 13,68 |
| | | | | | | 19 | 14,44 |
| | | | | | | 20 | 15,20 |
| | | | | | | 21 | 15,96 |
| | | | | | | 22 | 16,72 |
| | | | | | | 23 | 17,48 |
| | | | | | | 24 | 18,24 |
| | | | | | | 25 | 18,99 |

On examination, the micrometer ſcale wanted no adjuſtment.

## ECLIPSE of the SUN, obſerved at the NORTH CAPE.

1769
June 3 At 1h 48′ 4″, the clouds clearing away, I ſaw the Sun, and the Moon had made a ſmall impreſſion or notch in the Sun's limb; by obſerving the increaſe of the eclipſe, I ſuppoſe it began 4, 5, or 6 ſeconds ſooner than I firſt ſaw it, or at 1h 48″ 0″ per clock, or 20h 59′ 19″ apparent time, nearly.

Diſtances of the Cuſps.

| Time p clock | | | App. time | | | Meaſures | | Reduced | |
|---|---|---|---|---|---|---|---|---|---|
| h | ′ | ″ | h | ′ | ″ | | | ′ | ″ |
| 2 | 10 | 22 | 21 | 21 | 0 | 3,7 | 5 | 23 | 29,6 |
| | 13 | 19 | | 24 | 34 | 3,8½ | 9 | 24 | 29,6 |
| | 19 | 1 | | 30 | 15 | 4,1½ | 6 | 26 | 21,3 |
| | 21 | 3 | | 32 | 16 | 4,2 | 7 | 26 | 41,1 |
| | 23 | 50 | | 35 | 3 | 4,3½ | 8 | 27 | 38,8 |
| | 27 | 38 | | 38 | 50 | 4,4½ | 14 | 28 | 21,4 |
| | 31 | 10 | | 41 | 21 | 4,5½ | 10 | 28 | 56,4 |
| | 34 | 56 | | 46 | 7 | 4,6 | 13 | 29 | 17,7 |
| | 36 | 4 | | 47 | 14 | 4,6½ | 15 | 29 | 38,2 |
| | 39 | 11 | | 50 | 21 | 4,7 | 0 | 29 | 45,8 |

Meaſures of the lucid Part, near the Middle of the Eclipſe.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 43 | 7 | 21 | 54 | 16 | 1,1 | 5 | 7 | 1,7 |
| | 44 | 11 | | 55 | 20 | 0,9½ | 22 | 6 | 17,7 |
| | 47 | 50 | | 58 | 59 | 0,9 | 24 | 6 | 0,2 |
| | 49 | 35 | 22 | 0 | 43 | 0,9 | 9 | 5 | 48,4 |
| | 52 | 14 | | 3 | 22 | 1,0½ | 11 | 6 | 47,3 |

Diſtances of the Cuſps.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 54 | 55 | 22 | 6 | 2 | 4,6½ | 19 | 29 | 41,2 |
| | 57 | 1 | | 8 | 8 | 4,7 | 3 | 29 | 48,1 |
| | 59 | 55 | | 11 | 2 | 4,6 | 14 | 29 | 18,4 |
| 3 | 2 | 24 | | 13 | 30 | 4,6 | 10 | 29 | 15,4 |
| | 4 | 31 | | 15 | 37 | 4,6 | 7 | 29 | 13,1 |
| | 6 | 37 | | 17 | 42 | 4,5½ | 9 | 28 | 55,6 |
| | 8 | 13 | | 19 | 18 | 4,5 | 20 | 28 | 45,0 |
| | 10 | 34 | | 21 | 38 | 4,4½ | 18 | 28 | 24,5 |
| | 14 | 57 | 22 | 26 | 1 | 4,3 | 17 | 27 | 26,7 |

Sun's horizontal Diameter, meaſured directly after the Eclipſe ended.

4,9½ 21½
4,9½ 20
4,9½ 20
4,9½ 22+
4,9½ 21—

Mean 4,9½ 20,9=31′ 35″,9

By comparing the end with Mr. Maſkelyne's obſervation at Greenwich, the difference of meridians comes out 1h 44′ 6″ of time. = 26° 1′ 30″ eaſt, or difference of longitude of my obſervatory from Greenwich to the eaſt. From whence the longitude of the point called the North Cape is 25° 49′ eaſt of Greenwich.

Clouds came on, ſo that I ſaw the Sun no more till 3h 38′ 0″ per clock, and it broke away very clear, and continued clear to the end, which was at 3h 48′ 19″ per clock, or 22h 59′ 17″ apparent time. The air being very clear, the end ſeemed certain to about two ſeconds.

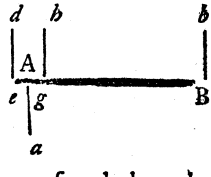
The teleſcope uſed was a reflector of 2 feet focus, made by Mr. Dollond; and the magnifying power, applied for the ingreſs of Venus, and the beginning and end of the ſolar eclipſe, was 100. The magnifying power uſed with the micrometer, was 50.

Adjuſtments of the teleſcope with the different eye-pieces and little ſpeculums, as combined together when uſed. N. B. — ſhews that (o) on the vernier, is behind, or to the left hand of the firſt diviſion on the ſcale; and + to the right hand, or before.

Long eye-piece and ſhort focus little ſpeculum magnifying 100 times = — o + 11½ on vernier.
Long eye-piece and long focus little ſpeculum with micrometer on = — o + 19⅓ on vernier
The eye-piece with moveable wires, and long focus little ſpeculum, and micrometer } = + o + 4 on vernier.
Theſe are a mean of 10 or 12 obſervations each.

The Value of the Scale of the Object Glaſs Micrometer was found as follows:

A baſe of 120 feet was carefully meaſured on level ice (which was covered with frozen ſnow about half an inch thick), with two 10 feet fir rods; and the meaſure being taken four different times, no one differed from any of the others ſo much as $\frac{1}{10}$th of an inch. But as the fir rods might not conſiſt of 10 feet exactly of the ſame ſtandard from which the micrometer ſcale was laid off, I therefore took ſix inches between the fine points of a pair of compaſſes, from the micrometer ſcale; and, by repeating this meaſure, found the exact length of the fir rods in meaſures of the micrometer ſcale; and thence corrected the length of the baſe, found immediately by the rods, and reduced to the ſtandard of the micrometer ſcale. Perpendicularly over the baſe, at one end, was placed the center of the divided object glaſs, and perpendicularly over the baſe, at the other end, a board was placed, having its plane at right angles with the baſe line, white paper paſted on its upper part; and at the height of the center of the object glaſs, nearly above the horizon, was a ſtrong black line drawn, as A B = 8 inches, A *g* and A *e* being ſmall but equal diſtances from A; by bringing (*e d* and *g b*) to coincide alternately with (A *a*) the error of adjuſtment of the micrometer ſcale was found; and by ſeparating the glaſſes till (A *a*) and (B *b*) made but one line; from this ſeparation the value of one extent of the micrometer ſcale was found, by making this proportion. As the length of the baſe: is to the length (A B):: ſo is 206265″ (the number of ſeconds in an arch equal to the radius of a circle) to a fourth number, which will be the ſeconds of the angle meaſured by that opening of the glaſſes, which is ſhewn by the micrometer ſcale; and other angles will be in direct proportion to the reſpective meaſures whence the table was formed.




## ZENITH DISTANCES taken with an Aſtronomical Quadrant, of one Foot Radius, made by Mr. Bird, at the NORTH CAPE of EUROPE.

| | | Bar. Inches. | Ther. out ° | Ther. in ° | | Interior arch ° ′ ″ | Exterior arch ° ′ ″ | ″ | Exterior arch reduced ° ′ ″ |
|---|---|---|---|---|---|---|---|---|---|
| 1769 | | | | | | | | | |
| ☉ May | 14 | 29,80 | 43 | 40 | ☉ U. L. on the merid. | 51 59 10 | 55 1 26 | 15 | 51 58 59,2 |
| | 20 | 29,71 | 45 | 41 | ☉ L. L. ditto | 51 10 40,0 | 54 2 12 | 8 | 51 10 45,9 |
| ♄ June | 3 | 29,93 | 66 | 58 | ☉ L. L. | 48 52 44,0 | 52 0 18 | 16 | 48 52 36,6 |
| | | | | | ☉ U. L. | 48 20 54,0 | 51 2 9 | 0 | 48 20 49,8 |
| | 11 | 29,57 | 46 | 42 | ☉ L. L. | | 51 1 11 | 12 | 48 7 26,7 |
| | | | | | ☉ U. L. | 47 35 37,0 | 50 3 3 | 0 | 47 35 49,3 |
| | 15 | 29,66 | 41 | 40 | ☉ U. L. | | 50 2 5 | 8 | 47 22 41,3 |
| | | | | | ☉ L. L. | 47 54 27,8 | 51 0 13 | 14 | 47 54 33,8 |
| | 16 | 29,70 | 44 | 39 | ♀ Center | 52 13 36+ | 55 2 27 | 17 | 52 13 27,4 |
| | 17 | 29,72 | 44 | 42 | ☉ L. L. | 47 50 28,0 | 51 0 4 | 0 | 47 50 30,5 |
| | | | | | ☉ U. L. | 47 18 50,0 | 50 1 28 | 10 | 47 18 42,0 |
| | | 29,71 | 47 | 48½ | Arcturus | 50 36 8,0 | 53 3 30 | 10 | 50 36 21,2 |
| | | 29,70 | 52 | 51½ | ☉ L. L. } on the north | | 91 1 12 | 24 | 85 37 41,1 |
| | | | | | ☉ U. L. } meridian. | 85 7 29+ | 90 3 6 | 0 | 85 7 19,4 |
| | | 29,70 | 52 | 51½ | ∝ Lyræ | 32 25 18+ | 34 2 11 | 0 | 32 25 22,0 |
| | | 29,18 | 52 | 54½ | ♀ Center | 52 27 0,0 | 55 3 25 | 0 | 52 26 55,4 |

From

From the foregoing Zenith Diſtances of the Sun, and of Arcturus, and $\alpha$ Lyræ, the Latitude of the Obſervatory is determined, as follows:

| 1769 | | From | Latitude ° | ′ | ″ |
|---|---|---|---|---|---|
| May | 14 | ⊙ U. L. | 71 | 0 | 43,2 |
| | 20 | ⊙ L. L. | 71 | 1 | 0,1 |
| June | 3 | ⊙ Center | 71 | 0 | 43,5 |
| | 11 | ⊙ Center | 71 | 0 | 39,8 |
| | 15 | ⊙ Center | 71 | 0 | 39,7 |
| | 17 | ⊙ Center | 71 | 0 | 40,6 |
| | | Arcturus | 71 | 1 | 0,9 |
| | | $\alpha$ Lyræ | 71 | 0 | 48,6 |
| | | Mean - - - - | 71 | 0 | 47,0 |

From whence the latitude of the point of land called the North Cape is 71° 10′ north.

By a great many trials with a very good compaſs, of Dr. Knight's conſtruction, I found the variation to be 6 degrees weſt; and by a dipping needle, I found, by repeated trials, the dip of the north end of the needle to be 79 degrees.

May 15, at $13^h \frac{1}{4}$ P. M. apparent time, or $1^h 7'$ after high water, by a mean of 7 obſervations, I found the dip of the horizon of the ſea, from the obſervatory, to be 12′ 18″. Height of the barometer 29,70 inches; thermometer, without, 24°; thermometer, within, 28°. And May 20, at $7^h \frac{3}{4}$ P. M. apparent time, or $7^h 33'$ after high water, from a mean of 8 obſervations, I found the dip = 12′ 25″,5; barometer 29,70 inches; thermometer, without, 43°, and, within, 40°. Both theſe obſervations were made on the N. N. E. point of the true compaſs. During each of theſe obſervations the water was very ſmooth, and the horizon clear.——I found it was high water, at the full and change of the Moon, at $3^h 44'$ P. M. apparent time, at the Cape; and, by a ſeries of obſervations, I found the water to riſe 8 feet 1 inch, nearly, perpendicular at the ſpring tides; and at neap tides 6 feet 8 inches, perpendicular; and the tides ſeemed to follow very regular, as they ought to do when not diſturbed by bad weather——June 8, I found the height of the obſervatory 140 feet 6 inches above low water mark.

A JOURNAL of the Barometer and two Thermometers, during the Time I was on Shore in the Iſland of MAGGERŒ, or NORTH CAPE, viz. from the 1ſt of May to the 21ſt of June.

| 1769 | | At noon. Bar. Inches | Ther. out ° | in ° |
|---|---|---|---|---|
| May | 1 | 29,72 | 19 | 24 |
| | 2 | 29,68 | 26 | 28 |
| | 3 | 29,90 | 18 | 22 |
| | 4 | 29,96 | 28 | 31½ |
| | 5 | 29,92 | 34 | 32 |
| | 6 | 29,91 | 58 | 38 |
| | 7 | 29,74 | 60 | 40 |
| | 8 | 29,84 | 56 | 39 |

| 1769 | | At noon. Bar. Inches | Ther. out ° | Ther. in ° | At midnight. Bar. Inches | Ther. out ° | Ther. in doors ° |
|---|---|---|---|---|---|---|---|
| May | 9 | 29,90 | 47 | 36 | | | |
| | 10 | 29,97 | 46 | 39 | 29,98 | 34 | 36 |
| | 11 | 29,97 | 39 | 34 | 29,96 | 30 | 32 |
| | 12 | 29,97 | 30 | 31 | 29,97 | 27 | 29 |
| | 13 | 30,03 | 42 | 36 | 30,04 | 34 | 37 |
| | 14 | 29,80 | 43 | 40 | 29,74 | 33 | 37½ |
| | 15 | 29,73 | 41 | 37 | 29,70 | 28 | 30 |
| | 16 | 29,66 | 29 | 31 | 29,64 | 26 | 28 |
| | 17 | 29,62 | 51 | 42 | 29,60 | 39 | 43 |
| | 18 | 29,48 | 53 | 45 | 29,39 | 38 | 41 |
| | 19 | 29,34 | 51 | 47 | 29,57 | 40 | 40 |
| | 20 | 29,71 | 45 | 41½ | 29,77 | 37 | 41 |
| | 21 | 29,51 | 54½ | 47 | 29,46 | 37 | 39 |
| | 22 | 29,51 | 41 | 38 | 29,64 | 36 | 43 |
| | 23 | 29,77 | 40 | 37 | 29,78 | 36 | 36½ |
| | 24 | 29,65 | 44 | 41½ | 29,47 | 40 | 40 |
| | 25 | 29,42 | 52 | 45 | 29,71 | 44½ | 45 |
| | 26 | 29,77 | 44 | 45 | 29,78 | 40 | 42 |
| | 27 | 29,76 | 48 | 44 | 29,73 | 36 | 38 |
| | 28 | 29,70 | 44 | 36½ | 29,66 | 34 | 35 |
| | 29 | 29,47 | 38 | 33 | 29,51 | 38 | 40½ |
| | 30 | 29,61 | 50 | 43 | 29,61 | 52 | 50 |
| | 31 | 29,61 | 52 | 48 | 29,70 | 42 | 37 |
| June | 1 | 29,67 | 41 | 38 | 29,72 | 38 | 40 |
| | 2 | 29,92 | 54 | 50 | 29,90 | 48 | 52 |
| | 3 | 29,93 | 66 | 58 | 29,78 | 36 | 36½ |
| | 4 | 29,79 | 43 | 43 | 29,70 | 46 | 40 |
| | 5 | 29,77 | 61 | 55 | 29,69 | 47 | 49 |
| | 6 | 29,51 | 47 | 43 | 29,50 | 43 | 43 |
| | 7 | 29,83 | 43 | 47 | 29,90 | 42 | 44 |
| | 8 | 29,89 | 47 | 45 | 29,90 | 41 | 40 |
| | 9 | 29,84 | 49 | 47½ | 29,74 | 40 | 42 |
| | 10 | 29,67 | 48 | 42 | 29,66 | 41 | 43 |
| | 11 | 29,57 | 46 | 42 | 29,58 | 33 | 38 |
| | 12 | 29,48 | 38 | 35 | 29,51 | 31½ | 33 |
| | 13 | 29,56 | 38 | 34 | 29,52 | 35 | 34 |
| | 14 | 29,53 | 39 | 36 | 29,57 | 35 | 35½ |
| | 15 | 29,66 | 41 | 40 | 29,64 | 34 | 35 |
| | 16 | 29,51 | 38 | 38 | 29,62 | 38 | 37½ |
| | 17 | 29,72 | 44 | 42 | 29,70 | 52 | 51½ |
| | 18 | 29,18 | 52 | 54½ | 29,52 | 44 | 46 |
| | 19 | 29,42 | 37 | 39 | 29,38 | 36 | 38 |
| | 20 | 29,67 | 36 | 37 | 29,49 | 32 | 34 |
| | 21 | 29,54 | 36 | 38 | 29,60 | 31½ | 33 |
| | 22 | 29,46 | 35 | 37 | | | |

The thermometers were kept, the one in the obſervatory, and the other without, in the open air; but always in the ſhade; and were always obſerved at noon and midnight, after the 10th of May; but before, only at noon.

The INSTRUMENTS uſed at the NORTH CAPE, by Mr. BAYLY, were as follows:

A quadrant of 1 foot radius, and two thermometers, made by Mr. Bird.

A 2 feet reflector, with an achromatic object glaſs micrometer, by Mr. Dollond.

A tranſit inſtrument, of 4 feet, made by Mr. Bird; with an achromatic object glaſs, by Mr. Dollond.

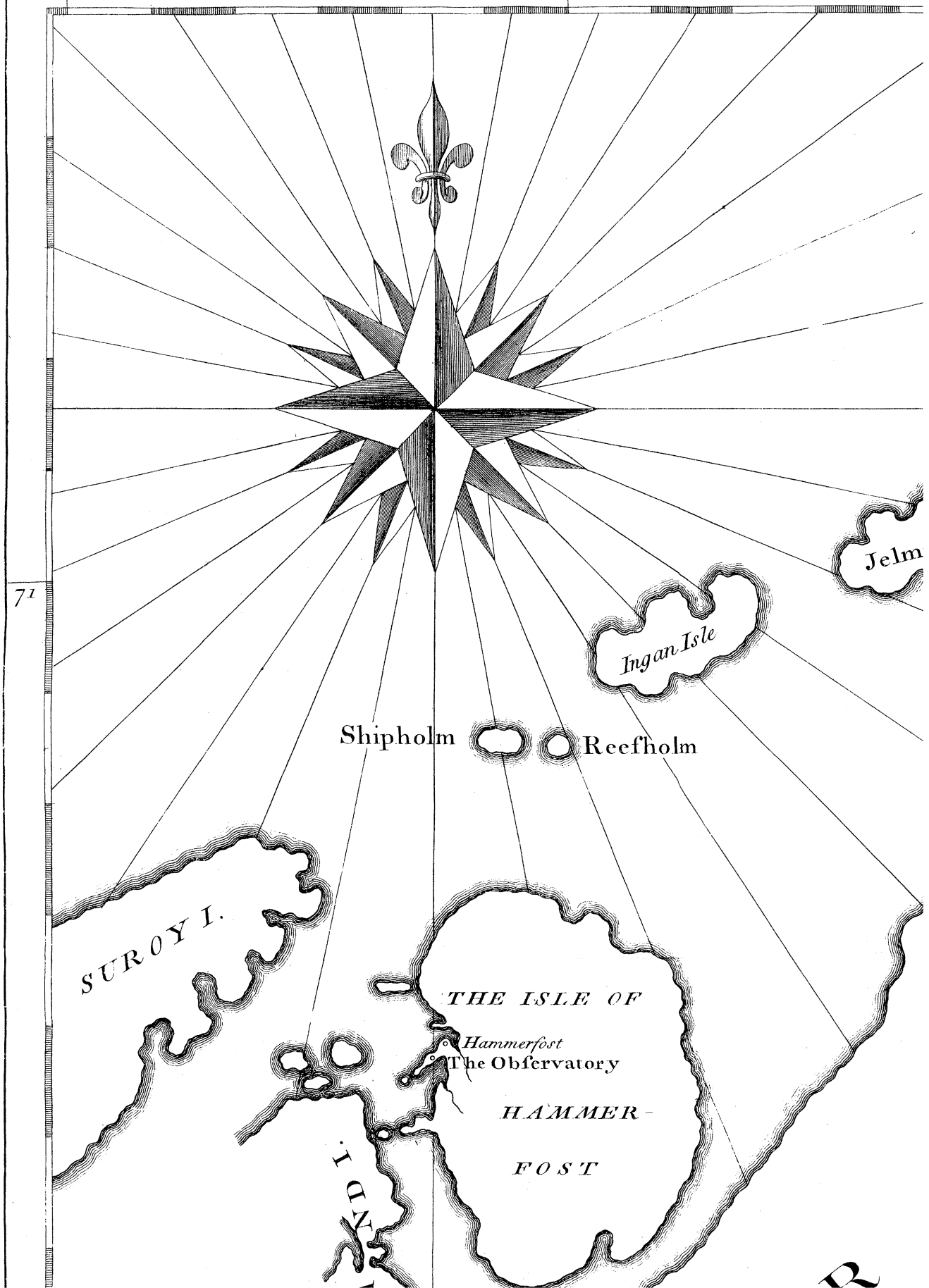
A barometer, by Mr. Ramſden.

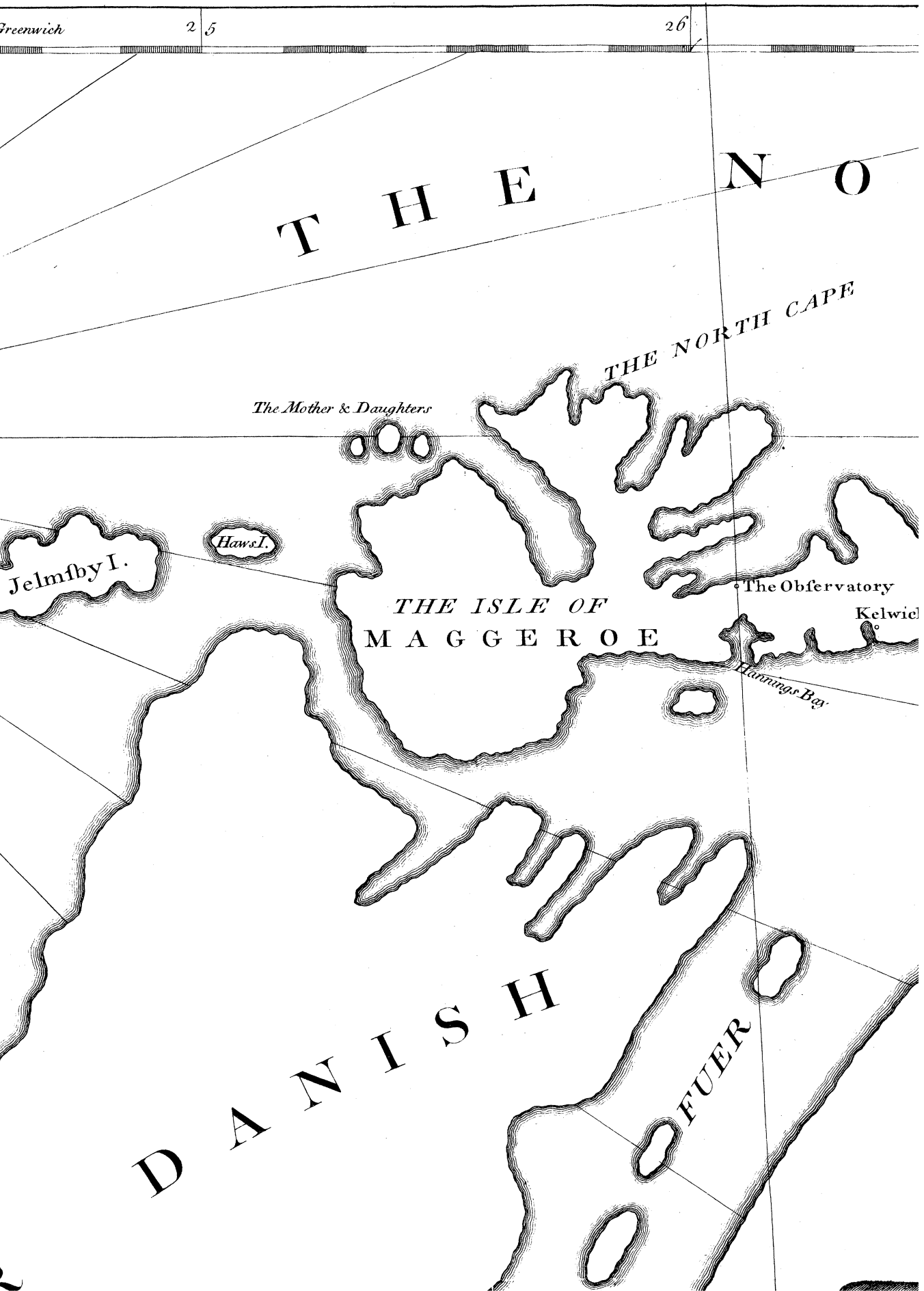
An aſtronomical clock with a gridiron pendulum, a journeyman clock, and an alarum clock, by Mr. Shelton.

A dipping needle, belonging to the Royal Obſervatory, made by Mr. Graham.

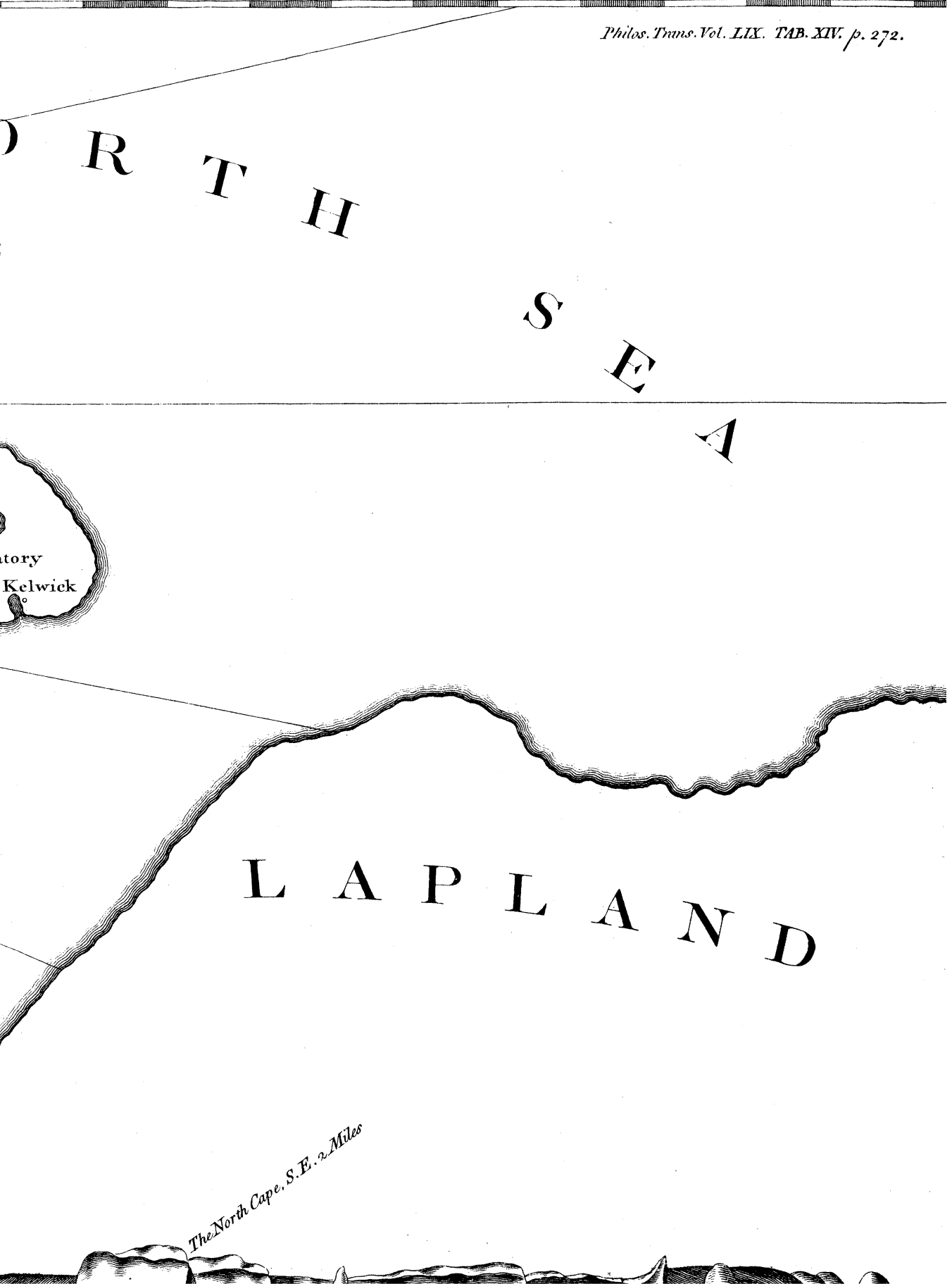
A like ſet, excluſive of a dipping needle, was uſed by Mr. Dixon, at the iſland of Hammerfoſt.

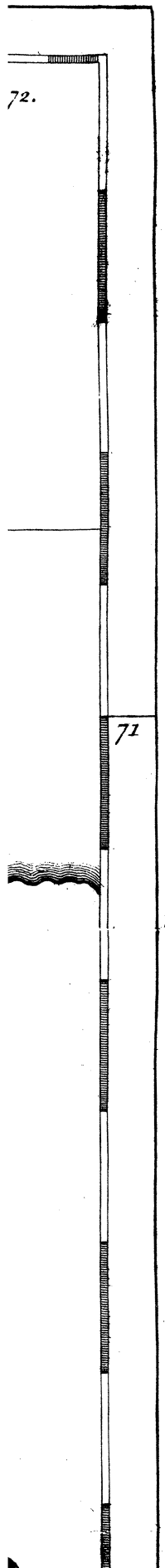
N. B. The adjoining chart, and views of the ſea-coaſt and iſlands, near the North Cape of Europe, Tab. XIV. were drawn from the joint obſervations of Meſſieurs Dixon and Bayly.

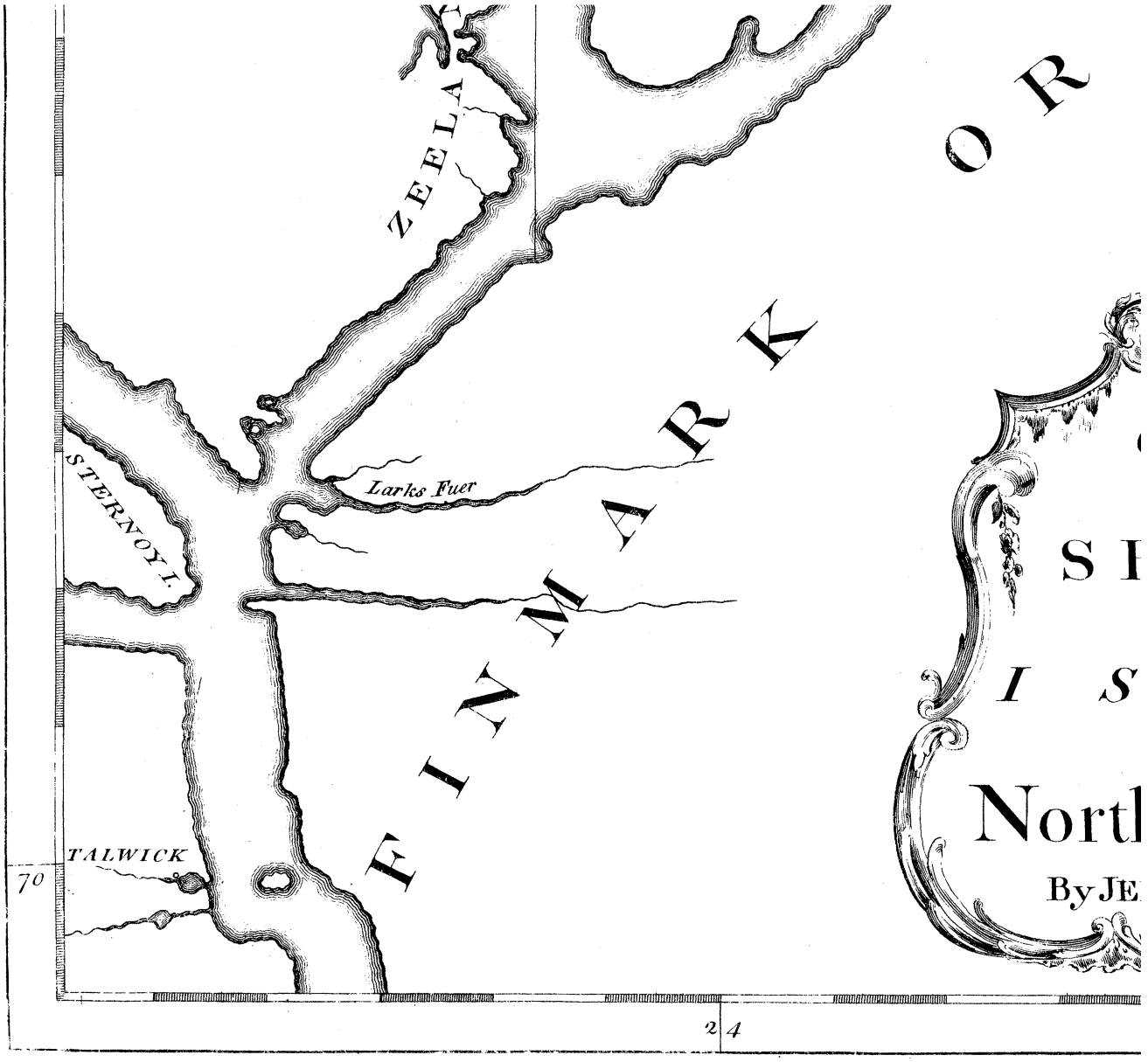

71
Jelm
Ingan Isle
Shipholm
Reefholm
SUROY I.
THE ISLE OF
Hammerfost
The Observatory
HAMMER-
FOST


THE NO
THE NORTH CAPE
The Mother & Daughters
Haws I.
Jelmsby I.
THE ISLE OF
MAGGEROE
The Observatory
Kelwick
Hannings Bay
DANISH
FUER

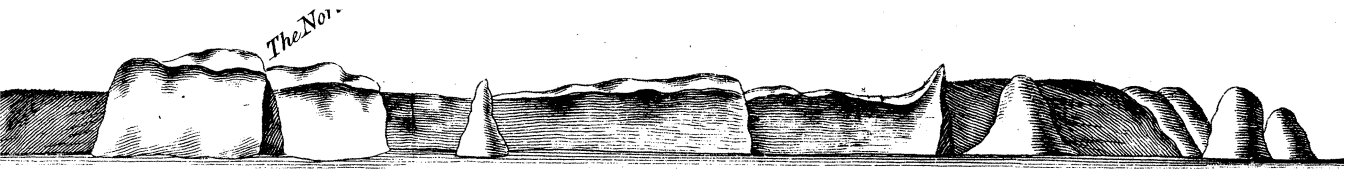
*Philos. Trans. Vol. LIX. TAB. XIV. p. 272.*



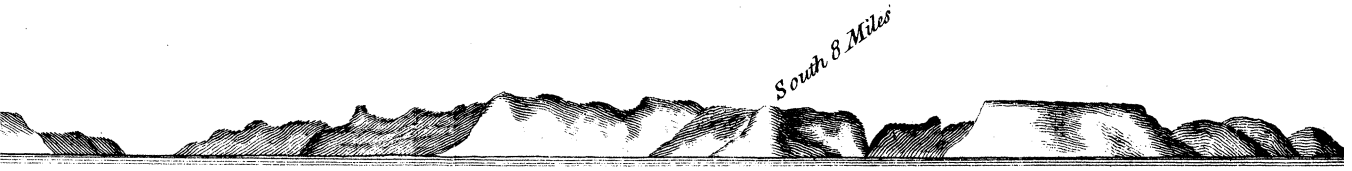

72.
71


ZEELA
FINMARK
OR
STERNOY I.
Larks Fuer
TALWICK
70
2 4
SI
I S
Nort
By JE

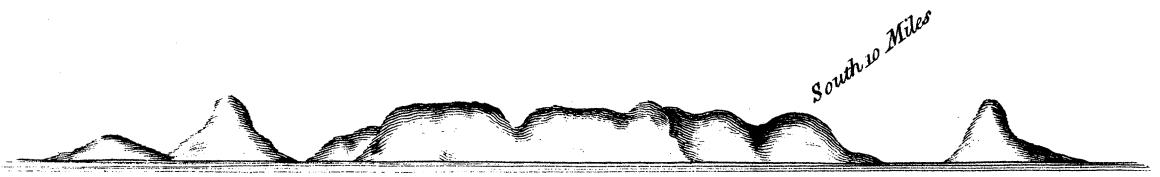

PESANGER
A
CHART
of the
SEA COAST
and
SLANDS
near the
orth Cape of Europe
By JERE. DIXON and Wm BAYLY 1769.
Maggeroe.



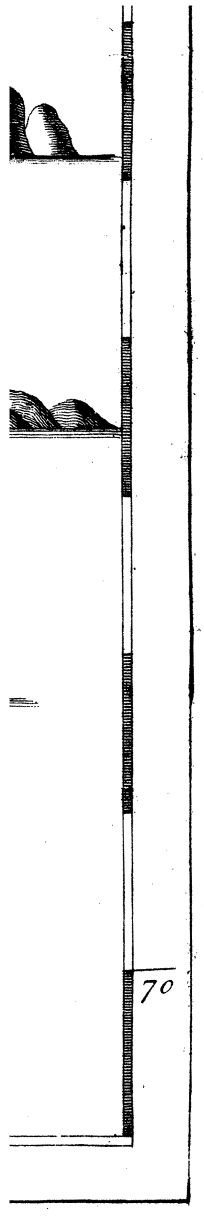

*The Isle of Maggeroe.*




*Jelmsby.*




*Ingan.* *Shipholm.*


70

23 24 East Longitude from Greenwich 25 26 27 28

71 71

THE NORTH SEA

THE NORTH CAPE

The Mother & Daughters

Jelmsby I.

Hawe I.

THE ISLE OF MAGGEROE

The Obfervatory

Kelwick

Hanningsø Reg.

Ingan Isle

Shipholm

Reefholm

LAPLAND

SUROY I.

THE ISLE OF HAMMERFOST

Hammerfost

The Obfervatory

ZEELANDT I.

FUER

PESANGER

FINMARK OR DANISH

STERNOY I.

Larks Fuer

TALWICK

70 70

# A CHART of the SEA COAST and ISLANDS near the North Cape of Europe

By JERE. DIXON and Wm. BAYLY 1769.

The North Cape, S.E. 2 Miles

The Isle of Maggeroe.

South 8 Miles

Maggeroe. Jelmsby.

South 10 Miles

Ingan. Shipholm.

24 25 26 27