# XVIII. Quadrantis *Aſtronomici* Muralis *Idea nova et peculiaris, multis incommodis quibus hucuſque uſitati laborant liberati, Autore* Chriſtiano Ludovic. Gerſten, *R.S.L.S.*

*Read* May 7. 1747.

INSIGNEM utilitatem arcuum parietibus in meridiani plano firmiter infixorum nemo niſi hoſpes in aſtronomiæ ſtudio ignorat. Factum inde, ut nullum hodie facile detur obſervatorium ſupellectile ſua inſtructum quod his carcat; repertum tamen nullum dari murum tam ſolidum atque inconcuſſum, aut tam validam craſſamque ferri et metallorum compagem, ut omnibus hiſce organon hoc invariatum atque prorſus immobile reſpectu axis terreſtris effici queat. Cogitavi itaque de novo artificio; arcum nempe muralem conſtruendum propono teleſcopio et micrometro inſtructum, cujus requiſita ſint ſequentia.

I. Ut quovis momento videri poſſit utrum planum inſtrumenti verticaliter poſitum ſit: et,

II. Utrum perpendiculum per centrum quadrantis et principium diviſionis limbi exacte tranſeat.

III. Ut aberratio plani quadrantis a linea verticali corrigi poſſit, manente poſitione principii diviſionis in limbo reſpectu perpendiculi: rurſuſque,

IV. Aberratio principii diviſionis in limbo a perpendiculo corrigi poſſit, abſque mutatione notabili poſitionis plani quadrantis reſpectu lineæ verticalis.

V. Ut pariter deviatio plani quadrantis a plano meridiei emendari poſſit, manente ſitu perpendiculari



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tum plani quadrantis tum principii divisionis in limbo.

VI. Ut penitus expers sit variationis quam extensio metallorum per calorem et frigus producere potest. Denique,

VII. Ut facile possit rectificari uti dicunt, hoc est, Ut facile videri possit utrum linea ab objecto per intersectionem filorum in tubo ad oculum transiens sit exacte parallela lineæ per centrum quadrantis et divisionem quam regula monstrat transeuntis, atque ubi opus est facile in rectum situm collocari. Negotium alias admodum operosum et difficile.

Ut omnia ista obtineantur, fiat,

1. Fulcrum ferreum *aaa*, *ccb*, (TAB. V. *Fig.* 1. & 2.), cujus pars quæ muro applicatur *Fig.* 1. altera *Fig.* 2. delineata. Consistit ex norma ferrea *aaa*, et regula transversa *cc*, ad ipsam normam claviculis mallei ope firmiter consolidata. In *b*, normæ brachium horizontale est inflexum, ut in tergo promineat, habens insuper foramen rotundum horizontale, cujus usus mox inferius indicabitur, aliudque verticale minus cochleæ striis excavatum, ut cochlea mas, *m*, huic immitti possit.

2. In tergo fulcri ad brachium verticale normæ claviculis consolidatæ sunt ansæ duæ *ehk* et *dg*. Superior *ehk* desinit infra in cylindrum *h*, et cochleam marem *k*. Inferior *dg*, ad *g*, in superficie inferiori conice excavata; ut axis cylindri *h*, et apex coni *g*, sit in eadem linea, eaque plano normæ anteriori *aa*, *Fig.* 2. parallela postulo, nec tamen ut summa præcisio in his adhibeatur.

3.

3. In ipſum murum plano meridiei utcunque parallelum immittantur, et idonea compage firmentur tres mutuli ferrei (*Fig.* 4.) *ah*, *gb*, *ce*; quorum duo, *ha* et *gb*, propemodum æquales, et in eadem linea perpendiculari exiſtunt. Superior *ha* habet foramen cylindriacum *h*, tantæ capacitatis, ut cylindrus fulcri *h* (*Fig.* 2.) eidem immitti poſſit. Inferior mutulus *bg* habet loco foraminis apicem conicum *g*, qui in cavum anſæ *g* (*Fig.* 1.) intrare poſſit. Diſtantia inter hos mutulos tanta, ut immiſſo in foramen *h* (*Fig.* 4.) cylindro *h* (*Fig.* 1 et 2.) et in cavum *g* (*Fig.* 1.) apice *g* (*Fig.* 4.) omne fulcri pondus apex *g* ſuſtineat, libereque fulcrum horizontaliter volvi poſſit. Anſæ igitur ſuperioris pars *c* (*Fig.* 2.) ipſum mutulum non premere, ſed aliquantiſper ab eo diſtare debet. Ne tamen ex cavo *g* (*Fig.* 1.) apex *g* (*Fig.* 4.) excidere aut vacillare poſſit, addatur cochlea fœmina ad marem *k*, cujus ope premendo inferiorem partem mutuli *ah*, fulcrum verticaliter ad apicem *g*, tantum deprimitur quantum ſat eſt.

4. Ut cylindrus *h* (*Fig.* 2.) in foramine *h* (*Fig.* 4.) ab omni vacillatione penitus ſit ſecurus, addatur alia cochlea minor horizontalis *f*, vel duo ex oppoſitis plagis, cylindrum in foramine tangentes. Ut axis foraminis *h* et apex *g* (*Fig.* 4) ſit in eadem perpendiculari, hujus effectio nihil habet difficultatis in praxi, quoniam in ipſa muri ſtructura hi mutuli ſic diſponi poſſunt. Primum inferior *gb*, deinde ſuperior *ha*, ope perpendiculi cuſpidati, cujus filum per axin diſci ænei cavitatem foraminis *h* exacte replentis tranſire debet.

5. Tertius mutulus *ce* (*Fig.* 4.) conſiſtit in craſſa cochlea mari, longe ſatis ex muro prominente. Fo-

ramen *b* (*Fig.* 2.) fulcri tantæ capacitatis, ut hanc cochleam transmittat, ipsius cochleæ superior pars ademta, ut habeat planum horizontale, cui cochlea *m* (*Fig.* 2.) inniti possit. Immisso itaque cylindro *b* (*Fig.* 2.) in foramen *b* (*Fig.* 4.) et cavo *g* ansæ *d*, (*Fig.* 2.) applicato ad conum *g* (*Fig.* 4.) additaque cochlea fœmina ad *k* (*Fig.* 2.) eademque applicata ad partem inferiorem mutuli *ab* (*Fig.* 4.) ad cochleam mutuli *ce* applicetur cochlea fœmina quædam plana, orbicularis et in margine dentata, ut eo melius clavi quodam expresse ad id confecto circumagi possit, adigatusque usque ad partem mutuli *c* propemodum. Deinde horizontaliter volvendo ipsum fulcrum, cochlea *e* (*Fig.* 4.) foramini brachii horizontalis fulcri *b* (*Fig.* 2.) immittatur, circumvolvetur cochlea *m*, eo usque donec planum cochleæ crassæ mutuli *e* attingat, et ipse mutulus adeo ponderis fulcri partem aliquam sustineat. Deinde addatur adhuc alia cochlea fœmina plana et dentata ad eandem marem *e* (*Fig.* 4.); agatur usque ad planum brachii horizontalis normæ, id quod in nullum alium finem flexum, nisi ut hanc cochleam fœminam sic recipiat, ne suspensioni quadrantis in fulcro obstet, atque ut eo major concedatur longitudo cochleæ crassæ mutuli *e*. Sic fulcri pars *b* (*Fig.* 2.) nititur hoc modo verticaliter in cochleam mutuli *ec* (*Fig.* 4.) et in positione azimuthali servatur per duas descriptas cochleas fœminas dentatas mutuli *ce*. Quodsi igitur aliquid in positione plani muralis aberratum, istud semper quo tempore libuerit, mediantibus hisce cochleis dentatis, corrigi potest. Me non monente, benignus lector intelliget foramen brachii horizontalis *b* (*Fig.* 2.) satis amplum et ovalis figuræ esse debere, ne angustia motui azimuthali obstet.

6. Fulcri

6. Fulcri pars anterior (*Fig.* 2.) tres rursus habet mutulos *n*, *o*, et *p*. Primus *n* est ad formam cubi aut parallelipipedi, nisi quod superficies ejus superior sit semicylindriace excavata. Secundus *o* unci formam habeat (*Fig.* 3.) specialiter depictam. Tertius *p* nihil aliud est nisi cochlea mas prominens. Cuncti ad normam quoad fieri potest optime consolidati.

7. Quadrans ipse ut ex solido sit metallo postulo. Facies ejus anterior exhibetur TAB. VI. *Fig.* 1. Crassities sit congrua, limbusque quadrantem idonea quantitate excedat. Ad planum limbi rectificandum adsit regula composita *kk*, ex duabus, quarum una *rr* perpendiculariter insistit ad planum alterius *kk*, sic ut in neutram partem facile flecti possit. Regulæ *rr* acies rectitudinem habeat perfectam, exhibeatque lineam rectam quæ sit in plano superficiei limbi anterioris. In tergo per cochleas hæc regula quadranti firmatur, sicuti ex *Fig.* 2. apparet. Quodsi enim hæc regula plano limbi in *m* et *n* bene coincidit firmata ad centrum alia regula rectilineari examinatoria, facile patebit utrum limbus et acies *rr* regulæ in eodem sint plano, per consequens limbi planum recte se habeat. Nam ex punctis *m* et *n*, nonnisi unica recta duci potest, quæ per hypothesin in acie regulæ *rr* revera existit. Per lineam rectam vero *mn*, et punctum *a*, nonnisi unicum planum duci potest. Quodsi igitur regula examinatoria ad *a* affixa ubique aciem regulæ *rr* et limbum quadrantis exacte tangit, planum limbi in plano trianguli *anm* necessario esse debet. Post examen et correctionem hæc regula *rr* superflua est, adeoque, si libet, adimi potest.

8. In

8. In tergo quadrantis (*Fig.* 2.) duo ſint ſuſtentacula orichalcea, *ab* et *ef*, ad ipſius quadrantis ſuperficiem per cochleas probe firmata. Suſtentaculum *ab* in *b* habeat foramen ovale; in lateribus ſint duo cochleæ *c* et *d* cuſpidatæ. Foraminis parietes ſuperne ſint convexæ, ut immiſſo mutulo *o* (TAB. V. *Fig.* 2.) in hoc foramen, pars cava *a* mutuli (*Fig.* 3.) repleatur, cuſpideſque cochlearum horizontalium *c* et *d* (TAB. VI. *Fig.* 2.) partem mutuli aut unci convexam inferiorem (TAB. V. *Fig.* 3.) ex duabus oppoſitis partibus ſtringant, et ſic omnis vacillatio excludatur.

9. Alterum ſuſtentaculum *ef*, in *e* cochleis ad planum quadrantis affixum, ad *f* habet foramen rectangulare, quod ingrediuntur cochleæ mares verticales *h* et *i*, quarum uſus eſt ſequens. Immiſſo mutulo ſive unco *o* (TAB. V. *Fig.* 2.) in foramen ſuſtentaculi *ab* (TAB. VI. *Fig.* 2.), mutulus *n* (TAB. V. *Fig.* 2.) quoque immittitur in foramen rectangulare ſuſtentaculi *ef*, et cochleæ *h* apex, qui hemiſphærice convexus eſſe debet, in cavo mutuli *n* (TAB. V. *Fig.* 2.) ſubſiſtat, et ſic per motum cochleæ *h* ſitus quadrantis elevando et deprimendo parumper eſt variabilis. Foramen *f* in hunc finem ſatis amplum eſſe debet; quando tamen ſemel ſitus conveniens per cochleam ſuperiorem determinatus, tunc vacillatio quadrantis non proficua, ideo per cochleam inferiorem *i* firmiter ad mutulum conſtringitur.

10. Duobus hiſce ſuſtentaculis quadrans in ſitu debito quidem teneri, ac, ubi opus eſt, corrigi poteſt, reſpectu principii, diviſionum in limbo, ut iſtud nimirum perpendiculo congruat per centrum quadrantis ducto. Sed requiritur ulterius, ut et ipſum quadrantis planum ſit perpendiculare. Ut id efficiatur, adſint

adſint duo cochleæ fœminæ planæ orbiculares, cochleam marem *p* (TAB. V. *Fig.* 2.) complectentes; harum prima eaque dentata, mari *p*, applicetur antequam quadrans mutulis fulcri ſit applicatus. Poſtea vero, ubi quadrans ſuſtentaculis *cd* et *fe* (TAB. VI. *Fig.* 2.) mutulis *o* et *a* (TAB. V. *Fig.* 2.) pender, atque cochlea mas *p* in foramine *c* (TAB. VI. *Fig.* 1 et 2.) exiſtit (quod ſat amplum et ovalis figuræ eſſe debet, ut conceſſa ſit variatio quædam ſitus, per cochleam anſæ ſuperiorem *h* (TAB. VI. *Fig.* 2.) efficiendam); tunc tergum quadrantis ſuſtinetur cochlea fœmina orbiculari dentata, ad marem *p* (TAB. V. *Fig.* 2.) applicata, paulo ſuperius deſcripta, facies vero per alteram cochleam fœminam orbicularem, clavi quadam, foraminulis nonnullis in hunc finem terebratis intruſa, circumagendam. Planum itaque harum cochlearum fæminarum, ſat amplum eſſe debet ne in ipſum foramen quadrantis ingrediantur. Et ſic his duabus cochleis non modo valide conſtringitur quadrans ab utraque parte, ſed etiam, ubi opus eſt, retro vel antrorſum promovetur, quoniam ſuſpenſio in mutulis *o* et *n* (TAB. V. *Fig.* 2.) huic motui non obſtat. Quoniam tamen nimia longitudo cochleæ *p* obeſt, conſultum erit cochleam anteriorem fœminam tali figura conſtruere, quam ſectio (TAB. VII. *Fig.* 2.) exhibet, ubi margo *ab* faciem anteriorem quadrantis tangere, collum *cd* vero ipſum foramen *c* (TAB. II. *Fig.* 1.) ingredi debet.

11. Centrum quadrantis (TAB. VI. *Fig.* 1.) *a* cylindrice excavatum eſt, ut clavum regulæ admittat. in tergo quadrantis, mediantibus cochleis affixa eſt lamina *mn* (*Fig.* 2.) foramen habens quadratum *m*, centro reſpondens; ſitque hoc quadratum, circulo foraminis

foraminis *a* (*Fig.* 1.) inſcriptum, aut paulo minus. Lamina *mn* (*Fig.* 2.) craſſitiem habeat congruentem, ſitque dupliciter ad normæ modum flexa, deſinatque in facie in partem *b* (*Fig.* 1.) a plano quadrantis ſatis diſtantem, ut ſtylum tenuem centrum clavi pungentem, filumque perpendiculi ſuſtinentem teneat. Ipſum clavum (*Fig.* 3.) ſpecialiter delineavi, in eoque eſt *a* caput, *b* cylindrus cavum centri quadrantis, et regulæ exacte complens, *c*, quadratum foramini *m* (*Fig.* 2.) immittendum, *d* cochlea mas, cui conveniens fœmina applicanda.

12. Tab. VII. *Fig.* 1. exhibet quadrantem cum regula et perpendiculi apparatu: *pr* eſt linea ſuperficiei quadrantis inſcripta, per centrum, ſi continuata fuerit, tranſitura, qua diviſionum in limbo principium eſt. *hikg* eſt parallelipidum eo modo, ſicuti figura indicat, excavatum, cochleis ad planum quadrantis affixum. quo filum *mo* perpendiculariter imminet lineæ *pr*, quod normæ accuratioris ope nullo negotio perficitur. Alterum filum *ik* ſitum habet ad planum quadrantis parallelum, ad tantam tamen exacte diſtantiam, quanta eſt altitudo centri in clavo *c*, ſive punctum ſuſpenſionis fili ſupra ſuperficiem quadrantis. Addatur tertium, ſecundo prorſus ſimile in latere oppoſito parallelipipedi *hgv*, cujus delineationem ſcenographiæ leges vetant.

13. Ipſum filum ſtylo ſubtili centrum clavi *c* pungente ſuſpenſum, ex pilis capitis humani conſtet, ponduſculum *f* ſemiunciæ facile ſuſtinens, et in cavo parallelipipedi *hikg* libere oſcillet. Fila minora parallelipipedi *mo*, *ik*, &c. etiam ex iiſdem pilis conſtent, habeantque craſſitiem æqualem. Uſus eorum hic eſt; ut facile cognoſcatur poſitio quadrantis

tis respectu perpendiculi *cf*. Nam per filum *mo*, ad lineam *pr* collimando, exactum datur oculorum judicium, utrum *pr*, principium divisionum in limbo, cum perpendiculo *cf* conveniat. Rursusque per filum *ik* ad alterum oppositum collimando, videri potest utrum planum quadrantis sit perpendiculo parallelum. Quod si loco parallelipipedi duo ponticuli, hæc tria fila sustinentes substituantur, idem finis brevius adhuc obtinebitur, cumque spatium oscillationis fili *cf* exiguum sufficiat, dispositio horum trium filorum talis esse potest, ut per vitra convexa collimatio fieri possit; quod commodum accidet, quibus obtusior oculorum acies. Cochleæ fœminæ *b* margo orbicularis, adeoque et ipsa cochlea mas fulcri *p* (TAB. V. *Fig*. 2.) quam complectitur, sic ultra superficiem quadrantis promineat, ne oscillationem fili *cf* impediat, aut, si mavis, istarum cochlearum et foraminis in quadrante locus extra oscillationis fili spatium assignandus. Quodsi observatorii structura patiatur, ut ab horizonte ad *Zenith* stellarum detur aspectus, tunc regula ad lineam *pr* accessum debet habere liberum, adeoque parallelipipedum *hikg* paulo inferius in appendicem collocandum, aut superius paulo in brachium verticale, ipsaque appendix incisionem convenientem habere debet.

14. Progredior nunc ad ipsam regulam, quæ quidem TAB. VII. *Fig*. 1. quoad maximam partem scenographice delineata, atque literis *nnnn* designata extat, insuper tamen habita justa magnitudine et proportione partium, quam in omnibus hisce figuris negligendum duxi, quoniam sic multo distinctius mentem meam figuris spectabilioribus explicare potui. Hæc regulæ structura, quoniam ea plane peculiaris, spe-

cialius nunc mihi explicanda. *nnnn* eſt planum regulæ circa clavum *c* volubilis. Contra incurvationis periculum munita eſt alia regula *ddd*, perpendiculariter ad planum *nnn* afferruminanda, aut alio idoneo modo conſolidanda. Diviſiones limbi indicantur in apertura, aut feneſtra regulæ *xx*; ibique aut per filum extenſum, aut per aciem vel marginem interiorem aperturæ, aut per diviſionem quam vocant Nonianam, prout libuerit. *qq* eſt teleſcopium. Quod ſi nunc ponamus regulam exacte gradum *o* vel 1 altitudinis in limbo monſtrare, nihil erit quod in organo deſiderares, niſi ut linea ab objecto per decuſſationem filorum teleſcopii ad oculum pergens, ſit exacte parallela lineæ per centrum quadrantis et gradum *o* vel 1, altitudinis in limbo tranſeuntis. Sed cum prima vice tubus talem in modum regulæ conſolidari nequeat, ut huic conditioni ſatisfiat, poſtulo eum ſic regulæ connecti, ut in ſitu, quo TAB. VII. *Fig.* 1. depictus eſt, motum aliqualem habeat non ſolum in altitudinem, ſed etiam in partes azimuthi. Motus in altitudinem perficitur per cochleas *uu*, motus azimuthalis vero per cochleas *ww*, quæ omnia tamen ſpecialius et diſtinctius TAB. VIII. delineata extant.

15. Motus in altitudinem efficitur ſequentem in modum. Tubo loco convenienti afferruminatur pes aut ponticulus TAB. VIII. *Fig.* 6. depictus; baſis *bck* eſt plana et rectangularis, ad *b* et *ck* craſſities metalli minor. Pars *i* perpendiculariter ad baſin afferruminata, huic connectitur altera pars volubilis *namh*, mediante ſtylo *h*, juncturas utriuſque partis tranſeundo. In *a* pars volubilis excavata, tali curvedine ut tubum recipiat ſtanno in hunc canalem afferruminandum. Baſin hujus pedis *bck* ad planum regulæ deprimunt, duo

fruſta

frusta orichalcea, quorum figuram *Fig.* 7. sistit, et quos *depressores pedis* voco. Habent autem hi depressores duo foramina *k* et *m*, ad recipiendas cochleas, et duos apices *h* et *i* foraminulis in plano regulæ in hunc finem terebratis intrudendos. Melius nunc omnia ex ichnographica delineatione horizontali *Fig.* 2. intelligentur, ubi *aa* tubi pars, *bc ee* pes, *ee* basis pedis, *bc* pars volubilis tubo afferruminata, *ff* duo depressores pedis, *gg* cochleæ mares, matrices in regula excavatas ingredientes, et hoc modo pedem valide prout libuerit ad planum regula deprimentes. *Fig.* 5. exhibet delineationem verticalem, in eaque *aa* tubi pars, *ee*, *ff*, cochleæ depressorum; ipse pes sub tubo latet: *g*, *h*, sunt duæ cochleæ mares, quarum apices planæ ab utraque parte pedem stringunt immotumque servant, et ubi situs horizontalis tubi elevando vel deprimendo mutandus, id facile per revolutiones harum cochlearum perficitur: sed tunc cochleæ depressorum pedis *ff*, *ee*, non nimis fortiter pedem ad planum regulæ deprimere debent.

16. Sequitur nunc motus ad partes azimuthi. Quod *Fig.* 9. delineatum, vocemus *tabulam plicatam.* Consistit ex plano rectangulari orichalceo *kfgh*, cui ad angulos rectos insistat aliud planum *abcf*, cujus latera tamen *af* et *bc* sint in curvedine circuli, ex centro foraminis *q* ducti, margines *af* et *dbcg* sunt ad angulos rectos excavati, prorsus eodem modo sicuti basis pedis (*Fig.* 6.). Cui respondere debent duo depressores similes ei quem *Fig.* 7. sistit, nisi quod curvedinem ipsi *bc* convenientem habere debeant. Planum *kfgh* aperturas habet rectangulares *mrn* et *osp* pro recipiendis appendicibus tubi quas mox describam. In *Fig.* 8. *aa* est tubi pars, *ee* ta-

bulæ plicatæ pars verticalis, mediante clavo *b*, ad planum regulæ firmata, atque circa clavum volubilis, *cc* et *dd*, depressores tabulæ, atque earum cochleæ. *hh* est sectio partis tabulæ horizontalis, quæ *Fig.* 9. literis *kfgh* indicatur. *gg* sunt appendices peculiares, tubo afferruminatæ; desinunt in cochleas mares, et pars earum foraminibus rectangularibus *mn* et *op* (*Fig.* 9.) respondet, sic ut secundum longitudinem *mr* aut *os* possint intervallo quodam apto hinc illinque promoveri, et tamen mediantibus cochleis fœminis *kk*, interpositis antea orbiculis *ii*, quando libuerit ad ipsum planum tabulæ valide firmari. Quodsi igitur TAB. VII. *Fig.* 1. per cochleas *uu* contra pedis parietes applicatas telescopium attollitur aut deprimitur, tabulæ complicatæ clavus istud permittit, relaxatis paulisper cochleis depressorum *xx*. Rursus quando ad motum azimuthalem peragendum, appendices *ww*, relaxatis cochleis fœminis hinc illinque, per consequens ipse tubus promovetur, pedis junctura id quoque permittit. Quodsi appendices *g*, *g*, (*Fig.* 8. TAB. VIII.) transverse valido satis metalli frusto connectuntur, hic motus azimuthalis unius cochleæ artificio et lentus et securus effici potest.

17. Præterea habet regula appendicem peculiarem tergum limbi radentem. Constat TAB. VIII. *Fig.* 1. et 2. ex parte normaliter inflexa *Am*, plano regulæ validissime consolidata et altera volubili *ko*, stylo *m*, juncturis suis cum immobili *Am* connexa, in parte volubili orbiculus *i* *Fig.* 2. circa cylindrum *q* in cochleam desinentem versatilis tergum limbi radit, atque adversus istud constringitur claustro *ns* cochleis *ssss* (*Fig.* 1.) firmato. Mota regula ad quamlibet deinde divisionem firmatur ope cochleæ *v*, cui objicitur lamina

tenuis

tenuis *ut Fig.* 2. ne apex metallum limbi excavet, contactum immediatum impediens.

18. In vitris telescopii nullam requiro quam vocant centrationem, hoc est, ut maxima crassities sit in medio vitri, negotium alias tædiosum et operosum. Hoc tantum postulo, ut vitra præprimis objectivum constantem habeant situm in tubo, in quem, si ad abstergendum forte amoveantur, facile rursus restitui possint. Angli artifices, passim vitra ocularia telescopiorum præprimis reflectentium, cylindris cochleæ helicibus incisis firmiter infigunt, quo deinde aptis matricibus tubo immittunt. Quod si igitur helices cochleæ sunt bonæ, et præterea signum quoddam efficitur in cylindri margine, alii in cavo tubi facto respondens, necessario vitrum eundem situm servabit vel centies amotum, modo sic tubo rursus inseritur, ut signum signo respondeat.

19. Micrometrum, TAB. VIII. *Fig.* 4. habet collum, cujus margo in octo æquales partes lineis ad centrum convergentibus, scrupulose, aut si plura fila verticalia requiruntur in alias quascunque partes divisus. Ad has divisiones fila sive serica sive metallica facile applicantur, firmanturque in collo aut ceræ ope, aut subtilioribus claviculis, ex buxi ligno aut metallo confectis. *a* est prominentia quadrangularis, habens in parte opposita similem aliam, sed aut majorem aut minorem: ambarum crassities æqualis esto aut paulo minor crassitiei tubi cui immittitur. Ipse tubus *Fig.* 3. delineatus, in *d* habeat crenam rectangularem, prominentiam annuli *a* (*Fig.* 4.) absque vacillatione recipientem. Ipse annulus micrometri bene cavo tubi conveniat, intrususque tubo parietes interiores ejus bene contingat. *b* est vitrum oculare, a filis micrometri

micrometri debito modo distans. *f* foramen oculare, operculo cochleato *b* incisum. Remoto hoc operculo aliud substitui debet vitris fuligine obductis munitum. Ut micrometri filum horizontale semper sit in eodem situ, aut si disturbatum, ad debitum situm rursus redigi queat, tubus major telescopii *aa* (*Fig.* 5.) desinat in cuspidem *i*. Inserto deinde tubo oculari *b*, et in debitum situm redacto, linea in superficie externa tubi *b*, ad ductum marginis horizontalis cuspidis *i* ducatur, et cochleis minutioribus postea hi duo tubi *a* et *b* ad se invicem firmentur. Quodsi micrometrum postulatur, filo mobili instructum, tunc structura convenienter mutanda.

20. Nunc ad rectificationem regulæ progrediendum: Fiat ex ligno sicco et solido asser, superficiem habens horizontalem ejusdem ferme longitudinis et latitudinis cum regula. In extrema superficiei horizontalis parte sit verticaliter erectus clavus æneus, in cochleam superne desinens, cavitatem foraminis centralis exacte replens. Alterum extremorum planum habeat, aut tabulam æneam parallelipipedalem prominentemque. TAB. VII. *Fig.* 3. *hh* denotat partem asseris, *fegk* tabulam æneam prominentem, cochleis *eeee*, probe ad ipsum asserem firmatam, sic tamen ne capita cochlearum in superficie tabulæ promineant. Ipsa metalli superficies superior sit probe polita, congruat cum plano superiori asseris, sitque in eo ducta linea subtilis *ab*, quæ, si continuata fuerit, axin clavi transeat. Sint porro duo parallelipipeda orichalcea *cd* duabus cochleis, ad ipsam tabellam firmata, sed in apta ab extremo *gk* distantia, ex sequentibus mox colligenda. Singula infra habeant quatuor apices cylindriacos foraminulis in tabulam terebratis intrusos, ut

ſitus eorum ſit quam firmiſſimus; duo hæc parallelipipeda ſe mutuo exacte contingant, et planum contactus ſit perpendiculare ad lineam *ab*. Quodſi igitur diviſiones limbi quadrantis monſtrantur per marginem interiorem aperturæ *xx* (TAB. VII. *Fig.* 1.), aut filum quoddam per aperturam iſtam extenſum tunc regula quadrantis primum ſic imponitur aſſeri, horizontaliter primum collocata ejus ſuperficie ſuperiori, ut clavus verticalis aſſeris per foramen centrale tranſeat, teleſcopio ſurſum ſpectante, et ſic remoto parallelipipedo *d* (*Fig.* 3.) margo aperturæ *xx*, diviſiones indicans, (*Fig.* 1.) aut filum extenſum exacte applicetur ad ſuperficiem perpendicularem parallelipipedi *c* (*Fig.* 3.); quo facto margo aperturæ aut filum extenſum erit in plano ad lineam *ab* perpendiculari. Porro firmata regula ad tabulam *fg* ope cochleæ *v* (TAB. VIII. *Fig.* 1. et 2.) teleſcopium cum ipſo aſſere dirigatur ad objectum quoddam remotum, immobile; notetur in eo punctum, quod per decuſſationem filorum obtegitur, immotuſque maneat in iſta poſitione aſſer. Poſtea invertatur regula, removeatur parallelipipedon *c*, et in priſtinum locum reſtituatur *d* (TAB. VII. *Fig.* 3.); margo aperturæ *xx* vero (*Fig.* 1.) ſive filum applicetur ad planum perpendiculare parallelipipedi *d*. Cumque hoc ſtatu minima pars regulæ aſſeri incumbat, adeoque neceſſe ſit ut reliquum cum teleſcopio præponderet, fulcrum quoddam cochleis inſtructum aſſeri combinandum. Applicata ergo ſitu inverſo regula ad idem planum perpendiculare lineæ *ab* (*Fig.* 3.) denuo ad objectum per teleſcopium collimandum, videndumque an punctum decuſſationis filorum ſit in eodem objecti puncto ac antea. Hic caſus ſi extiterit, nulla correctione opus habet regula. Nam cum

immota

immota fuerit recta *ab*, per centrum clavi regulæ transiens, idemque objecti punctum per telescopium tam in situ recto quam inverso apparuerit, necesse est ut linea ab objecto per decussationem filorum ad oculum transiens parallela sit lineæ *ab*. Sed cum hic casus vix unquam prima vice sic existere possit, sed semper fere aliud objecti punctum fila decussantia tangant, tunc aberratio potest esse aut in altitudine, aut in azimutho, aut in utrisque simul. Utroque casu telescopii positio per cochleas *uu* et *ww* TAB. VII. *Fig.* 1. ad dimidium aberrationis angulum corrigenda, quantum sc. oculorum judicio hoc affirmari potest. Deinde regula rursus in situ recto modo, uti antea, imponenda, noviterque per telescopium objectum contemplandum, mox rursus invertenda, videndumque an idem punctum appareat. Si secus, telescopii positio denuo dimidii erroris quantitate corrigenda. Examen hoc toties repetendum, quoties differentia adhuc aliqua appareat. Re perfecta omnes cochleæ *dd*, *cc*, *kk* (TAB. VIII. *Fig.* 8.) et *ee*, *ff*, *gh* (*Fig.* 5.) firmiter adstringendæ, ut telescopium in eo statu permaneat. Cui hæc multiplex regulæ in asfere inversio, quæ tamen sat brevi tempore absolvi potest, adhuc tædiosa nimis videbitur, is aut micrometrum addat cum filo mobili, aut, quod ego mallem, tabulam albam *bcde* (TAB. V. *Fig.* 6.) quæ duas fascias nigras *hl*, *gf*, habeat ad angulos rectos, situ horizontali et verticali sese decussantes, ad congruam distantiam disponat, et sic deinceps asferem cum telescopio situ recto imposito sic dirigat, ut punctum decussationis fasciarum sit in puncto decussationis filorum in tubo. Immoto asfere, sed inversa tamen regula, prope tabulam adsit socius, mandata observatoris per signa

data.

data exequens, habeatque ire duas alias fascias nigras *km* et *no*, quas ad nutum observatoris situ ad *gf* et *hl*, parallelo (facile structura aliqua peculiari in assere sic efficiendo) et quidem *no* horizontaliter, *km* vero verticaliter moveri possit. Quodsi enim inversa regula in assere punctum decussationis cadit in tabulæ punctum, v. gr. *g*, tunc socius utrasque fascias *km* et *no* successive sic disponat, ut filum verticale tubi cadat in fasciam *he*, et horizontale tubi in fasciam tabulæ *km*. Hoc peracto, intervalla *fo* et *kh* ope circini bisecanda, atque fasciæ in tabula motu parallelo in ista bisectionis puncta collocandæ. Tunc immoto assere regula cum telescopio in situm rectum rursus restituitur, atque telescopii positio tamdiu per cochleas corrigitur, donec punctum decussationis fasciarum in tabula coincidat cum puncto decussationis filorum in tubo. Quodsi prima vice inversa regula et tubo ad tabulam collimatur, secunda vice vero in situ recto, tunc puncto decussationis in tabula notata, atque debito loco collocatis fasciis mobilibus, error in eodem situ regulæ corrigi potest. Et sic tubi situs respectu regulæ erit talis, ut vel in recta vel in inversa positione telescopii, idem objecti punctum in tubo conspiciatur, per consequens regula quadrantis erit rectificata.

21. Quod si fieri nequeat quin hæc regula paulo evadat ponderosior, pro commoda ejus ad astra directione, duobus modis et huic incommodo mederi potest. Primus est quem dudum *Flamstedius* sextanti suo adhibuit, atque in *Historia Cælesti* descripsit. Cochlea nimirum perpetua in regulæ appendice versatili margo exterior limbi quadrantis denticulis congruis incisus raditur. Sed tunc apparatum appendicis *sq* (TAB. VIII. *Fig.* 2.) non omittendum suadeo,

ut regulæ planities plano limbi bene ſit contigua. Nam in ſextante murali *Petropolitano*, qui a *Rowlejo* præſtantiſſimo ſui temporis artifice confectus eſt, hoc vitium deprehendi, ut margo aperturæ *xx* (TAB. VII. *Fig.* 1.) diviſiones limbi ibi indicans, ſatis bene quidem limbum ſtringat, reliqua vero pars regulæ nimium a plano limbi diſtet, unde teleſcopium vacillat, vel validiſſime ad marginem adſtricta cochlea. Sed totum hoc artificium nimis operoſum mihi videtur, nec ſatis commodum in obſervationibus. Nam cochleæ revolutionibus limbi diviſiones aut examinare, aut corrigere, aut comparare, nullo modo ſatis tutum mihi videtur; pondus regulæ ſublevare, facilioremque tubi ad aſtra directionem hoc artificio efficere, id admodum nimis operoſum. Mallem ego alio uti centies ſimpliciori. Sit TAB. V. *Fig.* 5. *abc* quadrans muralis, *ad* regula; in *m*, centro *a* quadrantis verticali ſtatuatur axis vectis ferrei, *gmf*, ſic ut brachium *mf*, et ejus revolutio, ſit quamproxime in plano quadrantis; alterum *mg*, in alio parallelo, atque diſtanti. Longitudo *mf* ſit dimidium circiter longitudinis regulæ *ad*, longitudo *mg*, vero 3 vel 4 pollicum. Angulus *gmf* punctorum nempe rotationis *m*, et ſuſpenſionum *gf*, ſit rectus. Ad *f*, catenulæ vel funiculi miniſterio connectatur regula, ſic ut *mf* ſit æqualis et parallela *ae*. Ad *g* alligetur funiculus *gh* horizontaliter ad extremum conclavis extenſus; ibi trochlea *h* fultus, tandemque pondere *k* appenſo ad terram propemodum demiſſus. Quodſi enim hoc pondus *k* regulæ ſufficiens efficitur, in quocunque ſitu, ea vel demiſſa vel in altum ſublata manebit. Parum obſtabit, quod centrum gravitatis regulæ noſtræ a puncto ſuſpenſionis diſtans futurum ſit, quoniam

preſſio

preſſio elaſtri in tergo limbi inæqualem gravitatis actionem ſatis temperabit.

22. Reſtat nunc ut oſtendam organum deſcriptum cunctis requiſitis ſuis ſatisfacere.

I. Cum fila *i*, *k*, (TAB. VII. *Fig.* 1.) et alterum ipſi ſimile in oppoſita parte parallelipipedi ſitum habeant ad planum quadrantis parallelum, eandemque diſtantiam ac punctum ſuſpenſionis *c*, facili negotio collimando patebit, utrum filum perpendiculi ſit in plano horum filorum, adeoque planum quadrantis in poſitione verticali. Quod erat unum.

II. Quoniam filum *mo* eſt in plano lineæ *pr*, idque perpendiculare ad planum quadrantis, collimando per *mo* et *pr* facile dignoſcitur, utrum perpendiculum ſit in hoc plano, per conſequens principium diviſionis *pr* ſit in plano verticali. Quod erat ſecundum.

III. Quoniam quadrans ſuſpenſus eſt duobus punctis, primum in unco *o* (TAB. V. *Fig.* 2,) deinde in cavo mutuli *n*, motum ejus verticalem nihil impedit niſi duæ cochleæ fœminæ, marem *p* complectentes. His ergo cochleis ſitus plani quadrantis ad perpendiculum corrigi poteſt, cumque hac correctione brachium horizontale quadrantis non inclinetur, ſequitur quod hæc correctio ſit independens, a ſitu horizontali quadrantis. Quod erat tertium.

IV. Uncus (TAB. V. *Fig.* 3.) non modo in *a* eſt cavus ſed ſimul eſt convexus, ut ſectio ejus *ab* ſit circularis: hæc unci figura igitur non obſtat quo minus quadrans in mutulo *n* per cochleam *h* (TAB. VI. *Fig.* 2.) nonnihil attolli aut deprimi poſſit. Proinde cum poſitio principii diviſionis dependeat ſimul a poſitione brachii horizontalis, evidens eſt, per motum cochleæ *h*, poſitionem principii diviſionis reſpectu perpendiculi corrigi poſſe.

V. Cum ipſum fulcrum ferreum habeat motum aliquem horizontalem in mutulis *a h* et *g b* (Tab. V. *Fig.* 4.) axiſque rotationis ſit perpendicularis, ſequitur, quod reliquis omnibus manentibus deviatio plani quadrantis a plano meridiei corrigi poſſit. Et ſi vel maxime axis rotationis fulcri non exacte ſit perpendicularis, nihil tamen impediet, quo minus obſervator inclinationem hujus axis, ad quam partem ea tendat, explorare poſſit, et ſic deinceps pro re nata correctiones ſuas inſtituere. Quod erat quintum.

VI. Quadrans ipſe ex uno et ſolido eſt metallo. Quod ſi igitur extenditur aut contrahitur calore aut frigore, ſimilis ſemper ſibi manebit. Nec ſuſpenſio ejus obſtat extenſioni. Nam in fulcro mutulus *n* (Tab. V. *Fig.* 2.) canalem habet horizontalem, in quo cochleæ apex *h* (Tab. VI. *Fig.* 2.) hæret, et foramen *c* (*Fig.* 1.) ſatis amplum pro tam parva extenſione aut contractione quam calor aut frigus producit, nec cochlearum fœminarum, iſtud foramen in facie et tergo quadrantis tegentium, brachiumque conſtringentium, ſuperficies plana huic obſtat. Quod erat ſextum.

VII. Denique quoad rectificationem, ea jam ſatis ex ipſis præceptis patet. Nemo non intelliget, eam faciliorem expeditioremque eſſe hucuſque uſitatis; cumque aſſer pro rectificatione regulæ conſtructus aſſervari poſſit, quolibet tempore obſervator abſque magno labore regulam ſuam denuo examinare poteſt. Ergo organon requiſitis ſuis ſatisfacit.

Cæterum quoniam rariſſime in ædificiis conſtructis dantur muri in plano meridiei exiſtentes, vel ſaltem loca hiſce muris conſtruendis apta, arcus murales hucuſque ſemper ædificium expreſſe in hunc finem, diſpoſitum deſiderarunt. Sed quilibet facile intelliget noſtrum artificium quocunque ferme loco eſſe applicabile.

plicabile. Nam ſi, *v. gr.* in tali apertura quæ januarum eſt, duo mutuli *a h*, *g b*, (TAB. V. *Fig.* 4.) in murum immittuntur, tertius *ec*, murum contiguum præciſe non requirit; ſed in ferri quadam compage, longe de muri plano prominente, valide ſatis firmari poteſt.

Multa præterea ſunt quæ in hoc organo aliter aut forte melius diſponi poſſent; ſed longus nimis forem omnia cogitata mea in medium hoc loco prolaturus. Sufficiat artificium ſcopo congruens monſtraſſe, idque non ingratum penitus aſtronomis fore confido.

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## XIX. *Obſervationes duæ* Alberti Haller, *Prof. Med.* Gotting. *R. S. S.* Lond. *S. Fabricæ morboſæ in Cadaveribus repertæ.*

### OBSERVATIO I.

*Read* May 7. 1747.

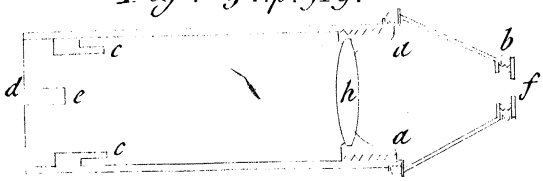
IN fœmina quadragenaria reperi venam cavam inter renalis ſiniſtræ originem, et inter iliacas venas, enormiter anguſtatam, ut vix quidquam tranſmitteret. Aliquid tamen polypoſi duri ſanguinis in ejus cavitate, quæ inter craſſas membranas arctiſſima fuit, repertum eſt. Vena vero ſpermatica dextra enormiter dilatata, unciali diametro venæ cavæ locum ſubiit, et ſanguinem, excluſum a via ſolita, reddidit ureteris venæ, alioquin in ſano corpore exiguæ, ortæ ab iliaca dextra.

Rariſſimi hujuſmodi coalitus exemplum aliud reperi in JOHANNIS RHODII *Mantiſſ. Anatom. Obſ.* XXI.

Ex utroque conſtat, etiam in maximis truncis vaſorum corporis humani morbos ſubnaſci poſſe, et obſtructionem in venis vere dari; et canales minimos, quando ſanguinis, ſolitis viis excluſi, impetus eo vergit, patentiſſimos reddi poſſe.

IN

Fig. 3. p. 519.

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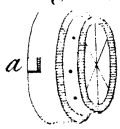


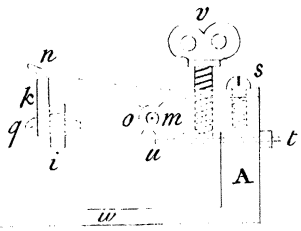


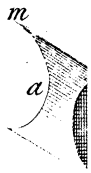


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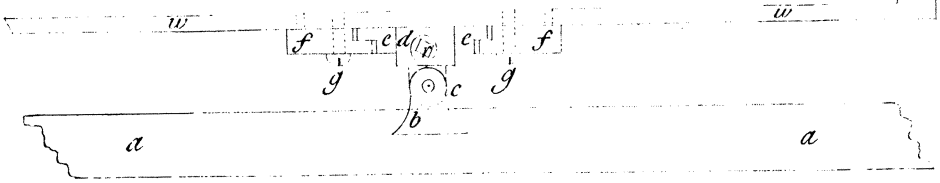


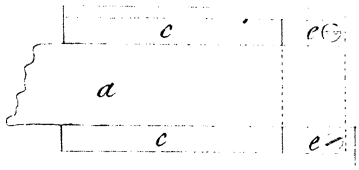
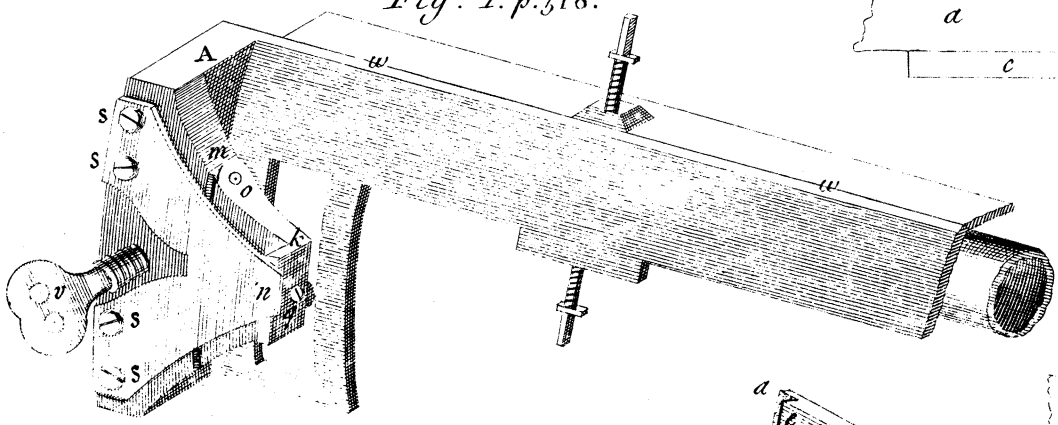




Fig. 1. p. 518.

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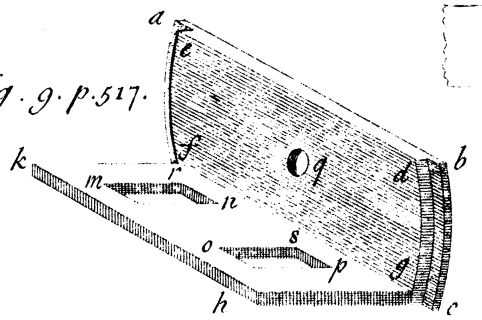


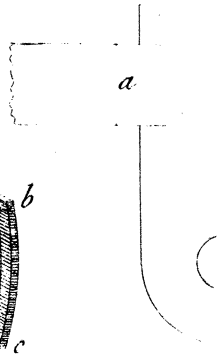

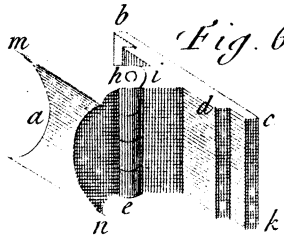


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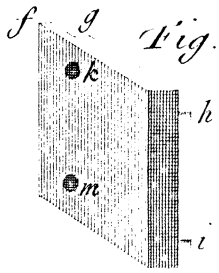


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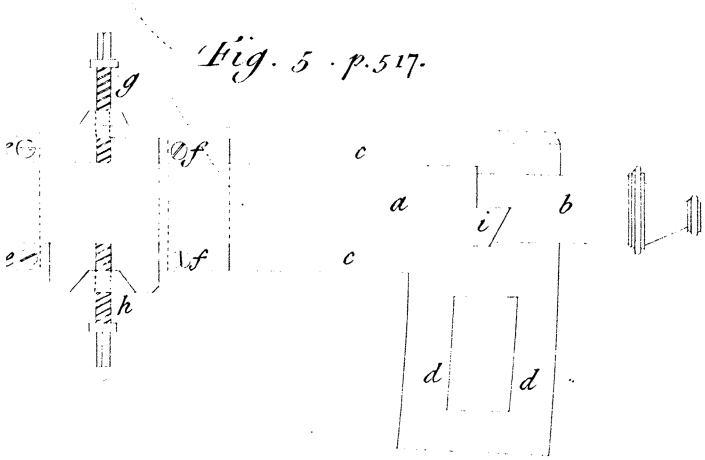


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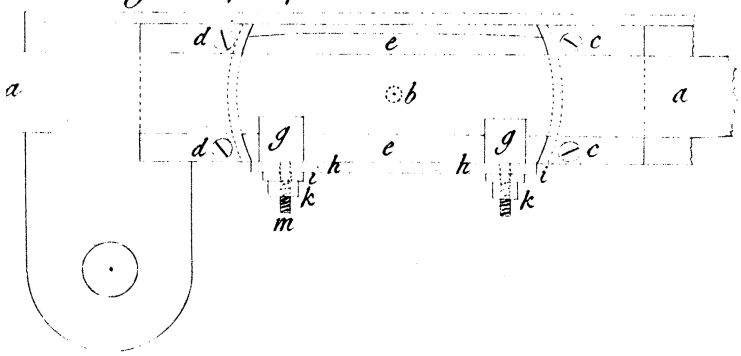
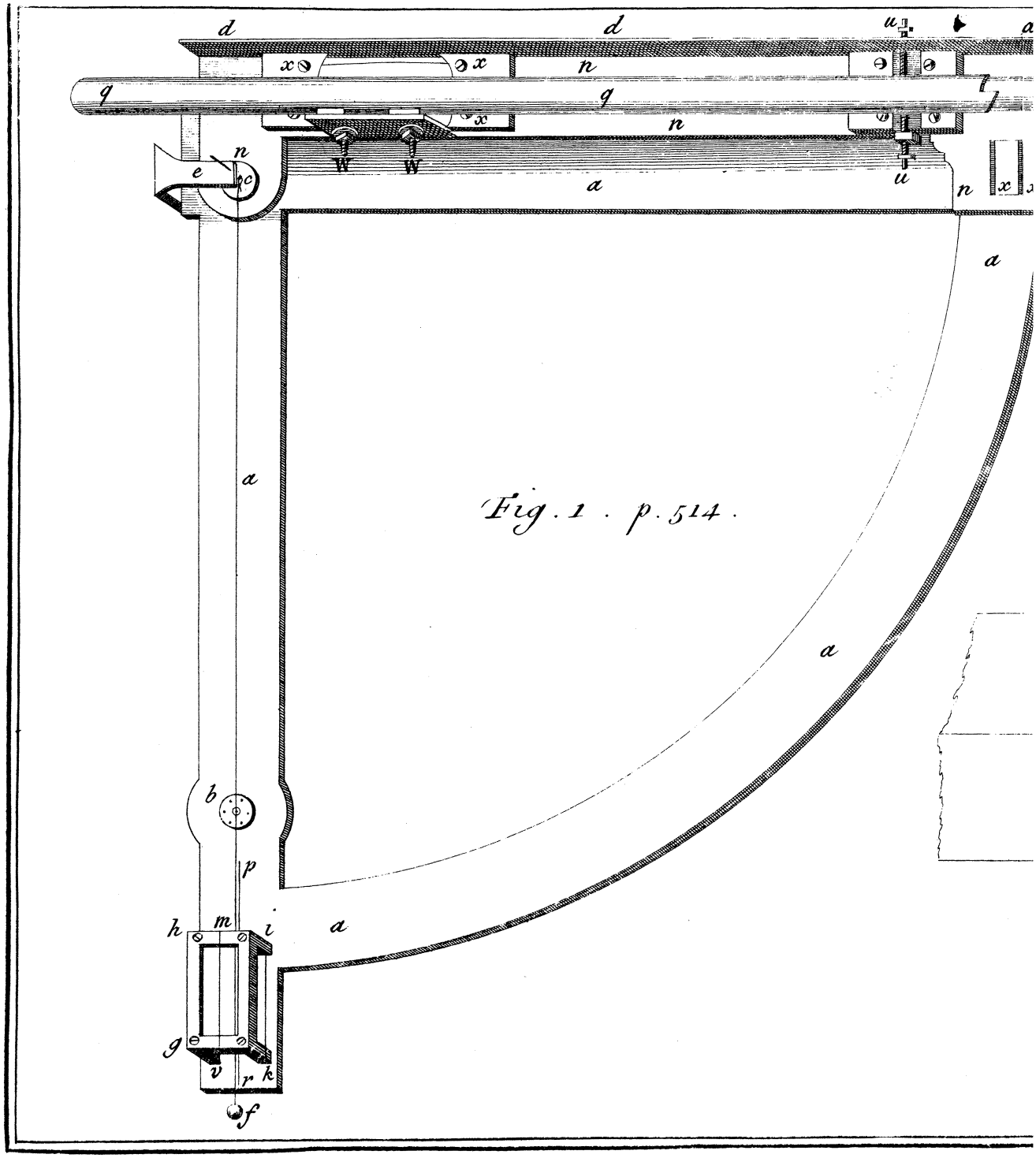



Fig. 8. p. 517.

J. Mynde sc.

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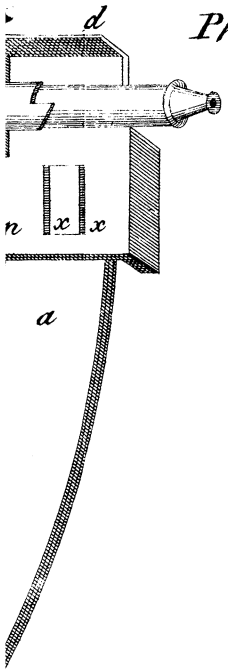


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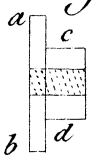
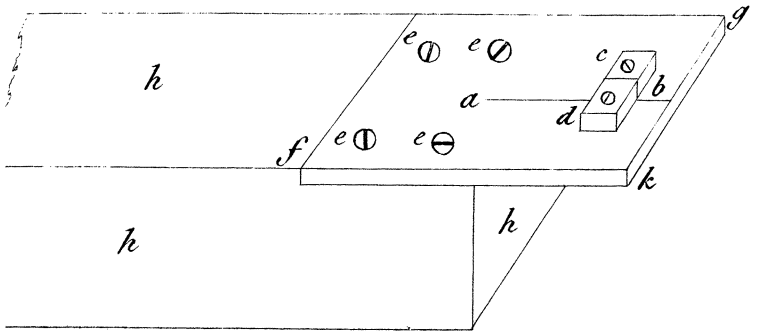



Fig. 3. p. 520.




J. Mynde sc.

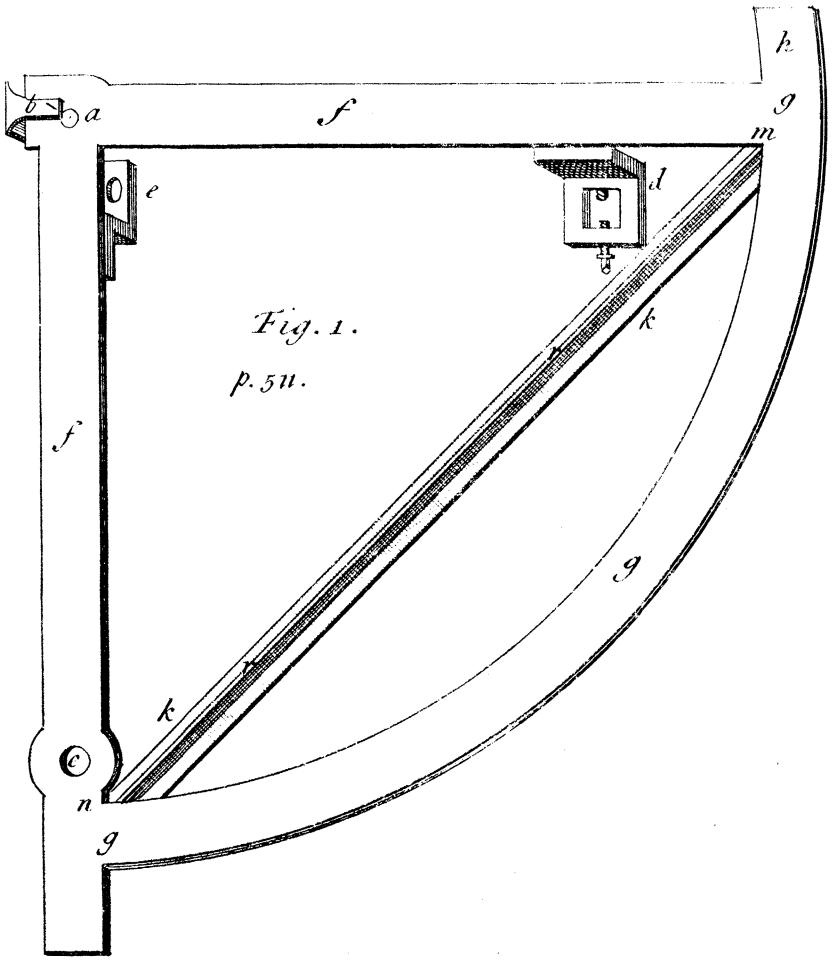



Fig. 1.
p. 511.

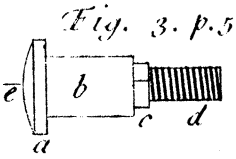



Fig. 3. p. 514.

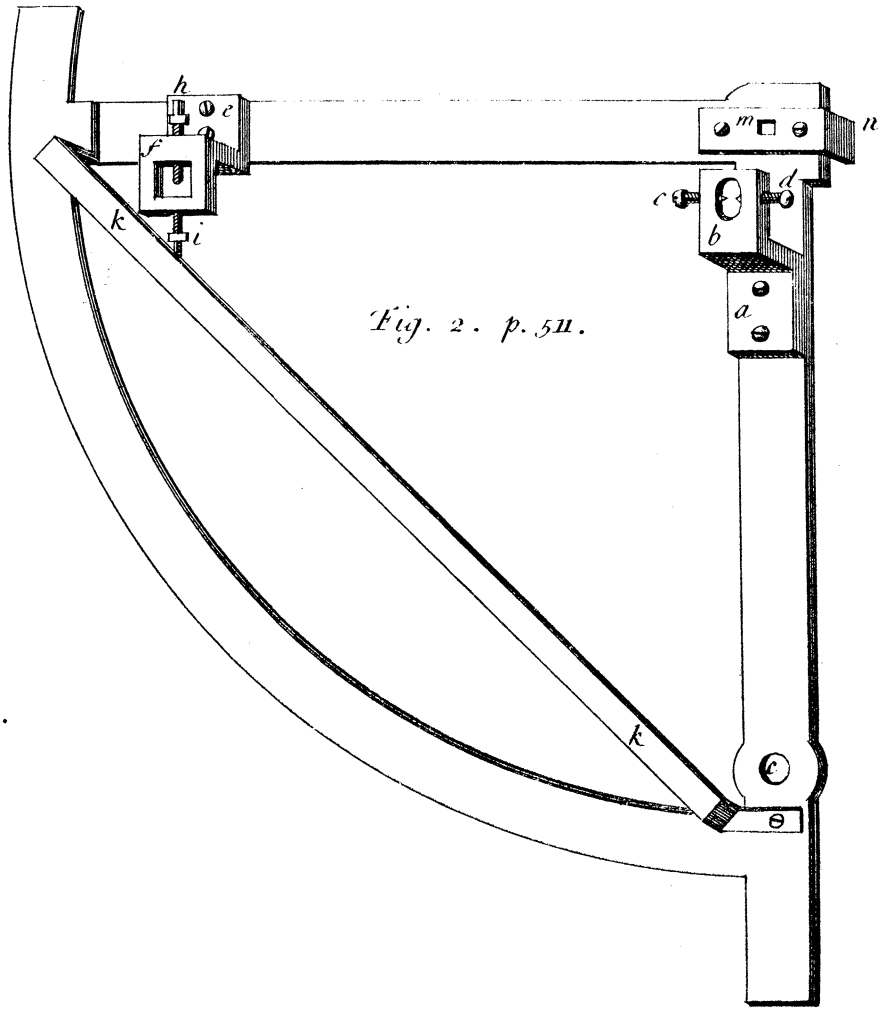



Fig. 2. p. 511.

514.

J. Mynde sc.

Fig. 1. p. 508

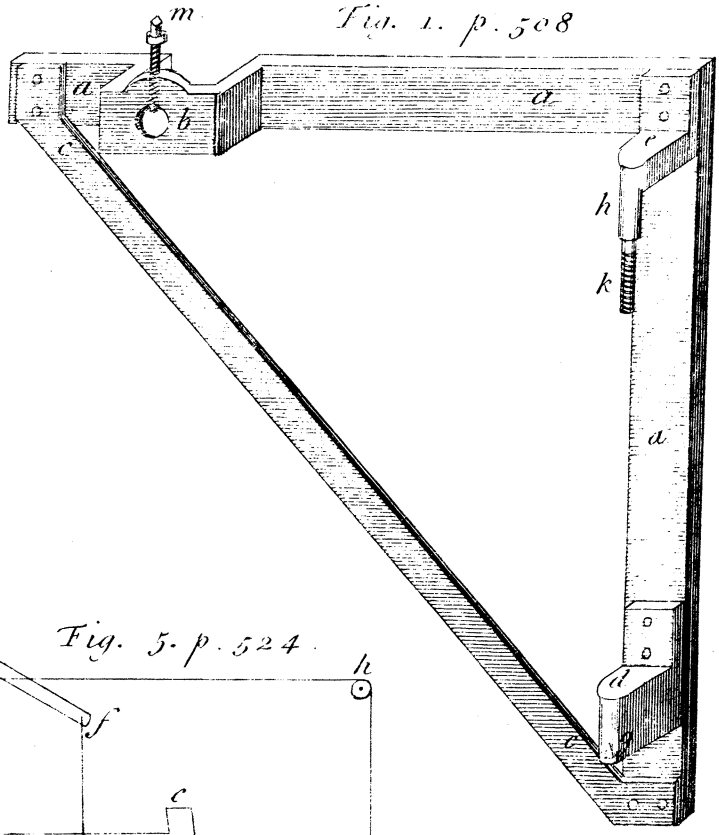



Fig. 5. p. 524.

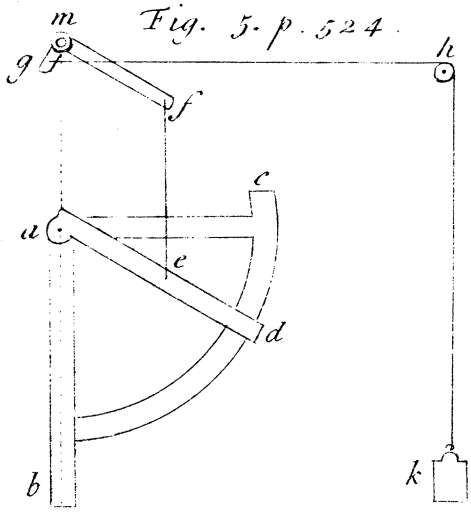
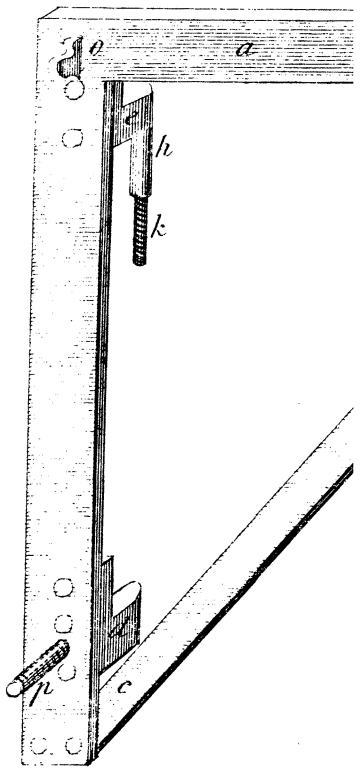



Fig. 2



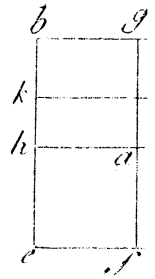




Fig. 6.
p. 522.

Fig. 2. p. 508.

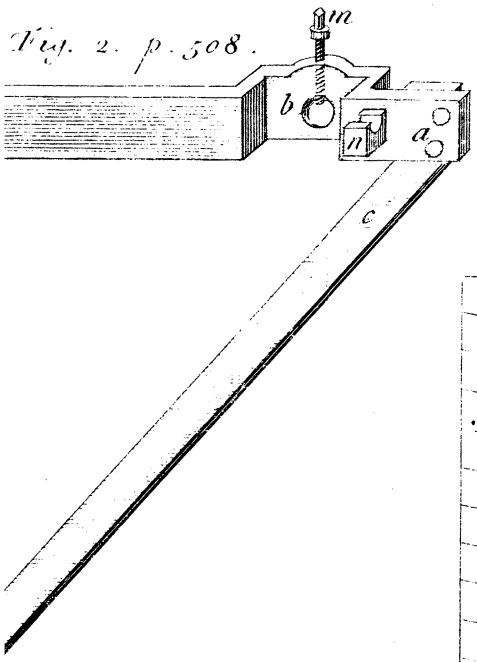



Fig. 3. p. 511.

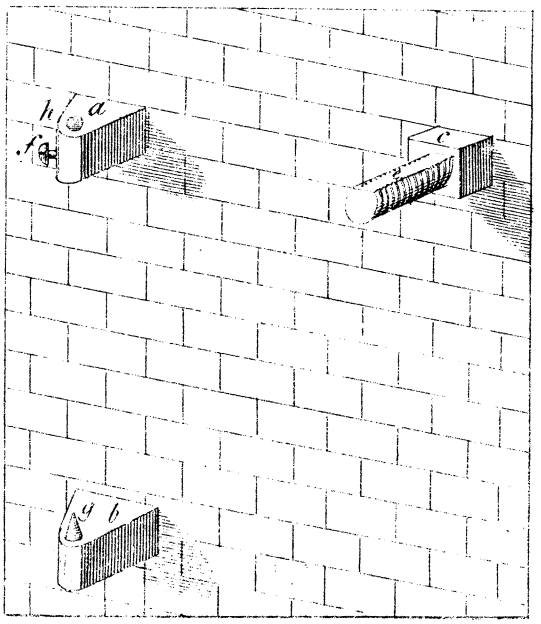
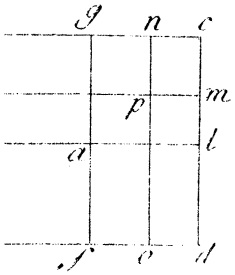


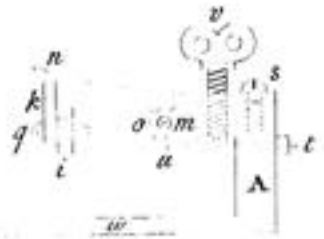

Fig. 1. p. 509.




J. Mond. sc.

Fig. 3. p. 519.

Fig. 4. p. 519.



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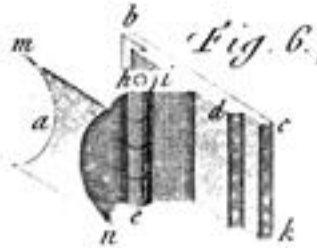

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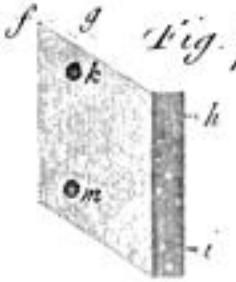
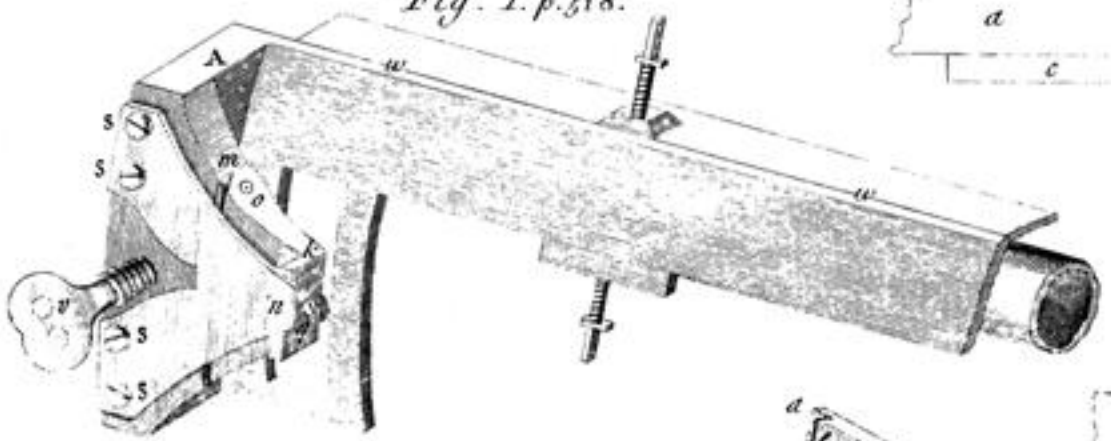


Fig. 2. p. 518.

Fig. 5. p. 517.

Fig. 1. p. 518.



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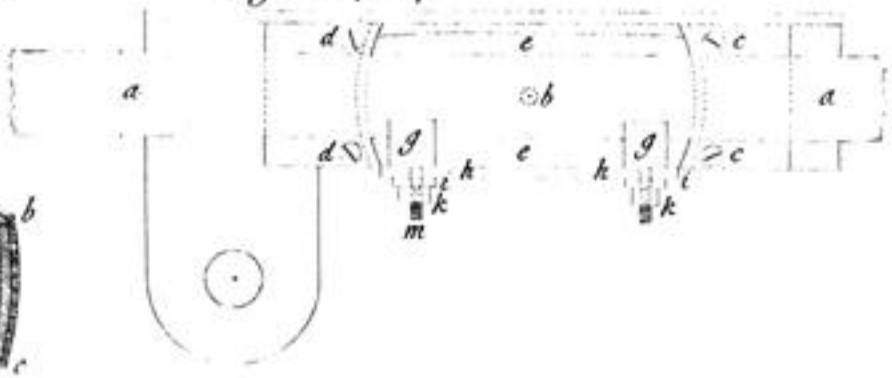

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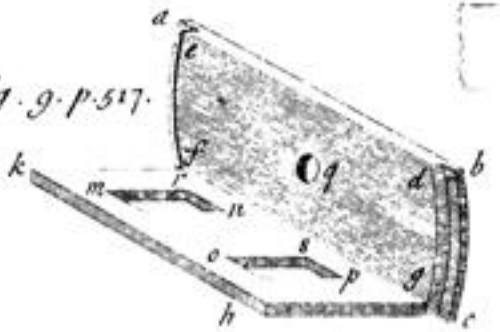

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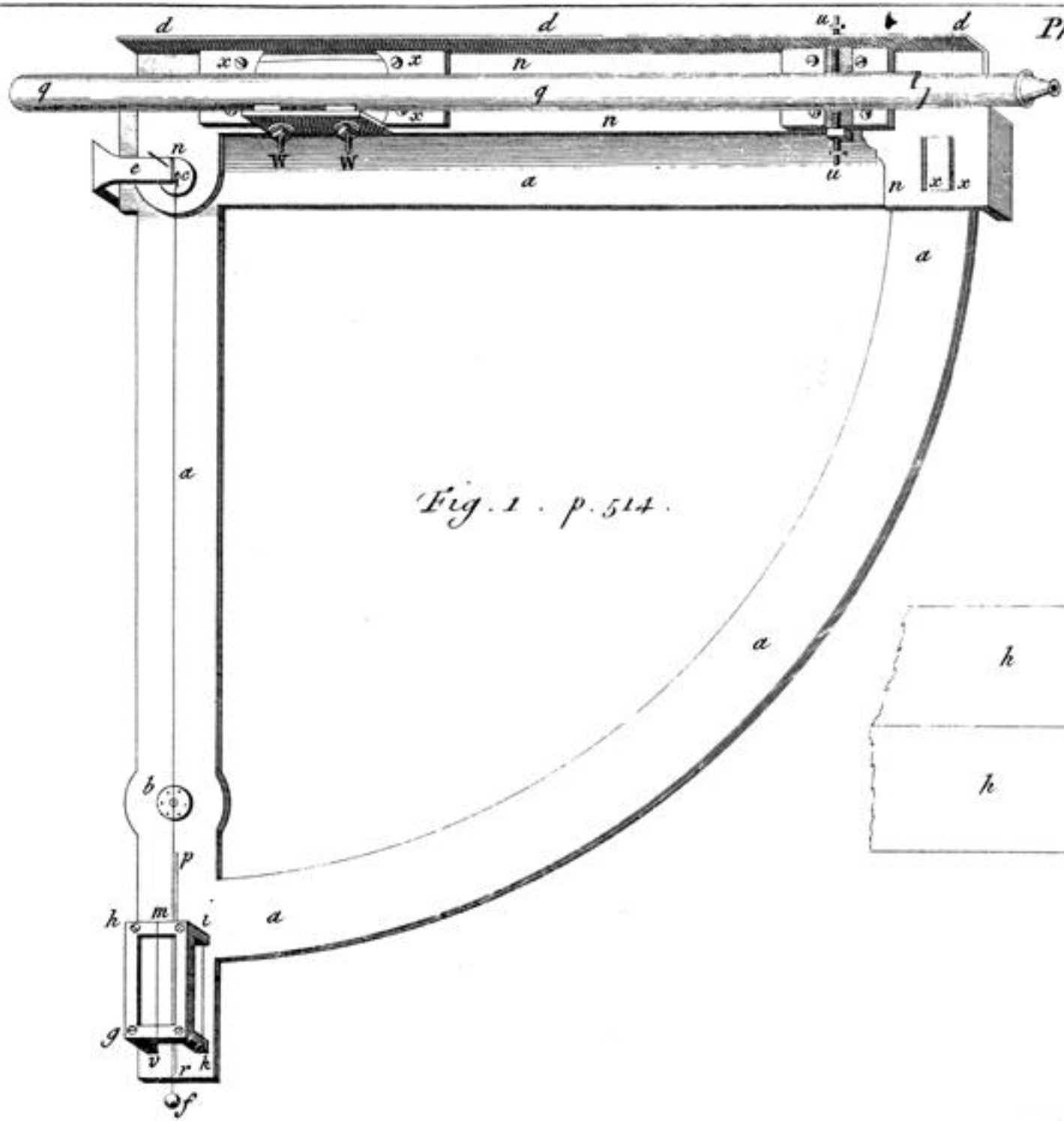
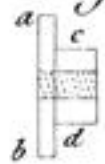



Fig. 1. p. 514.

Fig. 2. p. 513.

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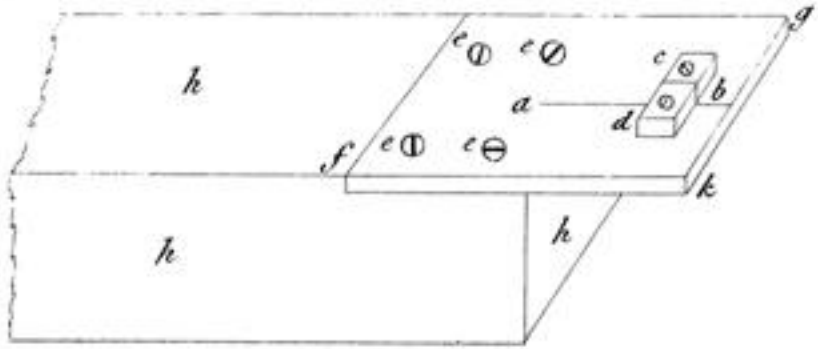


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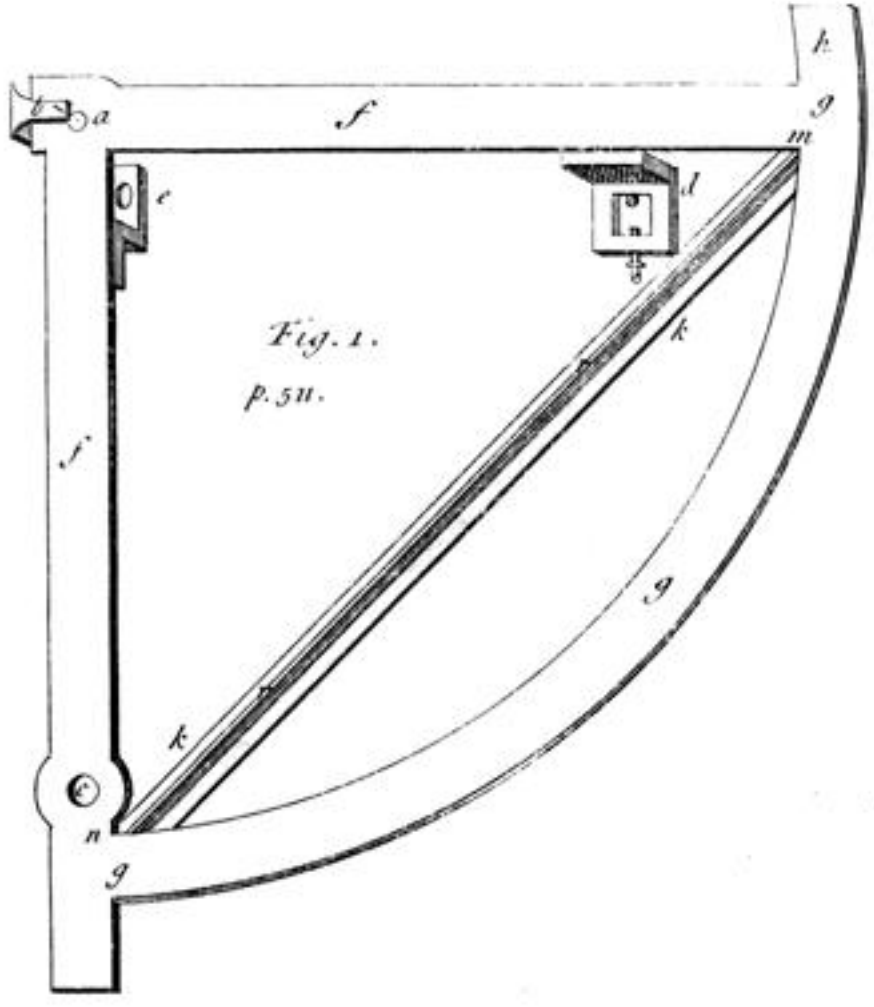



Fig. 1.
p. 511.

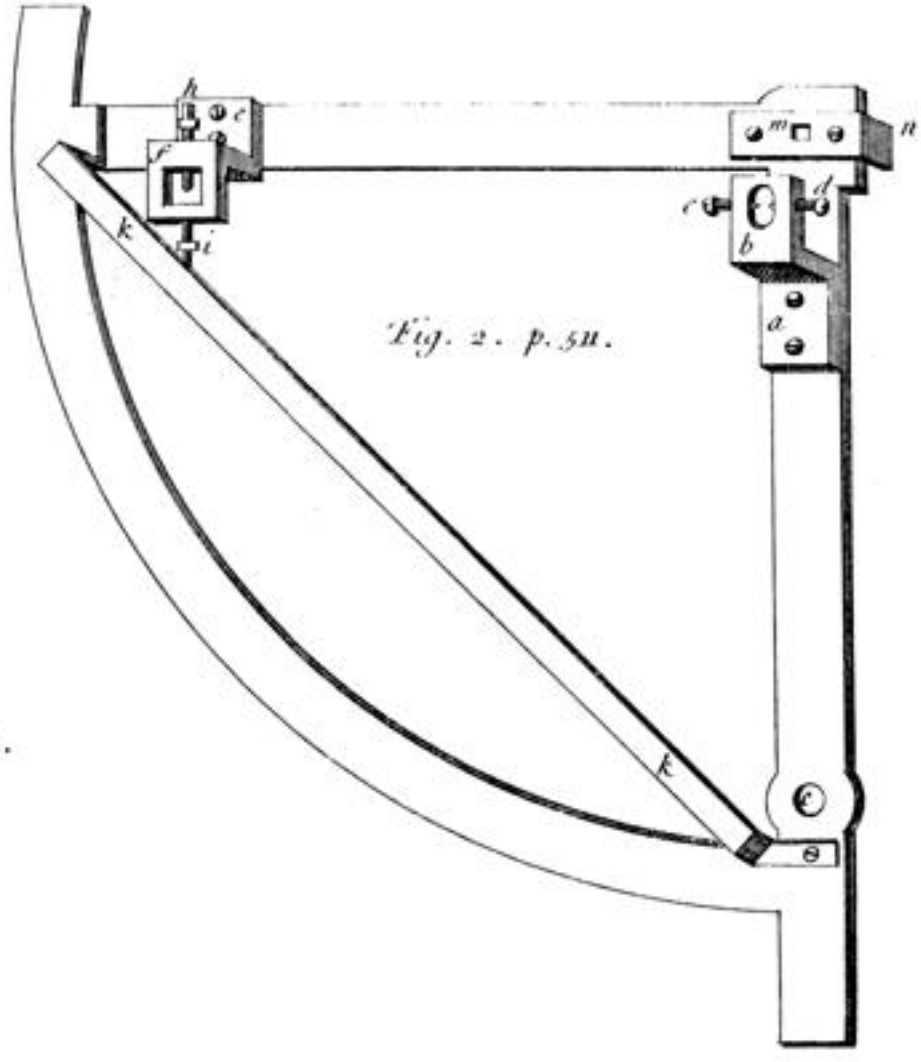
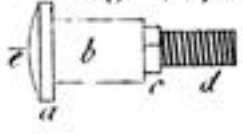



Fig. 2. p. 511.

Fig. 3. p. 514.




J. Mynde sc.

Fig. 1. p. 508

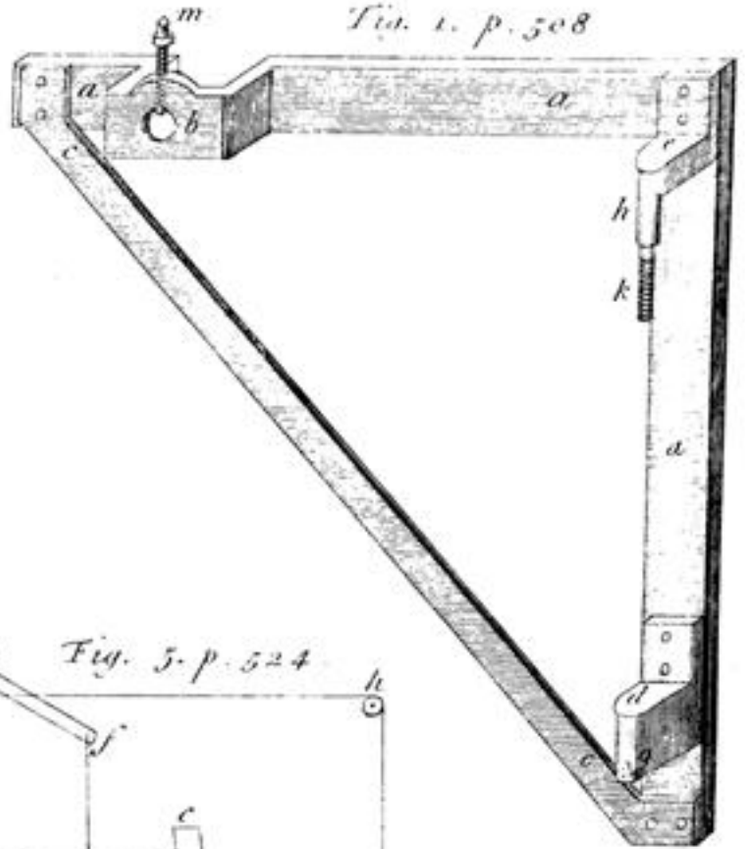
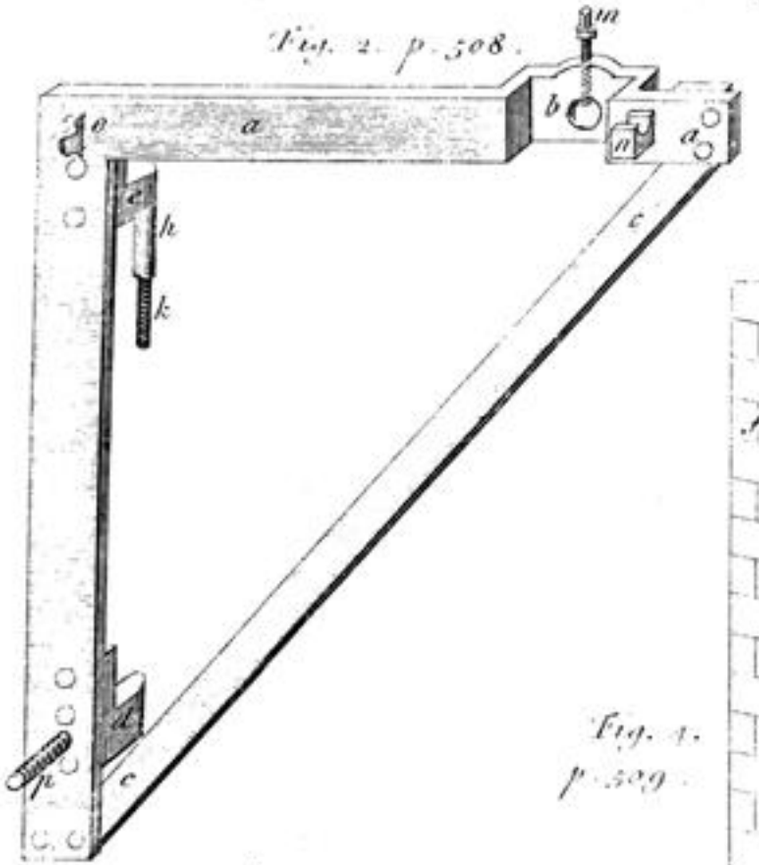



Fig. 2. p. 508.

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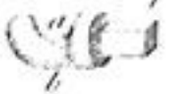


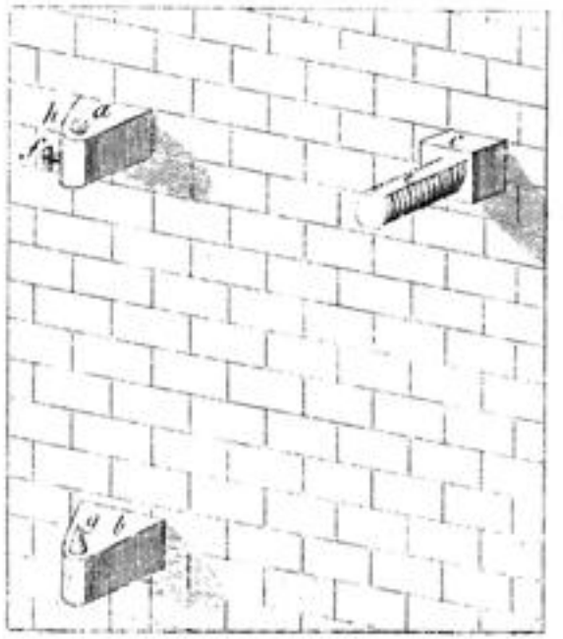
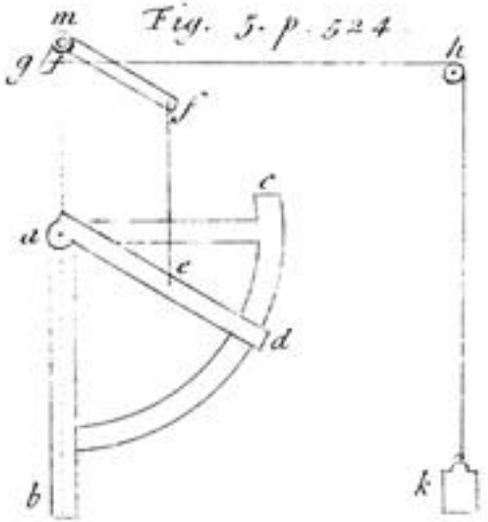




Fig. 4. p. 509.

Fig. 5. p. 524



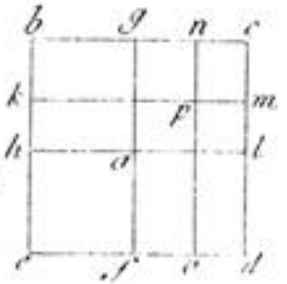




Fig. 6. p. 522.