

Planetarium  
Globe

Plan of the first course -

Wheel A = 90 Júpiter true motion turns  
retrograde. Its anterior motion also 90 this carries  
Júpiter -

C = 90 Saturnus true motion, turns B socket  
wheel of Saturn also = 94 -

On the wheels A and C are fixed the grooves  
for retrogression which take in the pins

in the two exterior of the small wheels in  
the lower axis below - The wheels A and  
C have small axes which go down thro' the  
apparent sockets and their ~~ax~~ pivots turn  
in the frame K - The wheels H, I in the

plan of the third course have sockets which  
turn within other sockets fixed on the  
half bridge - on the top of the inner socket  
is fixed one of the three wheels of twenty four  
teeth and on the outside fixed socket is fixed  
one of the two wheels of 20 teeth which  
produce the Eclipses. This wheel is of iron -

quarer fixed and and the other wheel revolves  
round it carrying the eccentric pin which is 9  
very near its center, who round in one ~~and~~  
revolution - The Perihelion is when the pin  
is on the side next the center of the great  
wheel which carry it and in Aphelion when  
opposite - The Great wheel of Jupiter = 09  
of Lat. 96 gives the mean ~~of~~ revolutions and  
the center of these wheels represents the  
sun - the axis of the globe represents the  
earth - These wheels have no arbors but turn  
on the same fixed sockets on the top of which  
the wheels of 40 teeth are fixed -

The wheel = 30 fixed on the same arbor with the  
wheel of 54 and below it gives motion to the  
wheel of 34 teeth whose periphery of 8 leagues  
turns Jupiter's great wheel of 09 under to which  
is fixed the wheel of 61 this turns the wheel  
of 41, above and to which is fixed the wheel of 26  
this turns the other wheel of 26 and this turns  
Saturn's great wheel = 96 - The former mentioned wheel  
of 54 above 30, turns 44 to which and below is fixed  
the wheel of 59, which turns Saturn's wheel F = 74  
which turns the center wheel G = 77 and thus

Jupiter's wheel = 77 The wheels H, I or below in  
half bridges, and turn the sockets which carry  
the feet of the ~~center~~ <sup>three retrograde</sup> wheels formerly mentioned  
of 25 teeth each - The wheel of 60 teeth immov-  
ably below the Cross K and thro' which the  
two steel wires pass gives motion to the  
four mentioned wheel of 30 and consequently  
to all the wheels of Jupiter and Saturn  
systems - The lower ends of the two steel  
wires pass thro' the bench which supports  
Mars's wheel work and are fixed in the wheel  
N. of 118 teeth which consequently moves 60  
above mentioned in the same time. This wheel  
of 118 is turned by a wheel of 22 on the same  
arbor of which and below is a wheel of 24 fixed  
this by the wheel L = 77 this is fixed on the  
two supports which ~~support~~ <sup>support</sup> the bench  
K which carries Venus and Mercury and  
this bench is fixed to the Great wheel I = 144  
This wheel is turned by the wheel 24 <sup>not to</sup> - The  
frame T. The great wheel moves on a socket  
fixed into the frame T, on which socket there  
are two rectangular projecting pins on which

is fixed the wheel  $Z=72$  this fixed socket  
 has other two one within the other the  
 outermost of the two carries fixed to it a  
 wheel of 72 y, the other also a wheel  $=72$   $\vee$   
 the lower end of the feet of the two sockets  
 is fixed into two wheels fixed together  
 the uppermost a 79 the other  $b=80$ . The  
 innermost socket ~~also carries a wheel~~  
 is riveted to three wheels, uppermost  
 $c=54$ ,  $d=101$ ,  $e=83$ . The two first wheels  
 riveted close, and the uppermost near the  
 upper frame collect below the second wheel  
 and the first of the other three, 1 and 2 of the  
 three riveted close, small distance between the  
 second and third — See Pl. 5 —  
 The innermost socket of the above five  
 goes on the steel axis of the globe —  
 and lies next the frame f —

The wheel  $x=32$  next and below the frame  
 f is fixed to the first lower socket and consequently  
 gives motion to the whole machinery of the

globe — On the lower end of this socket is  
 the wheel of 106 teeth on the outside and at the  
 lower pole of the globe — turned by the wheel of  
 24 this on the same socket with the wheel of  
 72 which last is carried round the wheel of  
 34 <sup>fixed to the frame in the center of which the axle move the globe</sup>  
 in 23. 56; 4.1 = several times

The above wheel  $x=32$  turns  $g=77$  on the  
 axis of which is fixed the wheel of 20 which turns  
 the lowermost of the above mentioned three  
 which riveted together i.e.  $e=83$ . Above the  
 last mentioned wheel of 20 and on the same  
 axle are two wheels at a small distance  
 from each other fixed <sup>together and turn on the</sup> ~~on the same axle~~  
 the uppermost  $u=29$ , the other 30 this  
 turned by the uppermost of the three wheels  
 and  $u=29$  turns  $b=80$  — the lowermost of the  
 two fixed wheels — The wheel  $d=101$  turns  
 $x=31$  on the same axle of which and below  
 is fixed the wheel 84 which turns the  
 central wheel  $o=5$  — The steel axis is fixed  
 to the frame g and runs thro' the whole

The wheel 85 carries the French with three supports/wires which contains one wheel in the center of 42, which turns another wheel of 42 this last produces the moon's <sup>epicycle</sup> motion

Trisly -  
- From the bench of mercury and Venus the lowermost fixed wheel 2=72 gives motion to the lowermost of the two wheels of 36 teeth which move independently, on the same stud fixed into the bench - The last mentioned lower wheel

of 36 gives motion to the lower of the two wheels of 72 which whose socket passes thro' the socket of the upper wheel of 72 and carries the outermost wheel of 24, this the wheel 12, and this 24 wheel last carries the pair of retrogression of Mercury

The two wheels move on the same stud fixed into the bench, and independently of each other

The middle wheel of 72 fixed on the socket of the <sup>lower</sup> three revolved wheels below gives motion to Venus's wheel of 36 teeth which moves Venus's great wheel 72 this carries the retrogression

A. B. Venus has no eccentricity in the machine -  
- The wheel V=72 fixed on the inner socket of the 3 wheels revolved below moves the uppermost of the two wheels of 36 on Mercury's side this moves the uppermost wheel of 72 on which is fixed the arm with the three retrograde wheels on the outermost of which is the pair last so as to be in a line with the extremity of the teeth - A. B. Venus's wheel of 36 also moves on a fixed stud in the bench &c. -

A. B. The usual piece of brass + + in the Elevator of the 7, 8, 9, 10 and 11 Courses fixed the two upright flat pieces on the <sup>upper</sup> ~~upper~~ <sup>ends</sup> of which is the wheel 2=77 - The lower ends of these uprights are fixed into the frame &c. - which is fixed to the wheel 144 -

+ In Mercur's bench are two grooves thro' which the stud was pass, to allow Mercur's motion of eccentricity -

+ There is a cord which goes on between the wheel 12 and Mercur's arm of retrogression -

+ A thin collet about an inch in length goes on the socket immediately above the central wheel G in Jupiter and Saturn's system

The Eccentric wheels of Jupiter and Saturn turn on studs fixed into the great wheel - The uppermost of the two riveted wheels  $a=49$  turns  $w=65$  on the same axis of wheels and below is fixed the wheel  $41$ , this turns the central wheel  $w=88$  which carries the frame with three studs in the middle of which is the fixed wheel  $40$ , which moves the epicycle wheel  $48$  which last has the eccentric pin below this takes in the groove of the arm to which the sun's socket is fixed - The pin goes thro' the arm into the wheel a groove the last wheel has one of 144 teeth which wheel consequently meshes with the frame - This wheel gives motion to wheel  $l=24$  in the middle of whose axis is the pinion of G ~~the sun's~~ and on the upper part above the frame  $F$  is the wheel  $24$  which turns the great wheel 144 and frame fixed to it - The pinion  $b$  last mentioned turns the wheel  $k=36$  on the

same axis <sup>of wheel</sup> and below is fixed the wheel  $n=14$  which turns the wheel  $i=39$  on the axis of wheels and immediately below is fixed the wheel  $j=23$  this turns the great thin central wheel  $s=73$  next the last wheel  $r$ . On the same axis with the wheels  $j=23, 39$ , and above  $39$ , is the wheel  $h=25$  this turns the wheel  $o=33$ , on the axis of wheels and at the lower is the wheel  $q=17$  this turns the last wheel  $86$  which carries the socket of the moon's nodes -

+ The pin which goes thro' the sun's Eccentricity is fixed on one side of a big pivot in the epicycle wheel  $\odot$  this pivot is the lower frame and the pin works in the groove of the great wheel below - The Central wheel  $73$  has a socket in the wheel  $u=85$  on this socket is fixed the middle wheel  $42$  in the moon's frame - The upper wheel of the sun frame turns on a socket fixed to the frame  $t$  above, on the lower end of this socket the central wheel of the sun's system is fixed - The moon has an arm with a groove for the eccentric pin like the other planets

The great wheel that serves for the sun's arm  
In Mond's system the large wheel below and  
beneath both move in a socket fixed on the  
frame O. The bench is connected with the Excentric  
wheel by the pin which has the pin-groove  
at one end which is fastened to the bench by two  
screws - The two grooves in the bench allow  
it to follow the motion of the excentric pin -  
On the above fixed socket is the wheel of  
fixed axis which gives motion to the Excentric -  
above this is another wheel fixed on a socket  
within the frame which moves the retrograde  
wheels of mass. The last mentioned socket  
comes from the wheel 2 = 77. —

All the motions of the pin retrograde  
and excentric as well as all the great wheels  
representing the sun move from west to East  
or in the same direction as the first socket  
except Jupiter and Saturn whose great wheels  
and pin move from East to west because they  
turn center wheels which consequently carry

The sockets round also from west to East  
like all the rest. —  
All the center wheels which have motion  
move in the same direction, except the  
last wheel below which carries the moons  
nodes, this revolves in the contrary direction  
in 19 years —

The movement for Syderical time  
to the 12 hour wheel of the clock is with a  
wheel of 24 this turns 24 on the upper end  
24 on the under end of the rod - 24 turns 40 on  
the sock of the 24 from hand of the middle on the  
center axle which is turned by the wheel 10  
revolved the wheel 38 this and the last would  
be 40 one made fast to each other the screw passing  
through the upper index on the same axle  
with 38 and pressing against the socket of  
48. when this screw is fast the clock shows the  
whole machinery when taken out, and the  
center axle turned the wheel of 38 and con-  
sequently all the Ashes work is disjoined  
from the clock and turned separately —  
38 turns 44 - 76, 76 turns 79 - 35 and 35  
29 which produces Syderical time — On the  
opposite end of the center socket is fixed the  
pinion 12 which turns wheel 84 both on the  
outside of the frame — 84 turns 40 - 116 both  
fixed on the same axle - The frame 48 turns center 48

The wheel carries the work hand - The former  
turns wheel 62 with its click and spring  
which takes into the bevel teeth of wheel 31 which  
carries the day of the month - 24.6. The great wheel  
when it is 61 moves on the socket - the wheel 31  
on the other side of the great wheel which moves  
along with it moves 60 below and the wheel 15  
fixed to the axle of 60, which nut moves wheel  
90 which carries the socket with the the year  
hand - The center wheel 44 next 38 moves the  
upper wheel 44, on the opposite end of whose axle  
is a wheel of 18 which moves on wheels of 36 both  
on the upper and lower side of the axis commencing  
with the lower system. 36 moves 84 which turns  
on a fixed stud, on this stud is the fixed pinion  
8 into whose leaves an epicycle wheel of 32  
fixed on the face of the above wheel of 54 takes  
and consequently revolves once for every four re-  
volutions of the wheel 84, on this epicycle wheel  
is a pin which every fourth revolution of 54 moves  
a ratchet of six rays one forward on this axis  
of this is a pinion of 6 which turns wheel 100  
whose axle carries the Century hand. On  
the axle of the wheel 100 is a pinion 6 which  
turns wheel of 48 with the pinion 6 which  
turns wheel of 60 to which is fixed the socket  
which performs one revolution in 8000-  
years -

First, lay the support of  
the platform, perfectly horizontal  
— lay the middle part of the platform  
which contains the connecting rod  
of the globe, first quite horizontal  
then the right and left wings also  
horizontal, and make all fast with  
the twelve large screws —

No 2 Place the Copernican or right  
hand system in its proper situation  
near the left —

N Before the two systems are placed  
fix the clock case which must be  
done first after the laying the plat-  
form — Then No. 2.

Next the right hand platform  
with Copernican system —



Place the pulley with the axis  
 in it in its situation taking care  
 that the pivot of the axis be in  
 the hole, put the cover on the top  
 and screw the meridian on keeping  
 the graduated side on the right hand  
 N.B. The Dress would be better  
 numbered from the equator — this  
 may be done on the other side —  
 Then put the minute and hour hand  
 of the upper dial to 12 and the  
 hour hand of the middle perpendicular  
 consequently to 12 also —  
 Put the wheel on the perpendicular  
 spindle which turns the connecting  
 rod of the globe and place the lower part  
 of this rod spindle in its hole in the

platform, then put the right and  
 left connecting rods thro' the holes  
 in the clock case and adjust the hori-  
 zontal wheel to the spindle to  
 the height of the wheel which drives it  
 by the friction screw, put the pivot  
 of this spindle, and the two connecting  
 rods into the holes of the pinion bent  
 at right angles, and make fast the  
 screws, N.B. when any of the three  
 systems is to be detached the wheel  
 belonging to it in the inside of the  
 clock may be disengaged from its  
 screw — Then on the perpendicular  
 rod which is supported in front with  
 gun bearing put on the weight  
 then attach the ball and set the  
 clock going, hang the small weight

in the Heavens which keeps the clock  
a going during winding up —

Globe

First adjust the Limas and Solar  
system of the Globe for some particu-  
lar Epoch as the Aphet. & Epoch  
for example July first

Sun in Aphet. — first Day July

Moon same Day in July 4741

→ Day's Interval for Progress  
to reduce this to the position of

the moon it is between the 3<sup>d</sup>

and fourth Day, then turn the

first axis which revolves in

13 Days about  $\frac{1}{4}$  of a revolution

from west to East which being

the same Epoch with the Sun —

N. B. Oct. 29 will be a good proper  
Epoch for regulating as the axis

perige and the moon's apogee  
happen on the same day —  
— when the sun and moon are  
reputed take particular care  
to make no change on the first  
~~and~~ socket it may be made fast  
with a screw — Then put on the  
celeptic to correspond with the  
poles of the Equator the same as in  
celestial globe, that is cover on the  
meridian when the pole of the  
celeptic is toward the clock and  
under the meridian — Then put  
on the moon's node, the sun and  
the moon, and the wheel of 106 teeth  
Then fix the globe in the meridian

1. N. The sun moon and Nodes  
are placed to their respective  
longitudes that is for the first of  
July, the quarter revolving the  
mer socket brought the sun and  
moon's motion together —  
Then take off the wheel of 106  
teeth at the lower ~~lower~~ pole  
to prevent any change in the  
sockets — Then bring the sun's  
longitude to the meridian, and  
put the Index to 12 Noon  
in both Dials — Then fix the  
wheel on the perpendicular spindle  
by the friction screw — Then set  
the clock a going and fix the  
screw on the middle Dial —

Then let the clock go <sup>8</sup> one Day  
and observe whether the sun is gain  
on the meridian at 12, making  
allowance for the equation N. 17.  
The motion of the sun is agreeable  
to apparent time. If the sun  
is not on the meridian observe  
the point of the ecliptic on the  
meridian at 12, and consequently  
the difference between that and the  
sun - Suppose  $10^{\circ}$  sun East.  
then raise the upper hand of  
the middle dial and make  
ten revolutions on the dial <sup>forward</sup>  
being nearly equal to the sun's  
motion thro'  $10$  degrees of the ecliptic.

N. B. if the sun is far from the  
meridian just being it may  
by shifting the screw of the proper  
ocular spindle, after which  
adjust as described in the last  
page, in the last mentioned  
sheet <sup>of 24 teeth</sup> one tooth is equal to  
 $\frac{1}{2}$  hour - when the sun  
is brought to correspond with  
apparent time put on the  
wheel of 24 teeth and take  
out the proper screw from the  
first socket - Then regulate  
the copernican system for the  
same epoch i. e. 1<sup>st</sup> July

The Solar System in the same  
epoch, 1<sup>st</sup> July —

1<sup>st</sup> Mercury's Aphelion is  $0^{\circ} 14'$   
put a thread over the sun axis above  
the sun, being the mean axis, the  
axis of <sup>in the axis</sup> Mercury and that of the sun  
to touch the thread which by a small  
weight hangs over the  $0^{\circ} 14'$  on the  
great circle — Then bring the thread  
to the Heliocentric Longi of Mars.

1<sup>st</sup> July  $1^{\circ} 21'$  Then turn Mars  
till his axis correspond with the  
thread laid over the Heliocentric Longi  
for the position Mars, and Mercury  
is regulated — Then move Venus  
and bring her axis to the thread, <sup>and</sup>

11  
over the Heliocentric Longitude of Venus  
 $2^{\circ} 16'$  N. B. as Venus has little excentricity,  
that is not expressed on the ma-  
chine, consequently no regulation is  
wanted for it

Earth. Lay the thread over the  
sun longitude,  $3^{\circ} 10' + 6^{\circ} - 9^{\circ} 10'$   
and bring the earth to the thread  
for the Earth which is not ex-  
pressed in this system.

Mars in Aph<sup>l</sup>  $5^{\circ} 2'$  bring the  
sun, the mean and true axis to  
touch the thread as in Mercury  
Then bring the thread to the Heliocentric  
Longi of Mars  $7^{\circ} 16' 40''$  Then turn  
Mars round till any part of the  
peltor at the eccentric wheel work  
N B. The center of the wheel is the mean axis

12  
until the true axis cut the line  
said as the Helocenter Long. of Quas  
in the foot the same -

Jupiter has two small plates  
of the Ecliptic the undermost shows  
the same shows the eccentricity, and  
the uppermost the ascending node  
of Jupiter's Equator - Being Jupiter  
to the Aphelion ~~at~~  $2^{\circ} 2'$   
 $6^{\circ} 11'$  then as formerly from Jupiter  
to the Helocenter Long. making the  
true axis touch the line. The  
two small Ecliptics are parallel to  
one another and to the great ecliptic  
- this is the situation of all the Ecliptics

note  
and the wire of the planet is the true

13  
Saturn has also two small ecliptics  
the undermost shows the eccentricity  
the uppermost the nodes of the ring  
they are par. both to one another and  
to the great ecliptic - Being Sat-  
to the Aphelion  $9^{\circ} 0'$  then to  
the Helocenter Long. ~~is~~  
 $= 0^{\circ} 24' 47''$

Moon  
First find the nearest opposition or  
conjunction to the Earth = 1<sup>st</sup> July  
This is full moon 4<sup>th</sup> Day at 7<sup>h</sup> 23<sup>m</sup>  
mean. Turn the Hour Index of the  
middle dial 3 revolutions, and  $19^{\text{th}}$   
and about  $\frac{1}{2}$  for the 23 minutes, the  
connecting rod of the system having  
been previously united with the clock  
that is with the machinery turned by

14  
index of the middle Diet Detached  
from the clock which at present is  
standing - Then bring the moon to  
the opposition without moving the earth  
and Copernic's system is finished -

Then calculate the <sup>mean</sup> epochs of the  
opposition or conjunction of the  
planets i.e. Saturn conjunction  
11 April at 4 in the morning. Then  
turn back the clock to correspond  
with the same hour - And Saturn  
will be found a little after his mean  
distance, <sup>by</sup> this position the globe  
must be regulated for Saturn's motions -  
In the system of sheet work for Saturn  
the eccentricity is below and the retro-  
grade motion immediately above it

15  
For the former a pin passes into a  
hole in the wheel below it, and in the  
retrogradation a pin slides in a groove  
The same in Jupiter and Mars -  
When the pin is next the center  
axis ~~of~~ <sup>the</sup> great wheel of 96 teeth  
which represents the center of the  
sun the planet is in perihelion &  
The above wheel produces the  
mean motion of Saturn - above  
this is an arm below which are  
two wheels of 40 teeth which make  
the parallel of the eccentricity  
and above this arm are 3 wheels  
of 24 teeth each the exterior con-  
tains the axis <sup>of a pin</sup> of retrogression and  
The center of Ptolemy's epicycle  
epoch of Vnde De la Lande

16  
 when the retrograde <sup>point</sup> is between  
 and forms a right <sup>angle</sup> with the center  
 of all the three sheets the planet  
 is in conjunction on the opposite  
 side it is in opposition. The up-  
 permost great sheet also exhibits  
 Saturn's mean motion with the  
 eccentricity, <sup>and retrograde</sup> <sup>conseq.</sup> <sup>large motion</sup> it draws an equal sheet  
 on the axis —

— Jupiter Great sheet 89 leath  
 equal to Jupiter mean motion —  
 above are two sheets of 40 leath  
 each — The outer contains the eccentric  
 axis — Above this three sheets of 24  
 leath each, the outer exhibits the  
 retrograde motion <sup>of Jupiter</sup>  
 The uppermost large sheet exhibits

17  
 also Jupiter's motion with his true  
 position, i.e. his apparent motion  
 on the 17<sup>th</sup> April Jupiter is in  
 opposition consequently the true and  
 the seen N.B. the center of the  
 uppermost great sheet in all the  
 systems represents the center of the  
 sun —

— Mars — The first axis below Sat.  
 and Jupiter is Mars —

13 July Mars is ~~at~~  
 at his mean distance —  
 In Mars the eccentricity wheels  
 are on a small arm on one side,  
 and the retrograde app. <sup>motion</sup> on a long  
 arm on the other, being the true  
 axis at right angles, to the east



The teeth of the wheel may be <sup>dis-</sup> <sup>miss</sup>  
engaged without taking out any <sup>part</sup>  
only by gently pressing up the wheel

Plan of operation 13 March  
at 12 at night, turn the  
machinery by the index of the  
middle dial, or a watch applied  
to the axis till the clock point  
out the above line, then press  
gently on the Retrograde arm of  
mass, take the small pin out  
of the axis of the middle of the <sup>of a scale 36</sup>  
wheel and turn the outer wheel  
till the outer wheel-pin is between  
the center of the great wheel and the  
axis of the globe, this brings mass

To the opposite —

Mercury - Inferior 15 May  
Superior 27 March

In the two inferior planets the  
inferior conjunction is the pin is  
external to the axis of the great wheel  
which represents the sun and the  
retrograde conjunction when it is on the  
other side is a straight line in  
both cases — The contrary of the  
superior planets —

Appetition 22 May  
Bring the mean axis the eccentric  
axis or pin and the center of the  
great wheel or sun in one line  
the pin at the greatest distance  
from the sun

Then turn the Chronometer to  
27 March and rectify for the superior  
conjunction —

Venus Superior Conjunction  
Aug! 5<sup>H</sup>. 15 after noon Turn  
the clock to the time and rectify  
for the superior conjunction by  
bringing the pin on the outside  
the center of the wheel or screw  
and the axis of the center is one  
right line — As Venus has but  
scarcely Phase it is not set  
in the chart work.

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Adjustment of the sun and the  
 the same apparatus as in the  
 other planets - That in the eccentric  
 the mean axis and axis of the globe  
 in one right line, the true axis between  
 the sun and earth is perpendicular -  
 and in the opposite the reverse -

After the clock has given some  
 line observe when the conjunction  
 is opposite correspond with the  
 time and place in the ecliptic  
 of these be any difference observe  
 the position of the surface of the  
 planet which turns to its position  
 for the time - In Mercury if two  
 conjunctions happen on the same side  
 and at the same distance for the sun  
 bring the planet to the sun, but

of the first conjunction be at a Distance  
 and the other on the same move the  
 sun half way and Mercury the other  
 half till they correspond - if the  
 conjunction happens on different sides  
 if equal bring Mercury to the sun  
 if unequal suppose 3 : 0 2

The  $3 + 2 = 5 \frac{5}{2} = 2 \frac{1}{2}$  move the sun  
 half a degree towards the west and bring  
 Mercury to him -

When the globe is erected for the  
 point of Jan<sup>9<sup>th</sup></sup> bring the pole of  
 the ecliptic to to the south of the  
 pole of the world under the meridian



in order to discover whether there be  
any change of relative position between  
the ~~clock~~<sup>system</sup> and Chronometer - This will  
be discovered in 24 hours —

6. Let the Satellite, or left hand  
system be treated precisely in the  
same manner — 30 year Reset<sup>n</sup>

7. To move the Molar or third  
system it must be connected with  
the Chronometer, the Astronomical  
part of which may be disjoined  
from the Clock, by taking out the  
screw in the upper end of the  
center Dial. Apply a wire to  
the arbor of the center Dial, and  
with this turn the Globe. As  
the other two systems have been  
already proved, it is unnecessary

to stop the motion of these systems  
by that of theirs. They may therefore  
be detached from the Chronometer  
and the Clock either stopped or allowed  
to go on. — Let the Globe not be  
turned = 30 years — Great care must  
be taken not to move the globe  
too fast or to stop suddenly, for any  
unexpected resistance in the form  
core and the centrifugal force of the  
Globe in the latter, would endanger  
the breaking of the teeth of the more  
delicate wheels —

Q Let all the three Systems be now  
attached to the Chronometer —

N.B. The above motions ~~will~~  
particularly the latter will require  
a considerable <sup>time</sup>, but they appear

absolutely necessary in order <sup>to me</sup> ~~to~~  
with regard to the future motions of  
of Manutarium —

9. Let the Clock be now accurately  
adjusted to mean time, either by the  
Sun's transit over the meridian or  
the occultations of the fixed stars —  
— all the Systems corrected —

10. Adjustment of the Systems —  
Following Elements are necessary

- 1. Aphelium of each Planet
- 2. Perihelion of <sup>its</sup> orbit
- 3. Longitude of the node <sup>ascending</sup>
- 4. Heliocentric Longitude
- 5. Geocentric Distance
- 6. Apogee & Perigee of the Sun
- 7. Distance of the Moon
- 8. Equatorial node of each Planet
- 9. Conjunctions of the inferior planets
- 10. Conjunction & opposition of the Superior

11. Longitude and Latitude of three or four fixed stars —
12. Table of these stars passage over the
13. Ditto for the moon
14. Table of the rising and setting of the sun and moon
15. Ditto of the planets
16. Ditto of Jupiter and Saturne Jettels

11. Ditch on some Epoch for which the whole machinery must be adjust calculate the Elements for that Epoch — in the present case for the 1<sup>st</sup> of <sup>Jan</sup> 1793 — begin with the Copernican System —

12. The Copernican System exhibits the motions of the Planets Mars Venus, Earth, <sup>many</sup> Jupiter and Saturn round the Sun and that of the moon round the earth — The orbits have the same eccentricity as in the heavens — This is effected in a simple and elegant manner by a small Epicycle the radius of which is = Eccentricity, moving round the circumference of the circular orbit — The Idea is borrowed from DeLomys' Astronomer — and of the axes accurately exhibited on the machine — Parallelogram — here the proportional distances & proportional magnitudes — except the sun are preserved —

— Semi magnitude is 12 inches for the  
system —  
— Trans of wheel work not 1° in 100 years



Section

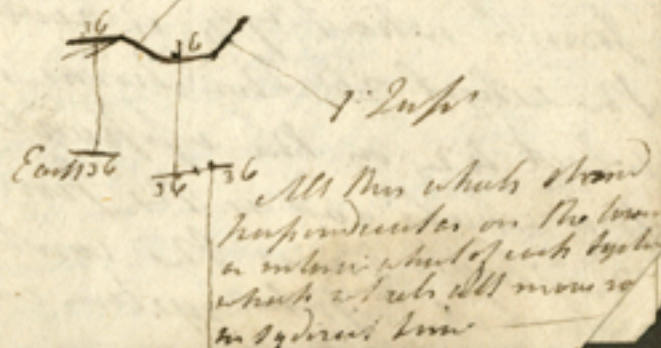
Solium Sylla

town wheel = 40 turned in  
 Hydant ton - the second wheel  
 63 + put on the same axle  
 according to the number  
 to the position of the letters  
 - The wheel 24 which has  
 its number from J. J. J. J.  
 50, turn 40 which is  
 found on the great book  
 and carries the pump  
 with Solium Annua  
 note - the first wheel 63  
 is found to the book and  
 the number of 10-29, 14-57  
 given 13 number the same  
 note of the work -

The middle wheel 3, 65 is  
 turned by the gear 65. The  
 wheel 61 above is fixed on the  
 same axle with the preceding  
 This turns both wheels of each  
 on either side one preserves  
 the parallelism of Saturn's  
 equator, the other effect of  
 the eccentric frame -

In Jupiter's system the  
 contrate wheel 59, 1st and  
 horizontal the teeth look  
 and the wheel 24 above it  
 are both fixed to the same  
 socket which turns on the  
 fixed stud the pinion <sup>12</sup> drives the  
 contrate wheel and consequently the  
 wheel 24 which drives the wheel 54

fixed to Jupiter's great socket. This  
 produces Jupiter's annual motion  
 The central wheel 69 is fixed to the  
 top of the great socket it produces  
 the parallax of the Equant's System  
 on the left end on the right the  
 annual motion of the earth with  
 the parallelism of Jupiter's Equator  
 similar to that of Saturn - The lower  
 wheel of Jupiter = 36 turns in 24  
 time by another of 36 - This one of the  
 four wheels of 36 at the center -  
 The fine wheel on the connecting rod  
 36, turns another 36 This one of the  
 4 of 36 at the <sup>36</sup> end



System of the Earth

The wheel 2 comes from the center  
36 turns the wheel interior, = 36  
in several times. Interior wheel  
has another = 36 on the opposite  
on whose axis is a pin & this  
turns 25, and this another wheel of  
25 on whose axis and close to it is  
a pin of 7 which turns the  
wheel 59 on whose axis is the  
pin of which turns the wheel  
73, fixed to the great socket &  
which produces the annual  
motion of the earth. To the  
former wheel 73 is revolved  
the wheel 38 this turns the  
wheel 42, on the opposite and  
this wheel's axis is the pin  
which turns the whole  
set of Jupiter's system as

formerly mentioned. The pin  
which turns the wheel of Jovis to  
the same axis and consequently  
the wheel 37 revolved to the former  
this last turns the wheel 60 on  
whose axis is the pin of this  
turns the wheel 77 on the top  
of the axis of this is 23 turning  
25 and producing the semi-rotation  
— The central wheel formerly  
mentioned = 60 moves another wheel  
= 60 this or third wheel = 60 on the  
top of whose axis is the wheel 14  
fixed. This turns the three wheels  
71, 40, 40, applied to the middle  
wheel 40. The uppermost 40 turns  
the former 14 <sup>in length</sup> supported on the  
half bridge on the top of which is  
fixed 20, turning 20 = rotation of  
the earth. The lowermost wheel of the  
two mentioned = 57 turns the

wheel 46 on the axis of which at the  
 top is a joint of 6 leaves. This turns  
 the wheel = 74 which carries the socket  
 and frame with the moon's wheel work  
 round in a month — On the top  
 of the lower great socket is fixed  
 the wheel 90 this gives motion to  
 26 <sup>90</sup> consequently on the top of whose  
 axis is fixed = 60 which moves 60  
 fixed to the great socket which produces  
 the parallel of the upper frame &  
 consequently of the earth's axis —  
 — The last mentioned 90 gives motion  
 to 46 and consequently to 24 fixed  
 to it 24 to 23 and consequently to 24 fixed  
 to it this last moves 29 with the socket  
 and consequently effects the part of the sun  
 axis —  
 — The wheel 53 is fixed on the socket of  
 the wheel 60 at the bottom and this gives  
 motion to the moon's nodes —

This wheel of 53 gives motion to 23  
 and consequently to 23 and 24 all  
 fixed on the same axis — The 23  
 moves 53 this carries the inclined plane  
 of the moon's orbit. The upper end of  
 the 23 which = 24 moves 56 in which  
 the axis of the moon's orbit,  
 is fixed <sup>the center</sup> the top end of fixed to the axis and  
 sliding on the rim of the lower end  
 fixed in the wheel 56. The lower end  
 of the moon's axis moves and rises  
 and falls on the inclined plane  
 — Jupiter's system of the satellites  
 35 moves 87 <sup>56</sup> this last 61-67  
 which carries the 1<sup>st</sup> satellite — 67  
 moves 61-83 this last 89-94 = 2<sup>nd</sup> sat.  
 94 moves 21-21 this last 97-60 = 3<sup>rd</sup> sat.  
 60 moves 53-21 this last 61, 4<sup>th</sup> satellite

Jovian System

Lower wheel of 40 turns in 24 and  
 1/2 time - Wheel 2. of 65 turns 3. of 65  
 and this 4. 65 on the top of a whole or  
 2 is the wheel of 36 which turns 3 1/2  
 9 on a how cable to find 30 this turns  
 80 on the top of this cable the satellite  
 7 period of 10 - The wheel  
 4 wheel has its motion from  
 Jupiter 36, turns 40 which is fixed  
 to the great socket and consequently  
 carries the prime with saturnus on  
 6 great motion - The first wheel 65  
 is fixed to the <sup>inner</sup> socket which is im-  
 5 movable and this the measure  
 of 10-29, 14-57 and period 15 produce  
 the an. m. of the Earth - From the  
 4 fixed wheel 65 is turned the lower  
 middle 65, top of how cable is fixed  
 3 to this turns 61 on both sides on the  
 2 doz. of Saturn Eclipse the other that of  
 1 the Earth from. In Jupiter Cycle the  
 12 from the earth turns wheel 57-2  
 - this last 54 - great socket -