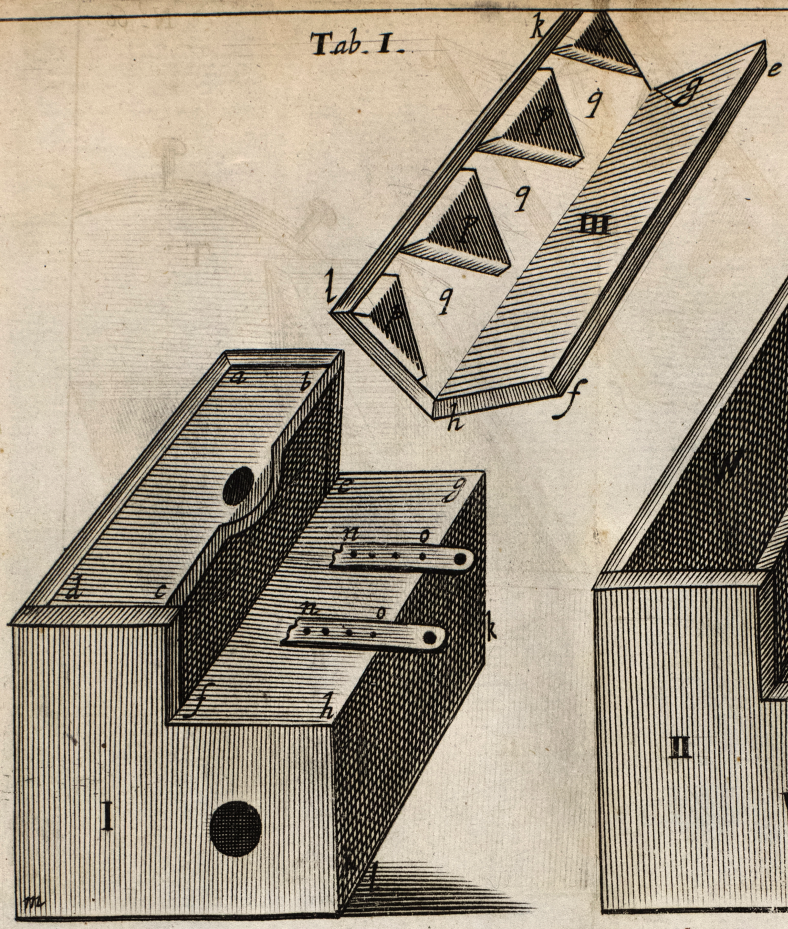

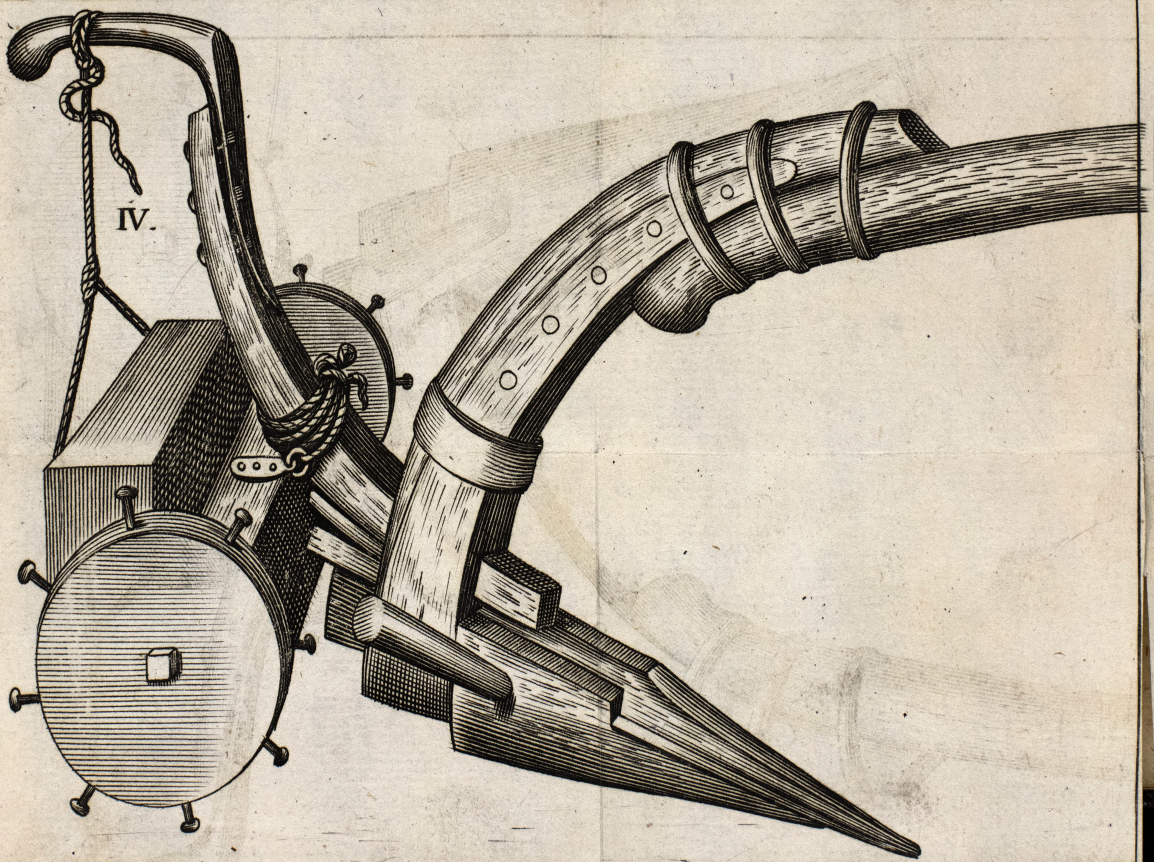

PHILOSOPHICAL TRANSACTIONS.

June 20. 1670.

The CONTENTS.

A Letter of John Evelyn *Esq;, to the Right Honourable the Lord Viscount* Brouncker, *Chancellor to her Majesty and President to the* R. Society *&c. Concerning the Spanish* Sembrador *or New Engin for Ploughing, and Equal Sowing all*

sorts of Grain, and Harrowing, at once; By which a great quantity of Seed-corn is saved, and a rich increase yearly gained; together with a Description of the Contrivance and Uses of this Engin, Englisht out of Spanish, *and lately presented to the* R. Society.

My LORD,

I Cannot devise better how to express my great respects to your Lordship, than by my utmost endeavors to promote the Interest of that *Society*, over which you have so long, with so much ability and affection, and so faithfully Presided. *This* therefore will plead my excuse with your Lordship, if in some confidence of gratifying the generous designes of that Noble Assembly, I communicate to them, through your hands, not only the *Instrument*, (which I herewith present them) but the Description of the *Use* and *Benefit* of it from such a *Deferent*, as I am sure they will very highly value. My Lord, it is now almost two years since, that (by somewhat an odd accident) lighting upon a paper lately printed in *Spanish*, I found a short passage in it, giving notice of a certain *Plough* newly brought out of *Germany* into *Spain*; in both which places it had (upon *Tryal*) so generally obtain'd, as (besides the *Royal Priviledg*, which was granted to the Inventor) to procure the Universal Approbation. Upon this hint, I took the boldness to write to My Lord Ambassador, intreating his Excelly, that, as his more weighty affairs would give him leave, he would not disdain to inform himself more particularly concerning it. *This* his Lordship was not only pleas'd to do, but so highly obliging, as to transmit to me the Engin it self, together with a full Description of it, and its use: All of it written with his own noble Hand, which I do here consecrate to the R. Society, to be inserted among their precious *Cimelia*.

My Lord, being not so happy, as to wait on you my self with it at your publick Assembly this day, I desire, your Lordship will cause these Papers to be read there, and expose the Instrument to their Examination and Tryal. There are many Gentle-

Gentlemen, who will not be offended with these *Rusticities*, and who know, how highly such *Inventions*, and even *Attempts* have been valued by the greatest and the best of Men. Something (tis possible) may happen to be out of order, by reason of the long Journey it hath passed; but their Ingenious *Curator* will soon be able to reform, and, if need be, improve it. My Lord of *Sandwich* is that Illustrious Person, to whom the *Society* is obliged for this, and many other Favors, and Productions of his own more consummate *Genius*, which enrich their Registers. But, let me tell them, his Lordship hath made, and brought home with him, such other polite Notices and Particulars of *Spain*, and other Forrain Parts, as I know no Person of the most refin'd and publick Spirit, who hath approached him, besides your Lordship: An Emulons and Worthy Example certainly to the rest of our *Noblemen*, and *Ministers* of *State* abroad, who may travel with so many Advantages to inform themselves above Others: And it is to me a shining Instance of both your Lordships happy *Talents*, and great *Comprehension*, that in the throng of so many and so weighty Employments, you can think of Cultivating the *Arts*, and of doubly obliging your Country. How do such *Persons* enamel their *Characters*, and adorne their *Titles* with lasting and permanent honors! This Testimony of my Just Veneration to both your Lordships I could not, upon this Occasion, but superadd, who am

Says-Court
23. *Febr.* 16$\frac{6}{7}$.

My Lord
Your Lordships most humble, most devoted and most obedient Servant

J. Evelyn.

Follows now the Extract of the Description of this Sembrador, *publish't by Don* Joseph Lucatelo *Knight, of the Province of* Carinthia, *a Subject of the* House of Austria, *Inventor of the Engin, Dedicated to Signor Don* Geronimo de Camargo, *Councellor of the* Consejo Real de Castilla, *and of the* Hazienda Real, *and by Commission of his Catholick Majesty made Judge* Protector *and* Conservador, *for the better Distribution, and Direction of the use of the said Instrument.*

After the *Inventor* had in the Dedication appeal'd to Don *Geronimo de Camargo* as an Experimental Judge and Eye-witneſs of the Performances of this Inſtrument, and taken occaſion to celebrate the happineſs of the latter Ages upon the account of the *Inventions* of many Excellent things, as the Uſe of the Loadſtone; Gun-powder; Great Ordinance; Printing; the Ordering of Quickſilver to ſeparate the nobler from the baſer Metals; the Perfecting of Watches by Pendulums; and many more: After this, I ſay, it is repreſented,

Firſt, That both the Ancient and Modern Husbandmen have agreed, that the Perfection of Agriculture conſiſted in ſetting the Plants in proportionable ſpaces, and giving ſufficient depth to the Roots, that they may ſpread enough, to receive that nouriſhment from the ground, which is neceſſary to produce and ripen the fruit: For which reaſon we ſee, that Plants are ſet in rowes by rule and meaſure, as the Vine, Olive-trees, and other Fruit-Trees; and in Gardens, the Herbs, and Flowres are planted and ſow'd with ſome order and diſtinction, ſo that their over-nearneſs and the confuſion of their Plantation may not hinder their growth.

Secondly, That care hath not been had in the practice of this important part of Husbandry, ſince even at this day all ſorts of Seeds, of Corn and Grain, are ſown by handfuls, throwing them out by aime, heedleſly and by chance (counting it too tedious and chargeable to ſet them one by one in large fields;) whence we ſee Corn ſow'd in ſome places too thick, in others too thin, and the greater part of it not cover'd, nor deep enough, whereby it is not only expos'd to be eaten by Birds, but alſo, in Cold Countrys, to be ſpoyled by Froſt, and in Hot Regions, by the Sun.

Thirdly, That, upon theſe Conſiderations, He (D. *Joſeph de Lucatello*) hath, ſome years ſince, given himſelf to invent an Inſtrument, which with great eaſe, and with litle charge or trouble, ſets grain in order and proportion, for the ſparing a great quantity of Seed-corn, and enriching the Crop: And that after much Experience he hath perfected and reduced unto practice thoſe *idea*'s, producing an Inſtrument, which being faſtn'd to the Plough, at once Ploughes, Soweth, and Har-

Harrows, whereby is saved the labor of the Seeds-man, and the grain falling in order, and in the bottom of the furrow, all of it remains in one and the same distance under ground, so that of five parts of seed, four parts are saved, and then in the Crop is gain'd incredible abundance.

Thirdly, That the Inventor having obtain'd a thing so beneficial to Mankind, thought it reasonable to communicate it to the World under the Patronage of one of its Greatest Monarchs; and so presented it at the feet of his *Catholick Majesty*, who received the Propcsition, and caused trial to be made thereof in the *Buen Retiro*, where it did answer expectation, notwithstanding the drought of the year, then much damnifying all Corn; an ordinary Husbandman from a measur'd space of ground there, sow'd in the common manner, reaping 5|125; where he, by his contrivance, from an equal space of ground there also, reaped 8|175; besides the seed saved in the sowing.

Fourthly, That thereupon his said *Catholick Majesty* did grant to the Inventor the Priviledge, That he only and his Assignes may make and distribute these Instruments in all the Kingdoms and Provinces of that Monarchy *in Europe*, at the price of 24 *Rials Plate*, each, and *out of Europe*, 32 *Rials Plate*; of which the fifth part should be paid to the King; prohibiting also to all, that have not the leave of the Inventor or of persons authorised by him, the making of this Instrument, under the penalty of 1000 *Escud. d'oro*, to those that are able to pay it, and to others, that are unable, other punishment equivalent thereunto: And not only those, that make it, but such also, as buy and use it, are lyable to the same penalties, which are to be divided into three parts, $\frac{1}{3}$ to the *Camera*, $\frac{1}{3}$ to the Judge, and $\frac{1}{3}$ to the Informer.

Fifthly, That for the better Execution hereof, and provision in all Cases that may happen for the introduction and Conservation of this Instrument, his Catholick Majesty hath nominated *D. Geronimo de Camargo*, for Judge *Conservador*, with full power to depute such persons, as he shall think fit, within and without *Spain*, for the exercise of his Authority, and for receiving his Majesties due upon this Licence.

Sixthly,

Sixthly, That before the *Inventor* came to the Court of *Spain*, he made divers Tryals in his own Country, wherein he succeeded according to wish; and thereupon made the great tryal of this Engin before his present Imperial Majesty, in the fields of *Luxembourg* in *Austria*, where the land usually yields four or five fold; but the Crop from the ground sow'd with this Instrument was *sixty* fold, as appears by a Certificate given in *Vienna Aug.* 1. 1663. st. n. by an Officer of the Emperor, appointed to see the said ground sowed and reaped: which Certificate was thought needless to insert here *verbatim*.

Seventhly, That this Priviledge being dispatch't and the Seed-time then approaching, he (the *Inventor*) forthwith publisht his Contrivance, and Instructions, as follows;

1. There is a Box of Wood, having a Cylinder or Roler passing at each end into two wheels, set about with strong nails, and divided into three equal parts, surrounded upon the lines of division with litle Bras-spoons. equally distant from one another, so as each of them in one row is posited over against the middle of the oppofite interstice of the other row; which Spoons in the turning of the Instrument take up, each, one single grain at a time, and throw it out at certain holes, into the ploughed ground. The parts of it are these: In the first *Plate*, representing this *Sembrador*, *Fig* I. shows the Intire *Box* without the Wheels; *a b c d* the cover of that part, where the Corn is put in, which is open in *Fig.* I. at W. And *e f h g k l*. the two sides which cover that part of the Box, where the Cylinder, which is stuck round with three rows of litle spoons, is moved about to throw out the Corn; which sides are taken off in *Fig.* 2. to make the Cylinder RS with the Spoons *x x x* appear: the inner shape of which sides is expres'd in *Fig.* 3; where may be seeen the four Triangular pieces *p p p p*, leaving Triangular interstices *q q q*, which serve to conveigh the Corn carryed up in the Spoons, and discharged at the top of the Cylinder, so as they may just run out at the holes underneath the Box, the parts of which answer to the parts of the first *Figure* according to the letter. T. is one of the Wheels; V, the other end of the Cylinder, upon which the other wheel is to be placed.

2. This *Sembrador* must be tyed fast to the Plough, in the man-

manner as is seen in *Fig.* 4; so that the Corn may fall in the furrow, and, at the turning of the Plough, the Ears of the Plough may cover the Corn of the last furrow with earth.

3. Because the Seed sow'd by this *Instrument*, is plac'd in a convenient depth, *viz.* in the bottom of the furrow, whereas the seed scattered the comon way remains nearer the superficies of the Earth, or quite uncovered, therefore it must needs shoot forth somewhat later; so that it is requisite, the Husbandman, using this Instrument, should sow 8 or 10 days sooner than the accustom'd Seed-time (that the Corn may sprout forth on the face of the Earth in convenient time) and make an end of sowing with the same as many days before others; *viz.* beginning to sow in the midle of *September*, and making an end at the midle of *November*.

4. In stiff ground the furrows ought to be 5 or 6 inches deep; in middle sort of ground, 6 or 7; and in light and sandy ground, 7 or 8 inches; and according to this proportion the husbandman must govern himself deepning or showling the Plough, as the condition of the land shall require.

5. Especial care must be had, that the Wheels of the side of the Instrument do always turne round, and never drag along without turning; as also, that the Ears of the Plough be made somewhat bigger then the ordinary ones.

6. 'Tis also convenient, that the Seed be well sifted and clean'd, that so the litle Spoons may every time take up a grain, and the Seed be the better distributed.

7. In *Barley* 'tis to be well observed, that it be made clean in that manner that the straw and beards be broken off as near the grain as may be, that so they hinder not the issuing of the grain out of the Instrument.

8. After Seeds-time done, furrows must be made to drain the land of water, according to the use of each Country, without doing any thing more extraordinary, until the Harvest.

This Instrument and these Instructions being thus made publick, many persons, expecting great benefit from it in Husbandry, came to *Madrid* A. 1664. to buy this Instrument at the price of three *Rials of 8. Plate*; which then seemed a rate proportionable for the charge of making the Instrument, and the Inven-

Inventors gain. And ſo they made tryal in many parts of *Spain*, where they found the truth of what was promiſed by the Inventor, and diſcovered no other defect of the Inſtrument, than the ſlightneſs thereof, and its not being durable enough. To remedy which inconvenience, *Don Geronimo de Gamargo* was perſonally to view ſome grounds near *Madrid* ſowed by this Inſtrument, the better to inform his Majeſty of the Condition and ſucceſs of them, and how it was neceſſary ſomewhat to increaſe the price of the Inſtrument, that it might be made ſtronger and more durable. And His Majeſty was pleaſed to add one piece of 8. to the former price; whereby the Inſtrument is notably improved and bettered; the little Spoons, which at firſt were of Tin, are now of Braſs, and bigger than before, and more in number: The Wheels alſo are made bigger, and more ſubſtantial, and the Iron-plates likewiſe, together with the Nails of the Wheels, and Clouts of Iron and Rings of Braſs, to ſave the Axel-trees from wearing.

And that the Husbandman may the more underſtandingly uſe hereafter this *Sembrador*, and with greater eaſe, here are added more large *Inſtructions* than thoſe, that were publiſht the laſt year.

Larger Inſtructions for the Uſe of the New Sembrador.

1. Before they ſow the ground, they muſt give it ſo many tilths as is accuſtomed in that Country where the Land lyeth; concerning which tis needleſs to enlarge, ſince every ploughman knows it to be one of the fundamental rules for having a good Crop, to plough the ground three or four times, thereby to reduce the Land into mould, to kill and p uck out the weeds, and to break the clods.

2. When they go about to ſow, the Ploughman muſt begin to open a furrow with the Plough for one or two paces, and when the Plough is well in the ground in a convenient depth, then they muſt tye the *Sembrador* to the Plough-beam (as was mentioned above in the ſhorter Inſtructions,) ſo that the wheels and the nails in them ſtand upon the ground, and the bindings of the rings muſt be very hard, and in the manner expreſſed in the *Picture*: So ſhall the wheels move always, and the Inſtrumennt not reel, but move equally, whereby it will ſow with better

better order and proportion: And this very ſtrong tying it to the Plough, ſo that it may not wreſt any way, will alſo make it ſow with the ſame order and equality over Hills, as alſo over rough uneven grounds, as over the ſmootheſt.

3. The Ears of the Plough are to be made larger, than hitherto; whence two advantages will ariſe: 1. It will better cover the furrows when ſown; and make wider furrows to receive the ſeed, when they do ſow. 2. Thoſe larger Ears will prevent the blows, the great Clods and Stones will give the *Sembrador* (if the Clods be not broken, and the Stones pick't out.) But when there are ſuch great Stones in the Land, as the Plough cannot penetrate, then the Plough-man by lifting up his plough muſt paſs over it, until he meets with mould again; and ſo muſt the *Sembrador* alſo be lifted up, the weight thereof being but very little, and no conſiderable trouble to the Plough-man.

4. When the Clodds and Stones cannot be maſter'd with only one pair of Ears, you muſt add another pair of them to the Plough, four or five inches higher than the firſt (chuſing a fit place in the beam to place them in,) although behind the others a little; for ſo the *Sembrador* will be perfectly ſaved and defended. And the ſecond Ears are to be of the ſame bigneſs with the firſt. And this is found by Experience to be the beſt remedy againſt the Stones and Clodds.

5. The Time of Sowing, according to the moſt experienced Farmers, is, when the mould of the Land is dry, or but a little inclining to moiſture: In either of which conditions of the Land, this new *Sembrador* works without clogging the wheels, or ſtopping up with dirt thoſe holes, through which the grain is to iſſue forth. And to ſow land, when 'tis dirty and full of water, is very hurtful to the Farmer, who then looſes his Seed, and the pains of tilling, and the Crop. And this *Sembrador* may ſerve for a means to try, *when* the Land is in good temper to be ſown, *viz.* when the wheels of the Inſtrument will move equally, and without hindrance or clogging with dirt. And when the wheels will not turn round becauſe of the clay and over-much moiſture, it is a ſigne, that 'tis not fit for cultivation, until it ungive and be dry.

6. When 'tis time to sow, the Corn must be very well clean'd, and especially the Barley, as was noted in the former Instructions.

7. To know, when this *Sembrador* works best and most equally, you are to observe the quantity of Seed it sows upon an *Hanega* * or half an *Hanega* of Land: for if it work as it ought to do, it will sow three *Celamines* of Wheat (a little more or less) and five *Celamines* of Barley in every *Hanega* of Land. And if it much exceed or fail of this proportion, it noteth some fault in the Instrument, or careleſsneſs in the Plough-man; which is very easy to discover, especially from any impediment in the wheels, which ought always to turn round, and not to drag, becauſe upon their motion the Sowing wholly depends; and without it there will not one grain be sowen.

* Hanega *is as much Land, (by the information of Inquisitive Travellors in* Spain*) as will take about* 1 ½ *buſhel of Engliſh meaſure, after the common way of ſowing.*

A Celamine *is about* $\frac{1}{12}$ *part of an Engliſh buſhel.*

And this care and observation must be in all other Seeds, proportionably to their bigneſs; noting that for the bigger sort of Seeds, such as are *Garavancas* (or Rounſifals) *Lupins* and other such like, there must be *Sembradors* made with bigger Spoons; as there are to be made others with leſſer Spoons for the sowing of *Rye*, *Millet*, and other leſſer Seeds.

8. How to manage the *Plough* in stiff or light ground, was noted in No. 3. of the former *Inſtructions*.

9. When you sow, you must plough the furrows very close one to another; that so the Plough, when it turns back, may the better cover the last furrow, which is left open, and sow'd as it came along.

10. The Plough-beam and Plough tail are to be governed straight, without wrinching any way, that so the *Sembrador* may follow straight, and without going awry, and sow the grain in better order.

11. After having sown the Land in the said manner, the Land should be made as plain as can be, and no such furrows made to carry away the water, as hitherto hath been used; but it will be sufficient, that at every four yards distance (one from the other

other) furrows be made: For, Experience hath taught us, that the Land laid up without furrows bears more Corn, than that which hath more furrows; becauſe the Wheat and Barley, and other Plants receive greateſt damage by drought: And therefore this ought more eſpecially to be obſerved in *Spain*, one of the dryeſt Country of *Europe*.

12. In many parts of *Spain* in 1664. it was found, that Land ſown in *September* hath yielded a better Crop, then that which was ſow'd in *October*; and that ſown in *October*, better than that ſown in *November*: Which proveth, that 'tis more advantagious to ſow early, then late.

13. They have obſerv'd alſo, That it is very profitable to ſow in the *New Moon*, becauſe it will ſhoot forth, and thrive, and ripen ſooner. This is underſtood for thoſe, who till but a little Land, and ſo can chuſe their own time to ſow; but thoſe that plough great quantities, can loſe no time nor ſeaſon in ſowing. And in *Spain* they may begin the firſt *New Moon* in *September*, and ſo go on, and end with the *New Moon* in *November*. And in *Italy* they may do in the ſame manner, as alſo in the Iſlands of the *Mediterranean*. But in *Germany* and the *Low Countries*, they begin in the end of *Auguſt*, and end with the *New Moon* of *October*.

So far this Account. If any deſire to ſee this *Inſtrument*, he may inquire for the *Curator* of the *R. Society* (Mr. Hook,) or for their *Operator* Mr. *Shortgrave*, in *Greſham Colledg*, *the latter of whom will alſo, in all likelyhood, be ready to provide the Engin itſelf for thoſe, who ſhall pleaſe to make uſe of it.*

An Account of the Obſervation, made by the Philoſophical Academy at Paris, May 12 1667. *about* 9. *of the Clock in the morning, of an* Halo *or Circle about the Sun; together with a Diſcourſe of M.* Hugens de Zulechem, *concerning the Cauſe of theſe Meteors, as alſo that of* Parelia's *or Mock-Suns. Engliſhed out of* French *by the Publiſher, to whom it was ſent but lately from the worthy Author of the ſaid Diſcourſe.*

THe Diameter of this Circle, which was exactly obſerv'd, was found to be of 44 degrees, and the breadth of the Limb thereof, of about half a degree. The upper and lower part were of a vivid redd and Jellow, with a little purple-co-