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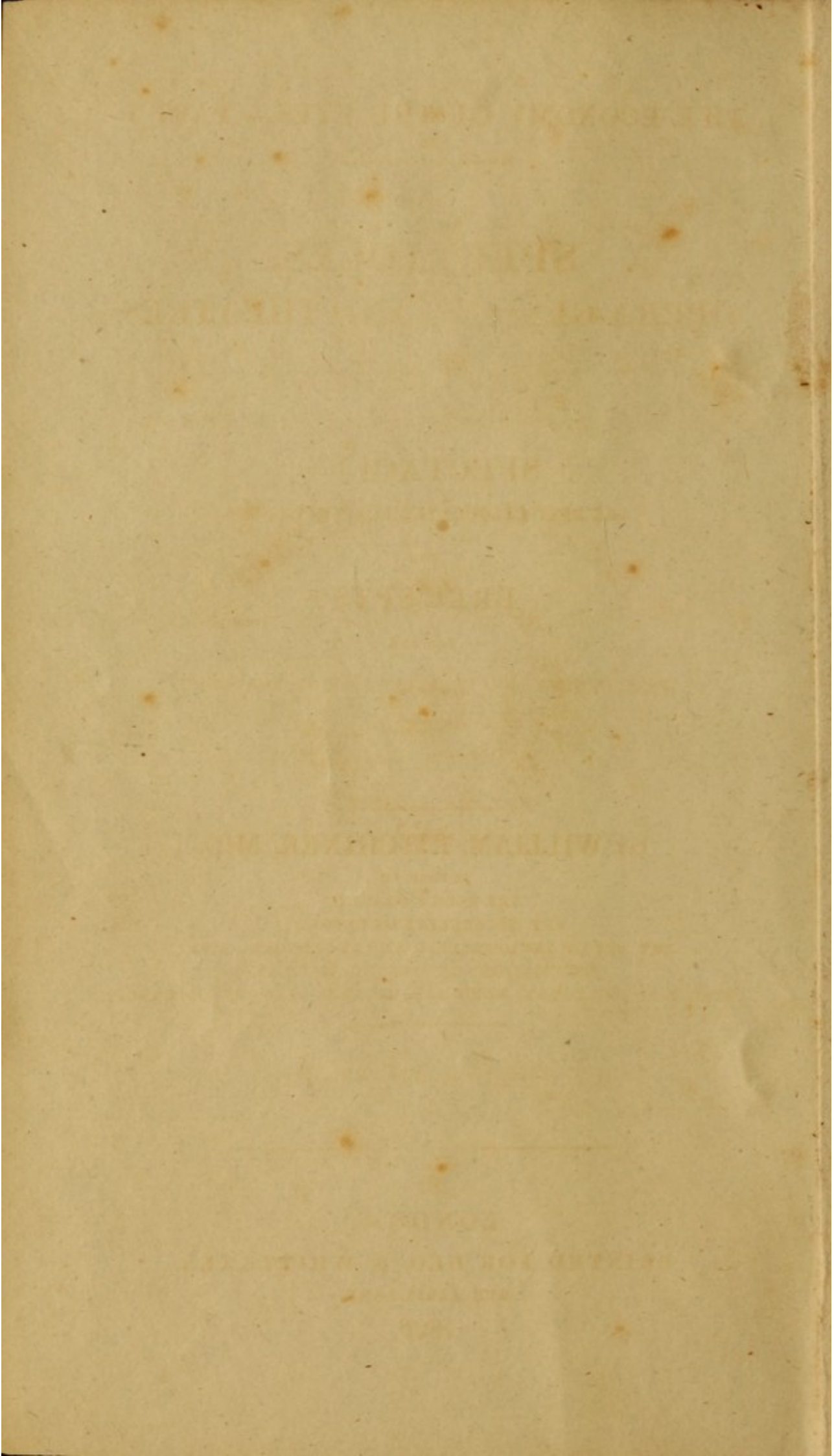
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THE ECONOMY OF THE EYES.—PART I.

OF

**SPECTACLES,
OPERA-GLASSES, AND THEATRES:**

PLAIN RULES,

WHICH WILL ENABLE ALL TO JUDGE EXACTLY WHEN AND WHAT

SPECTACLES

ARE BEST CALCULATED FOR THEIR EYES

AND

PRECEPTS

FOR THE

IMPROVEMENT AND PRESERVATION OF THE SIGHT.

“ Qui Visum, Vitam dat.”

BY WILLIAM KITCHINER, M.D.

AUTHOR OF

THE COOK'S ORACLE;

THE HOUSEKEEPER'S LEDGER;

THE ART OF INVIGORATING AND PROLONGING LIFE;

OBSERVATIONS ON SINGING, &c.; AND

EDITOR OF THE LOYAL, NATIONAL, AND SEA SONGS OF ENGLAND.

SECOND EDITION.

LONDON:

PRINTED FOR GEO. B. WHITTAKER,

AVE-MARIA LANE.

1826.

Just published, in 12mo. price 9s. Boards,
THE SECOND PART
OF
THE ECONOMY OF THE EYES.

OF
TELESCOPES;
BEING
THE RESULT OF THIRTY YEARS' EXPERIMENTS
WITH
FIFTY-ONE TELESCOPES,
OF FROM ONE TO NINE INCHES IN DIAMETER,
IN THE POSSESSION OF
WILLIAM KITCHINER, M.D.

TO WHICH ARE ADDED,
An Abstract of the Practical Parts of
SIR WM. HERSCHEL'S
Writings on Telescopes and Double Stars, &c. ; some Observations
thereon, and Original Letters from
EMINENT OPTICIANS.

LONDON :
PRINTED BY J. MOYES, BOUVERIE STREET.

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PREFACE.

TO BE READ AFTER THE WORK.

Now, friendly Reader, before I take leave of You—after Your deliberate perusal of this Volume,—if You vote that my labour has been lost, or has afforded you so little pleasure, that you begin to think You would rather have your Seven Shillings in your pocket again, than this first part of “*the Economy of the Eyes*” under your Chin,—allow me to suggest, that You ought to *Lend* it to every body you know—to prevent others being decoyed, as in such case You will suppose you have been to buy a Book which is not worth reading.

But if it so happen that fortunately for the Writer, You think that you have derived as much Amusement or Instruction from his work as you expected,—if You are so good as to wish to be grateful for the Information

which it has given you—LEND IT NOT to one of those prudent folks who are in the habit of borrowing your new Books, and so contrive to become wise at your expense,—but do the Author the favour to recommend all your friends to purchase it.

SECOND EDITION.

The Author has heard no objection against this work from any Oculist, or Optician, excepting One, who, when he requested his opinion of it, said,

O. “Why, Sir, I think that you have done exactly the contrary of what you ought to have done:—Why did not you write in learned scientific terms?—Why, your Book will soon make all the World as Wise about *Spectacles and Opera Glasses* as I am Myself!!!”

This is the very thing that the Author endeavoured to accomplish — Let Truths interesting to All, be told in terms intelligible to All.

INTRODUCTION.

GENERAL OBSERVATIONS ON SPECTACLES.

WITHOUT SPECTACLES* all the other working tools, of most Artists, soon after their 40th year, would be almost useless.

At that precious period of Life, when Genius begins to wait upon Judgment,† the persevering Student would no longer be able to enjoy the fruits of the labours of his Predecessors, or to preserve the produce of his own for the benefit of Posterity.

The accomplished Artist, almost as soon as he acquires his Art, would be incapable of

* “ Were there no other use of Optics, than the invention of *Spectacles* for the help of defective Eyes, I should think the advantage which mankind receives thereby, inferior to no other benefit whatever, not absolutely requisite to support Life.”—MOLYNEUX’S *Optics*.

† “ The exact time when years have ripened *the Judgment*, without diminishing *the Imagination*, by good critics, is held to be punctually at *Forty*.—See MARTIN SCRIBLERUS *on the Dunciad*, p. 55.

pursuing it, — the seeds of perfection which he has been industriously cultivating during the First period of Life, would very soon after cease to be productive, and, but for the Eye-invigorating Art of the Optician, his latter days would be melancholy and forlorn.

It is hoped that by a little attention to the following pages, that All who can *Hear*,* may be enabled to procure precisely such Glasses as are most proper for them.

Every body is in want of such Information, because Nobody has given it, — therefore, I have endeavoured to render it as easily attainable, as it is universally desirable, by communicating it in such plain terms that Any body may understand.

The choice of Spectacles is one of those acts which cannot be properly performed by proxy — the Sight cannot be perfectly suited, unless

“ Every Eye negotiate for itself.”

* It is presumed, that the majority of the purchasers of this Work, cannot See! till they have learned how by the instructions herein given.

This is so absolutely true, that not only One Person cannot choose for another — but One Eye has often very little notion what Glass will be best even for its own Brother, so extremely does the Left Eye occasionally differ from the Right.

No faculty of man varies more in its nature, or is susceptible of a higher degree of Improvement and Refinement by Art, than the Sense of Sight. The highest degrees of its discriminating power are acquired slowly and imperceptibly.

From organic imperfection and neglect of cultivation,* many People pass through Life who (it may be said, comparatively,) never See—*i. e.* whose Eyes never have the faculty of accurately appreciating either Form, or Colour :—to very few is it given to perceive and to portray both.

* “ Every person acquainted with Optics and the nature of vision, knows that what is generally comprehended under the term *Seeing*, is a complex operation ; an art acquired by degrees, in which judgment and imagination are concerned, together with simple perception.”—CRISP *on Vision*, 8vo. 1796, p. 106.

There cannot be a more evident proof of the general defect in people's Sight—than the general acceptance of capricious and unreasonable Fashions, which often appear to be prevalent, in proportion that they are in direct opposition to the principles of good taste, and which to a fine Eye, are frequently frightful, and painful to behold.

From the different modes of colouring of different Artists, I suppose that the eyes of no two painters feel exactly the same impression of colours,—and objects, appear of different Colours accordingly as they are illuminated with different lights.

“ The Mole's dim curtain, and the Lynx's beam,”
POPE.”

do not differ more extremely than does the Sight of different persons—and of the same persons at different Ages.

The language of one Eye differs from another, as much as the Tone of one Voice from another — the Fascination which beams from some optic nerves is inconceivable!

The peculiar conformation of the *Eyes*,

differs quite as much in different persons, as the construction of their *Noses*.

It is just as impossible to guess exactly what Spectacles will best suit the Sight of another Person, as it is to tell—what Tunes are most delightful to his Ear, —or what Tastes are most delicious to his Tongue.

Nothing can be more erroneous than the common notion, that there is an invariable Rule, that *a certain form of Glass is calculated for a certain Age*. No rule has more exceptions:—this *Vulgar Error* has been productive of great and irremediable Injury to the Eyes of Thousands!

Hence, the grand desideratum is to instruct people how to choose wisely for Themselves—which, I hope, even those who are totally unacquainted with the subject may do with ease and accuracy, by the help of this Treatise, which is not published for the purpose of persuading the reader that the simplest of all Optical instruments, spherical Spectacle Glasses, can be purchased of only ONE OPTICIAN; which has evidently enough been the motive for the publication of some

preceding *Essays on Spectacles*. Had I written with any such motive, may be I might have found the following anecdote not very inapplicable :

It is recorded of a Minister who had a place to give away, that he said to one who congratulated him on the power and pleasure of patronising ; — “ Patience — I have Six applications for that situation ; when I appoint to it, I shall make One man Ungrateful, and the other Five my Enemies.” —

I have written for the Public, — my pages are a plain statement of the Facts I have accumulated during my attentive consideration of the subject for 30 years past, and I have

“ Nought extenuated, nor set down aught in malice.”

The Motto, friendly Reader, which has guided my Pen in all my works, is

“ TRUTH, TEMPERED BY GOOD HUMOUR.”

Men must be taught as if you taught them not,
And things unknown propos'd as things forgot.
Without Good-Breeding, Truth is disapprov'd ;
That only, makes superior sense belov'd.

Essay on Criticism.

I do not think it is my Business—I am sure it is not my Pleasure, to register the various *Pretended Improvements in Spectacles* which have from time to time been proposed to the Public,—such as the “SYMPATHETIC PEBBLES”—which “as the Sight alters, alter also to the Sight, by which one pair will last the wearer for Life,” &c. &c. &c.!!! This would be irksome to the Writer, and useless to the Reader.—I shall only mention the most remarkable.

In 1758, *Mr. B. Martin* published a pamphlet recommending what he called

“VISUAL GLASSES,”

the use of which, he assures us, would be “productive of peculiar advantages,”—they might be—although, *by Mr. Adam’s* account, not to the gentlefolk who bought them.

“The desire men have to increase their Business, and extend their Fame, has, in many instances, been the origin of alterations and inventions, injurious to Science and detrimental to the Public.”

“To this we may, with propriety, impute

the invention of *Visual Spectacles*. But the good sense of the world, which always, in the long run, justly appreciates the value of every invention, now leaves Visual Spectacles to the neglect they merit."—G. ADAM'S *Essay on Vision*, 8vo. 1792, p. 113.

I beg to be excused saying more, than that I do not think that any of the Spectacle Glasses which have come before my Eye, have any superiority over — *the Common Spherical Lenses now in general use*.

In instituting *Experiments for ascertaining the distinctness and brightness of Spectacle Glasses*—be extremely careful, that the Glass is of exactly the same quality and of the same *Focal length*—or any attempt at comparison will be useless.

If one of the Glasses be only of a very little shorter focus than the other, objects will make a very different, and sometimes a much stronger impression on the Eye.

To measure the Focal Length of Spectacle Glasses, see Chapter xv.

To give my Readers all the satisfaction in my power, — I have added an APPENDIX,

which contains sufficient corroboration of what I have asserted on certain important points, — because — by the time Persons want Spectacles, they have generally become wise “in their own conceit,” and have picked up a parcel of silly prejudices concerning them, which unless completely counteracted, and rectified by the invariable standard of irresistible truth, will prevent their deriving that benefit from this publication, which the Author heartily wishes that they should receive to the utmost extent.

I have given Rules for the choice of Glasses as relates to their degrees of Magnifying, — and have also pointed out those criterions by which All may judge if the Glasses are good, and may readily discover those imperfections in them which are so common, and so injurious to the Eyes.*

To effectually eradicate erroneous opinions, and to establish the Truth beyond all doubt, I know is no easy task — therefore, I have given an Appendix of Quotations

* See Chapter xvii. “*Of the Quality of Spectacle Glasses.*”

from the best Authors on the subject, the correctness of whose Judgment has been established by Experiment, and has been pronounced indubitable by acceptance — *i. e.* from the Writings of Dr. Smith; — Dr. Jurin; — Dr. Porterfield; — Dr. Blagden; — Dr. Wells; — Dr. Herschell; — Mr. G. Adams, the Optician; — the late Mr. Ware, the Oculist; — and Mr. Stevenson, the Oculist; for many valuable facts, I am indebted to that experienced Optician, MR. SAMUEL PIERCE, who was upwards of Thirty Years with Mr. Jesse Ramsden.

“Palnam qui meruit, ferat.”

There could not be a more Useful Charity than that of providing proper

SPECTACLES FOR THE POOR.

The Best Glasses, set in Single-Jointed Steel Frames, may be purchased wholesale at the rate of 18s. per dozen Pairs; — if a Single-Jointed frame is fastened round the head with a Riband, it may be kept on, almost as steadily and comfortably as a Double-Jointed Frame.

For the small sum of 18 Pence the Benevolent may enjoy the gratifying reflection of giving an industrious Workman the power of long continuing his labour with undiminished Ability, and of earning a subsistence till extreme Old Age.

In no way can so much Good be done with so little Money!

“ Qui Visum, Vitam dat.”

The greatest part of

The Disorders of the Eyes of the Poor who are upwards of 45 years of Age, are occasioned by their straining their Sight for

want of Spectacles, — or by looking through bad Glasses, or those of a Focus not suitable to their Eyes: — I hope when this is considered by **THE OVERSEERS OF THE POOR,** — **THE DISTRICT SOCIETIES FOR BETTERING THE CONDITION OF THE POOR,** and the **Patrons of THE EYE INFIRMARIES,** that they will make the distribution of Spectacles a part of their Bounty.

CHAPTER I.

ON READING GLASSES.

*For Persons whose Eyes are impaired by Age—
and Single Eye-Glasses for the Short-Sighted.*

WHEN would-be-thought-young Persons first feel the necessity of giving their Eyes Optical assistance, they are, nevertheless, shy of mounting *Spectacles*, which they seem to consider an inconvenient manner of advertising their Age upon their Nose—not reflecting that they are worn by many persons who have not seen half their years, but who being *Short Sighted*, are obliged to walk about in *Spectacles*, or forego the sight of “the Human Face Divine.”

However, they suppose that *Spectacles* are such unequivocal evidence of Age* and Infir-

* Since the former Edition of this work I have received a Letter from a fair Lady, from which I make the following extract:—

“ I was sitting yesterday in my parlour-window looking

mity, that they desire to dispense with exhibiting them as long as possible—therefore, they purchase “A READING GLASS,” and habitually put it up to One and the same

carelessly on the people as they passed; when all at once a fellow abruptly presented himself before me; and cried in a hoarse voice — *Spectacles, MADAM! Fine Spectacles!* and at the same time thrust a pair of those Nose-saddles within the sash.

“ You cannot imagine, my dear Sir, how I was shocked; I gave the man a short answer, and immediately threw down the window. — *Good God!* said I to myself, *do I look Old enough to be supposed to want Spectacles!* — not considering that it was the fellow’s trade to offer them to every body, and that many people Younger than myself were obliged to make use of them.—I ran however to my Glass, and fancied that I perceived what they call the Crow’s feet appearing at the corners of my Eyes.—I looked, and looked again, and the more I did so, the more I thought these cruel marks of time were visible; and now, recollecting that my last Birth-Day brought me into my 35th year, and that a very few more of them would rank me among the number of the aged, I fell into such a fit of the vapours as I had never before known.—I do assure you, that I had grown two or three hours older, before I could bring myself to be reconciled with the apprehensions that every moment brought me nearer to that so much dreaded stage of life.”

Eye, leaving the other involuntarily to wonder;—after a few years, the sight of the Idle Eye becomes of a different focus to that which has been employed with the Glass, and is often irreparably impaired.

“ These puerile propensities give rise to a variety of artifices, by which each individual endeavours to hide from himself and others, what no artifice can conceal, and which every one can discover, in all but himself;—these endeavours often contribute to hasten the Evils they are meant to conceal. Opticians have daily experience of the truth of this Observation, and in no instance more so than in the preference given by many to *Reading-Glasses*, (under whatever pretext it may be covered) merely because they think that the decay of their Sight, and their advances in age, are less conspicuous by using a *Reading-Glass*, than *Spectacles*: but the Eyes in endeavouring to See with a Reading-Glass are considerably strained, and in a short time much fatigued: and there is another objection to the use of Reading-Glasses, which arises from the unsteadiness of the hand, and

the motion of the head, which occasion a perpetual motion of the Glasses, for the Eye endeavours to conform itself to each change, and this tender organ is thereby kept in continual agitation: to these evils we may add the dazzling glare and irregular reflexion from the surface of the Glass, which so weakens the Eyes, that those who accustom themselves to a Reading-Glass, are in a short time obliged to take to *Spectacles*, and to use them much older than they otherwise would have done.”—Mr. GEORGE ADAMS *on Vision*, 8vo. 1789, p. 115.

When persons who have long patronised One Eye, and slighted the Other, take to Spectacles, they will (generally) require Glasses of a different focus for each Eye.

When You go to an Optician's to choose Spectacles, the first thing to attend to, is to look at a Book with each eye alternately,—and carefully ascertain, if You see equally well, with both Eyes, with the same Glass, at exactly the same distance.

Inequality of the focus of the Eyes, is much more common than is generally supposed, as

Painters, Watchmakers, Engravers, and most Artists, who work with a Magnifier, will tell you;—they generally work with One and the same Eye, with which they can see much better than with the other.

After a certain Age, the relative sharpness of the sight of the Eyes, varies as much as does the quickness of the Ears—the Senses of *Hearing*, and of *Seeing*, begin to fail about the same time; there are few people past 40 who have not found out that they hear better with One Ear, and see better with One Eye, than they can with the Other: but the Organs of *Sight* generally fail earlier than those of *Hearing*.

The Eye least used, soon becomes weak, and in the course of a little time almost useless.—This fact, is so little known, that I have frequently heard persons who up to the age of 40 have worked their Right Eye, and finding it begin to fail, say, they must begin to teach their Left Eye to See—however, as I told them, they found on trial, that the Eye which had been Idle, was much more impaired than that which had been active.

By ceaseless action all that is, subsists."

COWPER.

SPECTACLES are always preferable, because both Eyes, by being kept in action, are kept in Health, and Vision is brighter and easier, and the labour of each Eye is considerably lessened.

To ascertain whether an Object seen with *Both Eyes*, appears *brighter* or *larger*, than when seen with *One Eye* only, Dr. Jurin made several experiments, which are too long to insert more than the results of them.

" This difference was most conspicuous, when in making the experiment by candle-light, the book was at such a distance from the candles as that there was scarce light enough to read with both eyes; when the column which was seen by *One Eye* only, was not at all legible; but I could read with both; though with some difficulty. — See Dr. SMITH's *Optics*, 4to. vol. ii. p. 107 of Remarks.

" Though the Letters of a printed book appear brighter and stronger, yet they do not seem at all larger when viewed with *Both*

Eyes than when seen with *One Only*." — See Dr. PRIESTLEY *on Vision*, 4to. 1772, p. 669.

Dr. *Firminger*, who was some years at the Royal Observatory at Greenwich, informed me, that "when his *Binocular Telescope* is well adjusted by looking with each *Eye* separately through its respective *Telescope*, and adjusting each to distinct vision; then, if both eyes be applied at once, that land objects appear much brighter and more distinct than when viewed through either of the *Telescopes* separately."

As the *Eyes* of Persons who have either a very *Long* or a very *Short* sight, are useless without Optical assistance—they should have **DOUBLE FOLDING SPECTACLES** slung round their neck; (See Chapter IV. and Figure IV. in the Plate fronting the Title); or, if they will have a *Single Eye-Glass*—let them take care to use it without partiality, and put it to *Each Eye* alternately.

A *Single Glass*, set in a smart Ring, is often used by Trinket-fanciers merely for Fashion's sake, by folks who have not the least defect in their Sight, and are not aware of the mis-

chievous consequences of this pernicious plaything, which will most assuredly, in a very few Years, impair the vision of One or Both Eyes.

This Fashion of pretending to be *Purblind* prevailed in former times as well as in the present.

“ About five years ago, (1704,) I remember it was the Fashion to be *Short Sighted*. A man would not own an acquaintance until he had first examined him with his Glass. At a Lady's entrance into the Play-house, you might see Tubes immediately levelled at her from every quarter of the Pit and Boxes. However, that mode of Infirmary is out, and the Age has recovered its Sight.”—*Tatler*, No. 76, for 1709.

Notwithstanding all the experience collected during the preceding 42 Years—the *Third act of Life*, *i. e.* from 42 to 63—is as seldom performed properly, as either of the former,—“ *The Art of Growing Old with a Good Grace*,”—I believe, is one of those, which the Ancients termed “ *Occult Arts*”—and it appears to be almost as little under-

stood, as that of communicating to our speedily perishing Body the unchangeable nature of the incombustible Asbestos.

Query. Which appears most ridiculous? A Young Man pretending to the Sagacity and Experience of Age—or an Old Man affecting the Strength, and Apeing the Alertness of Youth?

The only way that Persons can indulge their humour of appearing Purblind with impunity, is to use—

CHAPTER II.

SPECTACLES WITH PLAIN GLASSES.

THESE should be kept by all Opticians,—who are not seldom sadly puzzled and plagued by more nice than wise folks, who without any need of Spectacles, yet hearing their acquaintance talk of how charmingly they can see in Glasses, they long, like “the Italian

Count,* to be better than well”—and will not believe, that although they have not the least occasion for Optical assistance, yet, without trying all sorts of Glasses, cannot be convinced, that however this branch of Optics may alleviate the infirmity of the Eyes, as a Hearing Trumpet does that of the Ear, yet that when the Eyes are in a healthful state, they can receive no more assistance from Glasses, for the ordinary purposes of the Sight, than a person who is not Deaf can from a Hearing Trumpet—which, although so serviceable to a person who is deaf, is not of the least use to one who is not deaf.

“ Why has not man a Microscopic Eye ?
 For this plain reason, Man is not a Fly.
 Say what the use, were finer Optics given
 T’ inspect a Mite, not comprehend the Heaven !
 GOD, in the nature of each being, founds
 Its proper bliss, and sets its proper bounds.”

POPE.

That ingenious Optician, the late Mr.

* Whose Epitaph is—“ I was well—wished to be better—Took Physic—and Died.”

JESSE RAMSDEN, told me, that he had oft-times more trouble to make obstinate and ignorant persons understand that the Art of Optics could not be of any service to them, than he had to find Glasses for correcting the most eccentric aberrations from good Vision—and that he found the only plan of completely convincing such troublesome Customers was, after he thought that they had sufficiently amused themselves with trying a variety of Glasses,—and had tired him,—he would say with that humble deportment, conciliating simper, and that gentle purring tone, which few commercial philosophers comprehend the conjuration of better than our arch friend JESSE did:—Well!—perhaps *the very first Sight* will suit You best,” and give them a pair of Spectacles glassed with *plain Glass*—when they would cry out with rapture — “Ay, *These* will do — *These* are capital—I can see charmingly in *These*—why—why didn’t You give me *These* at first?!!!”

Nothing, short of such Ocular demonstration, could satisfy them.

CHAPTER III.

CASE OF A PERSON WHO COULD NOT READ
IN SPECTACLES.

MR. R. told me that he was once strangely puzzled, by a clever Old Gentlewoman of 79 years of age, for whom he was requested to make a pair of Spectacles.—She had applied in vain to several eminent Opticians, and no Glass could be found that improved her Sight.

With all that Ambition to overcome difficulties, which was the ruling passion of JESSE RAMSDEN, he waited upon the Lady with several pairs of Convex, and of Concave Spectacles, making quite sure, that however others had failed, he should succeed, and enjoy one of those triumphs, which constituted the Zest of his Existence,—but after patiently trying every one of them, She said with a Sigh! — “No, — not one of these will do— I can see better with my Naked Eye. Well! what an unfortunate Creature I am,

at my Age, not to be able to see to read in Spectacles!!”

JESSE consoled the Good Lady as well as he could, by observing, that many at her advanced age could hardly see at all; and that although she could not see to read—— Here she interrupted him with sufficient vehemence, and, to his extreme astonishment, exclaimed, —“ Sir, You are strangely mistaken, Sir!—I did not tell you that I could not see to Read, Sir!—Bless you, I can see to Read as well as ever I could,—I only complained that I could not see to read in Spectacles!! *I can see to Read very well without!!! Bless you, I can thread a needle without!!!* but my Acquaintance are continually telling me how charmingly they can see to read, and work too, *with Glasses*, and surely, it is very hard that I cannot enjoy the same Advantage.”

CHAPTER IV.

HAND SPECTACLES.

ARE infinitely better than any Reading Glass,* however large it may be, — but are still not so comfortable to the sight as *Spectacles on Nose*, unless considerable care is constantly taken to hold them exactly parallel with, and at exactly the same distance from the Eyes.

Double Folding Hand Spectacles are preferable to a *Single Eye-Glass*, for *Short-sighted* persons to view pictures, &c. &c.

* “The *Single Convex Glasses* with which some Persons read, must be very injurious, if they be sufficiently large to admit the same object to be seen with both eyes. For as both axes will then pass through them, one on each side of the centre, the interval of the pupils will be widened, and the refracting power of the Eyes be diminished; so that here a disadvantage is to be added to the prejudice of the convexity of the Glass,—not a benefit to be placed against it, as in the case of Common Spectacles for the Long-Sighted.”—Dr. W. C. WELLS *on Vision*, 8vo. 1792. p. 130.

Moreover, the use of them is not so likely to be set down to Impertinence and Affectation — a censure which all persons expose themselves to, as often as they stare about them with “*a Quizzing-Glass.*”

The ingenuity of the Optician is often displayed in the formation of Hand Spectacles, and a variety of highly-finished Gold and silver mountings have been contrived — but unless the Glasses are defended by a case, they will soon become scratched and spoiled. The Pearl frame is the most elegant.

CHAPTER V.

SYMPTOMS OF THE EYES REQUIRING SPECTACLES TO READ WITH.

THE natural decay of the Sight commences, in Common Eyes, very soon after “the Meridian of Life,” which, according to those who train men for Athletic Exercises, and

according to DR. JAMESON,* is about our 28th, — according to others,† about our 35th Year.

“ *The Crystalline Humour* is clear and transparent like water — till about the 25th or 30th year of our age, when it begins to become a little Yellow towards the centre, which Yellowness grows gradually deeper and deeper, and extends more and more towards the surface, in so much that DR. PETIT found that the Crystalline of a man 81 years old, resembled two pieces of beautiful Yellow Amber.” — DR. PORTERFIELD *on the Eye*, 1759, 8vo. vol. i. p. 229.

The commencement and progress of the deterioration of the Sight, depends upon the health of the individual — upon the original formation of the Eye, — and upon how it has been used.

Some Eyes, at 30 years of Age, require

* See Dr. J. *on the Changes of the Human Body*, 8vo. 1811, p. 89.

† See 5th Edition of “ *The Art of Invigorating and Prolonging Life*,” by the Author, and sold by the Publisher of this Work, 12mo. 1824, p. 46.

the aid of art as much as others do at 50,— while the Sight of some persons continues almost as perfect at 50 as it was at 30.

The average period of the Eyes requiring Spectacles to read with, is about the 45th year.

Nature has decreed, that soon after our 40th year, the most perfect Eyes shall no longer retain the privilege she gives to Youth, of the power of adjusting them to See distinctly at different distances:—this range of accommodation diminishes gradually, till it fails almost entirely, and those to whom it is given to continue to discern distant things distinctly,—have no longer the power of seeing distinctly those which are near.

Very few persons past the age of 40 can see quite so well by Candle-light, as they could before that Age,—those who can—will generally find that there is a small degree of *Shortness* in their sight, which is the cause of their possessing that advantage longer than persons in general do—if they will try that very shallow *Concave* which is called, by Opticians, “*No. O. Concave*,” or “*Half a Number*”—they will find it give a decided

outline to distant objects, which they never saw defined sharply before.

However, people who do not use their Eyes for minutely examining Near, or for accurately delineating Distant objects, are quite unconscious of the finer perceptions of a fine and cultivated eye, and are equally insensible to the smaller gradations of the deterioration of their Sight, and happily suppose that "they have a Good Eye," while, as *Beatrice* says,

"They can see a Church by Day-light."

There are several symptoms, too evident, even for the Self-love of the vainest and the weakest to mistake, by which All persons will easily perceive when they really require the assistance of Spectacles.

The first Indication of the Eye beginning to be impaired by Age, is that when You wish to read a small Print, nib a Pen, or thread a Needle, &c., You are obliged to remove it further from your Eye than You have been accustomed to do, and desire the aid of plenty of Light; and on looking at a near object, it

becomes confused, and appears to have a kind of mist before it, and the letters of a Book run one into another, or appear double, &c.; and, BY CANDLE-LIGHT,* You catch yourself holding a Book, &c. close behind the Candle—and you begin to admire the ingenuity of the Gentleman who invented Snuffers.

You will begin to feel the absolute necessity of using Glasses, when you want to read a small print by Candle-light, for Twelve months before you require their assistance by Day-light.—See Cumumbra Lamp.

If You obstinately strive against Nature, and barbarously refuse your Eyes that assist-

* “ There are many who find the effect of *Candle-light* so different from the purer light of *Day*, that they are obliged to use Spectacles by night, though they can do very well without them in the day. These, when the eye has become more flat, will find it advisable to have two pair of spectacles, one to use by day, the other appropriated for the night: by this means, nearly the same quantity of Light may be brought to act upon the retina at one time as the other; thus the eyes will be less fatigued, and longer maintain their natural Vigour.” — Mr. G. ADAMS *on Vision*, 8vo. 1789, p. 108.

ance from Art which will enable You to see with great ease, — but without which, you cannot see without great difficulty — You will act as absurdly as if You refused to eat when hungry, or to sit down when You are tired — and will soon strain and weaken your Sight, which will receive more injury in a few Months by such forced exertion, than it would in Years, if assisted by proper Glasses which render Vision easy.

However, some people seem to be about as unwilling to acknowledge this Truth, as they are to confess that they do not feel quite so frisky at 45 — as they did at 25.

The common objection which people make to put on Spectacles, is, that “ if They once begin to wear them, They are afraid they can never leave them off again :” this is true enough ; — but why should they ? if by such aid, their sight is relieved and preserved, and They are enabled to see easily and distinctly, and when they attempt to read without, their Eyes ache, — their Head aches, — and every bit of ’em aches.

A Gentleman afflicted with incurable Lame-

ness, who cannot move without Crutches, would act just as wisely, in refusing to avail himself of them, — because he can never hope to walk again without.

“ Timely assistance from Glasses will ease the eyes, and in some degree check their tendency to grow flatter — whereas, if they be not assisted in time, the flatness will be considerably increased, and the Eyes be weakened by the efforts they are compelled to exert; all delay is dangerous, and the longer those who feel the want of assistance, defer the use of Spectacles, the more they will increase the failure of the Eye.” — ADAMS *on Vision*, 1792, 8vo. p. 109.

“ The change in the conformation of the Eyes, which renders Spectacles useful, seems to be one of those which Nature has destined to take place at a particular period of Life, and to which there is no gradual approach through the preceding course of Life. A person for instance at 40, sees an object distinctly, and at the same distance that he did at 20. When he draws near to 50, the change I have spoken of, commonly comes

on, and obliges him in a short time to wear Spectacles. As it proceeds he is under the necessity of using others of a higher power. But, instead of supposing that his Sight is gradually becoming worse, from a natural process, he attributes the increase of the defect in it, to his too early and frequent use of Glasses. • Upon the whole, I should draw this inference from what has been said, that — *no person whose Sight begins to grow Long, ought to be in the least prevented from enjoying the immediate advantage which Spectacles will afford him, by the fear that they will ultimately injure his Eyes.*” — DR. WELLS *on Vision.*

CHAPTER VI.

OF PRESERVERS.

By the help of *Convex Glasses** of 36 or 30 Inches focus, if your Eyes are in the state

* Of *Convexes*, — *i. e.* Glasses for assisting those Eyes, which are too *Long Sighted* — or what is commonly called

above mentioned, You will be enabled to read with the same ease, and at the same distance, that you did before your Sight was altered by the inevitable decrees of Old Time — such Glasses, will make things appear clear, and distinct as they did before your Eyes were impaired; and if judiciously chosen, lessen the labour of the Eyes, and enable them to do their work with ease, and therefore, I suppose, do, in a certain degree, preserve the Sight.

This Title of PRESERVERS, which some sagacious name-giver gave to Spectacles of 36 Inches focus or *the First Sight*, is an admirable appellation to attract the attention of people — but is equally applicable to all the following gradations of Glasses; — for the term is generally misunderstood, — people

an Old Sight, are named from their focal length; the highest number, No. 36, magnifies least, and is called the 1st Sight: See Figure 5 in the Plate facing the Title.

Of *Concaves*, *i. e.* Glasses for a *Short Sight*, — that which is the least concave, and gives the least assistance to the Eye, is called No. 1. See Figure 7 in the Plate fronting the Title.

seem to suppose, that Spectacles of 36 Inches focus, have the magic power of arresting the progress of that failing of the faculty of Sight, which is one of the natural and unavoidable consequences of Age.

When once the Sight begins to fail, it continues to decay, till in extreme Age, our Eyes, like our other Senses, become of almost as little use to us, as they were in our Infancy.

It is very common for Persons after they have worn Spectacles of 36 Inches focus for a Year or two, to complain that they think that “their Glasses cannot be of the right focus for their Eyes, for when they do not wear them, they certainly cannot see so well without them as they did before they used them, therefore, — they certainly cannot be *Preservers.*”

After the process of deterioration has been proceeding for 12 months it would be wonderful if it had not made some perceptible progress! — It is as ridiculous, to expect that it is in the power of an Optical Instrument to entirely prevent the Eye undergoing that invariably certain, although almost imper-

ceptible change which accompanies the advance of Age, as it would be to suppose that Art can prevent the failing of any of our other faculties.

I make these remarks, because I know that the prepossessing term has induced some excellent Artists,* who were naturally extremely anxious about their Eyes — (their Eyes are their Estate, the mainspring of their Fame and of their Fortune) — to wear Spectacles before they wanted them.

MEM. — *The premature use of Spectacles*, is as pernicious to the Sight, as Physic to the Stomach of a Man in Health, and as absurd, and as uncomfortable, — as it would be to put on a Fur pelisse at Midsummer, as a *Preserver* against your feeling the Cold of Christmas.

* See Chapter 12. THE ART OF SEEING, &c.

CHAPTER VII.

TABLE

Of the Focal Length of the Convex or Magnifying Glasses commonly required at Various Ages.

| <i>Years of Age.</i> | <i>Inches Focus of Convexes.</i> | <i>Remark.</i> |
|----------------------|----------------------------------|--|
| 40 | 36 | Convex Spectacles are seldom wanted, except to read by Candle-light till 45 or 50. |
| 45 | 30 | |
| 50 | 24 | |
| 55 | 20 | |
| 58 | 18 | |
| 60 | 16 | |
| 65 | 14 | |
| 70 | 12 | |
| 75 | 10 | |
| 80 | 9 | |
| 85 | 8 | |
| 90 | 7 | |
| 100 | 6 | * |

The above Scale was given to me by an eminent Optician, as the average results of upwards of 50 Years' extensive Experi-

* These three last deep Lenses are very rarely required except for *Couched Eyes*. "One focus is seldom sufficient to enable those who have undergone the operation of

ence :—and I believe it is as good a General Rule as can be written ; but, as I have ob-

Couching, to see objects at different distances — who generally require one pair of Spectacles for near, and another for distant, objects. The *foci* which are used lie between 6 and $1\frac{1}{2}$ inches.”—G. ADAMS *on Vision*, 8vo. 1792, p. 126.

If you are a Laughing Philosopher, gentle Reader, You will not be very angry with the Author for inserting the following Anecdote :—

“ In the city of Leyden, in Holland, a young woman lost her sight from a cataract ; the operation of couching was successfully performed upon her Eyes, and she recovered the use of them ; but it appeared that the Visual Organ (as is usual in such cases) was not completely restored to its primitive condition. Some very singular and unaccountable anomalies in her Vision presented themselves, which not a little puzzled the curious in Physiology and Optics.

“ It was ascertained that her Eye was able to define a certain class of very minute objects with abundant accuracy, such as the Eye of a needle, for example, which she could thread as well as ever ; but on presenting her with a Book, it was evident that she could not distinguish a single letter, but complained that she could see nothing but a heap of odd marks.

“ These facts, no less strange than true, naturally excited an intense interest among the Medical Professors and Students ; every one was anxious to distinguish himself by

served in the Introduction to this work —
No General Rule has more Exceptions.

“ No regular estimate can ever be established as an absolute criterion, either of the want of, or for the change of Spectacle

affording a satisfactory elucidation of these inexplicable phenomena.

“ A hundred theories were framed — every one more ingenious than the other. The Professors VON KRACBRANER, and PUZZLEDORF, favoured their pupils with most excellent lectures on the subject, with which they were greatly edified. However, none of the disputants succeeded in establishing a Theory which met with universal approbation. Many of the vulgar still chose to think that all the said Theories might be liable to the old objection (however satisfactory and plausible they might appear), viz. — ‘ That they were not True.’

“ Matters were in this state, when a mischievous rogue of an Irish student, who took a singular delight in ridiculing every thing learned and philosophical, contrived to insinuate himself into the confidence of a younger brother of the Patient’s by a present of an extra portion of Double-gilt Gingerbread, which so entirely won the Youngster’s heart, that he confessed (though with some difficulty) that to the best of his belief, his Sister “ *Sarah had never learned to Read,*” but unwilling to acknowledge her ignorance, had made him and all the family — promise not to tell.”

Glasses; because, the failure of the strength of the sight, varies so considerably with different people: — several youths under 20 years of Age, have applied to me, who could not see either to read or write, without very strong Magnifiers of 6 or 8 inches focus — while I have met with other persons who have arrived at 80, able to read a small print without any.

“ That celebrated Preacher, the REV. MR. ROMAINE, Rector of *St. Ann's Blackfriars*, who died in the Year 1795, having attained the age of 81, could read the small print in a pocket Bible, unassisted by Glasses, even to the last. He never wore Spectacles, nor wanted any.

“ I knew a Gentleman who took the assistance of Glasses at about 40 years of Age; these after some time he exchanged for older ones; and although he lived to be 84, they were never afterwards altered, and his sight continued sound and healthy. Knowing this circumstance, I had the curiosity to measure the focus of the Glasses, and found it was

14 inches, which he had been using quite satisfactorily for upwards of 40 years.

“ Another Gentleman, now living, with whom I am well acquainted, did not take to the use of Spectacles until he was 55 years of Age : since that period, his Glasses have been twice or three times changed ; and although he is now but little short of 87, yet the Glasses which he generally uses, and which he can see the best with, are 16 inches focus.”

For these last Remarks I am indebted to
MR. SAMUEL PIERCE.

The time that the First Glasses of 36 inches focus will sufficiently assist the Sight, depends on the peculiar nature of the Eyes — on the wear they have previously had — on their subsequent exertions — and on the Constitution and general Health of the Individual.

Persons of a strong Constitution, who make more use of their Legs and Arms, than

they do of their Eyes, seldom want Spectacles so soon, or want to change them so soon, as the Studious and those Artists who are much employed in fine works, which require not only the most earnest exertions of the Eyes, but also the application of a powerful Magnifier.

As a general Rule, the first Spectacles will last You for reading by Day light, during your first apprenticeship to Old Age — *i. e.* about 7 years.

CHAPTER VIII.

WHEN TO CHANGE THE FIRST SPECTACLES,
FOR STRONGER MAGNIFIERS.

WHEN You find a recurrence of the Symptoms which first prevailed upon you to wear Spectacles, and begin to see but little or no better with the first Glasses, than you then did with your naked Eye — your eyes require *The Second Sight* of 30 inches focus. — But, I

most earnestly entreat my friend the Reader, to be content with as little assistance as will enable him to read a Newspaper comfortably by Candle-light,* at about the same distance he did before his Sight was impaired — from 8 to 10 inches, is the mean distance at which common Eyes, in their mean state, see most distinctly.

When you find that *the First Sight* of 36 Inches focus, is hardly sufficient help to read by Candle-light — to examine any very minute object — *i. e.* to make Pens, &c., You may get *the Second Sight*, of 30 inches focus. — But pray — only use them, for purposes for which you find *the First Sight* is quite insufficient.

The following Advice of MR. GEORGE ADAMS, the Optician, is excellent: —

“ Those who are careful in following a regular gradation in the change of their Glasses, may preserve their Eyes to the

* See Reading Candlestick or Lamp, in the Table of Contents.

latest period of Old Age, and even then be able to enjoy the comforts and pleasures which arise from distinct vision. Do not therefore precipitate these changes, lest you should absorb too soon the resources of Art, and not be able to find Spectacles of sufficient power."—G. A. *on Vision*, 8vo. 1789, p. 108.

Many persons have irreparably injured their Eyes, and indeed have worn out their Sight prematurely, by beginning with *Spectacles of too Short focus, i. e.* which magnify too much, or as the common expression is, are *too Old*.

Nature soon bends to Custom. Eyes which have been excessively stimulated by too deep Magnifiers, never recover their elasticity.

CHAPTER IX.

MY GRANDMOTHER'S SPECTACLES.

How often a story like the following, is told to Opticians * by persons coming to change, what They call their First Spectacles.

When their Optical friend expresses his surprise to find them choose very old Glasses of 12 or 10 inches focus, instead of *the Second Sight* of 30 inches focus,

They say, “ Why, when I thought that I began to want Glasses, — I recollected that there was a pair of nice *New Spectacles* in my Grandmother's old Bureau, — and I had often heard the old Gentlewoman say, when she was past her 70th year, that she could

* There are very few Opticians but what must have seen instances of Persons who by habituating their Eyes to Glasses of too short a focus, *i. e.* of too great a magnifying power, have so injured those tender organs as to deprive them of future assistance from Glasses.

This not unfrequently happens to BARGAIN-HUNTERS— who buy their Spectacles of— Hawkers and Pedlars— Toy-shops, Dealers in Marines Stores, &c.

still see to read Charmingly with her *New Spectacles!* — and so I thought, that I could not do better than use those Glasses whose sight-restoring power I had been Eye-witness of. — I naturally thought, that they must surely be capital Spectacles which enabled so Old a Person to see so well: and when I put them on, I was not disappointed, for they made every thing appear very big indeed, and I could read the smallest print very nicely indeed — better than I had been able to do with my naked Eye for a long time past.”

I must now give you a hint, gentle Reader, — however improper such mighty Magnifiers may be for your Visual Organs, preserve them with all care, — the occasional use of them will greatly contribute to preserve that Grand Organ your Stomach. No “*Grand Gourmand*” who has any pretensions to prudence, should venture to attend a **TURTLE-FEAST*** without such Sentinels on

* “Nothing is more difficult of digestion, or oftener requires the aid of *Peristaltic Persuaders*, than the glu-

his Nose — they are absolutely as indispensable a part of the paraphernalia of the Banquet, as a Plate or a Spoon!

The Eye is a mighty and merciless enemy to *the Stomach* — alas! as the Proverb says, “it is bigger than the Belly.” Now even supposing your Eye to be as big again, — with these powerful Spectacles, your Eyes may be filled with delight, and your Stomach also: for the former, will imagine that while you have been leisurely sipping a small Soup-plateful, you have been swallowing an immense Tureenful: — What a beautiful delusion! at once, equally delightful to your

tinuous *Calipash*, which is considered the “*Bonne Bouche*” of this surfeiting Farrago.”

The usual allowance at a TURTLE-FEAST is 6 Pounds live weight per head:—

“At the Spanish Dinner, at the City of London Tavern, in August 1808,—400 Guests attended, and 2500 pounds of Turtle were consumed.” — See BELL's *Weekly Messenger* for August 7, 1808.

Epicure QUIN used to say that it was “not safe to sit down to a Turtle-Feast at one of the City Halls, without *A Basket-hilted Knife and Fork*.” — From page 251 of the 5th Edition of THE COOK'S ORACLE, 12mo. 1823.

Stomach, your Eye, and your Tongue — equally magnifying the pleasure of those two most troublesome of the Senses, the Sight and the Taste — which are ever the most irrationally importunate in their demands, and the most difficult to be satisfied! for, as the Proverb tells us, People will often

“ Please their Eye, if they Plague their Heart.”

Well — whenever your Tongue cries out for more dainties than your Stomach has previously plainly told you is agreeable to it — to settle all the difference of their demands to their mutual satisfaction, you have nothing to do, but to — put on your Spectacles, and you may set to at *Calipash* and *Calipee* with impunity; for they will make “ A LITTLE LARK ” look like

“ A LARGE FOWL,”

and “ A PENNY ROLL ” as big as

“ A QUARTER LOAF!!! ”

Some Philosophers have said, that *Pain* is only imaginary, — we may as justly believe the same of *Hunger*; and if a Gentleman who eats only an Ounce of Mutton, imagines, by the aid of these magnifiers, that he has

eaten a Pound — ought not his Hunger to be as fully satisfied ?

MEM.—The addition to your Optician's Bill — will soon be overpaid by the subtraction from your Butcher's and Baker's.

CHAPTER X.

HINTS TO PERSONS CHOOSING SPECTACLES TO READ WITH.

A PART of the paraphernalia of an Optician's counter, is a Book * of rather a small print, (about the size of the Note at the foot of this Page,) which is presented to those who come to choose Spectacles — and such Glasses are recommended, as will enable the person to read it at the same distance,

* The Author will be sadly disappointed if in future this Work is not the Volume chosen for that purpose.

N.B. *To this Second Edition* — The Author supposes that this is the page selected for the above purpose by every Optician, except the Gentleman who is immortalized in the preface to this Edition, who is of opinion that — for His Customers, "*Ignorance is Bliss.*"

with the same ease, that he could before his Eyes were impaired, and through which the Letters appear perfectly distinct, and of their natural size.

The first thing to attend to, is to look at a Book with each Eye alternately (shutting the other), and carefully ascertain, if you see equally well with both Eyes, with the same Glass, at exactly the same distance. — Persons are quite unconscious of the frequent inequality in the focus of their two Eyes* till they thus try them separately; when they often find that a Glass which does very well for one Eye — is of little or no use to the other, which to be rendered effective must have a Glass of a different focus — therefore, *nothing can be more absurd than to purchase Spectacles ready glassed*, and it is therefore, a very hurtful practice to use any but our

* “It is as rare to find a person who can use both his Eyes with equal effect, as one who is equally dexterous with both his Hands: there is not One person among Thousands whose Eyes are both of exactly the same size or of exactly the same focus.” — Dr. WILlich *on the Eyes*, p. 619.

own glasses, to which our Eyes are accustomed, — every Irregularity is injurious, and *the preservation of the Eyes depends chiefly on uniformity with respect to Glasses, and of the Light in which the Eyes are employed.*

With Glasses not convex enough,

or, according to the common expression, which are *too Young*, You will not see clearly, unless the Book is placed so far from your Eyes, that the Letters cannot be seen distinctly.

With Glasses too Convex, or too Old,

You will be obliged to bring the Book nearer to your Eyes than you did when your Sight was good, and the Letters will appear larger than they really are.

Spectacles which magnify too much, will strain the Eyes even more than those which do not magnify enough, and instead of retarding, will accelerate the defect which age brings on.

“ When persons apply to an Optician for

Spectacles to read or work with, they should clearly understand, that the Objects for which such Spectacles are solely calculated, must not be placed more than 12 or 14 Inches from their Eyes, *i. e.* whether Reading, Writing, Sewing, &c.—there seems to be a natural impulse in most persons, that after a printed Book has been handed them for trial to read, to presently look off to some object on the other side of the Room, or across the Street, and say, ‘Why now I can see well enough to Read with these Glasses, but I cannot discern what that word is over yonder Door;’ and the Optician has oftentimes no little trouble to convince them, that such Spectacles are not intended to show objects at a distance—to see which, their Sight is as strong as ever; and in fact, that they can see distant objects best with their naked Eye.” Spectacles to enable the Eye to read at the distance it did when Young, and unimpaired, can enable it to do so at that distance only—*if you want to see any thing farther off—or nearer—you must have Glasses of longer, or*

shorter focus, and different Glasses for almost every different distance.

“ A person in business, with whom I was acquainted, began to want the common Optical assistance, especially for Writing, when about 40 years of age — the Glasses he first used were of 30 Inches focus, but he soon found them useful to look at the labels on the parcels of Muslin arranged on the shelves around his Shop: after a while, he found it easy and convenient to keep them on during the Day, to serve his Customers, or occasionally to look along the Street for a passing friend. Another pair of deeper focus, was a repeated necessary consequence, for the mechanism of his Eyes naturally formed themselves to the power of the Convex Glasses, and his Eyes still growing older and strained by too strong excitement, at last would not perform their office distinctly, unless assisted by Spectacles of 11 Inches focus — so that in the course of about 10 Years, he become half blind.

“ This, is not a very singular, but a very

common case, — one of the most frequent causes of irreparable injury to the Eyes, and is one of the first cautions to be given to those who are choosing *Convex Spectacles*.

“ From not being aware of this, I have known several Painters and other Artists, who have, in their natural anxiety to see as well as possible, irremediably injured their Sight — so that when they became 60 or 70 years of age, they were obliged to use Two half glasses of different foci fixed in the rings of a Spectacle frame — the upper half to help them to see a distant picture or sketch, &c. and the lower half to transmit it to canvass.” — MR. S. PIERCE.

Divided Glasses require considerable attention to raise or depress the Eyes sufficiently, so as to look only through one half, — and that the rays from the other half may not confuse the Eye and distress its adjustment, which will be as extremely perplexing to your Eyes, as it would be bothering to your Ears, to listen to two Barrel Organs at the same moment, — One playing “*Sally in our Alley*,” and the Other “*Ally Croaker*.”

There have been several other plans for obtaining the convenience of

TWO PAIRS OF SPECTACLES IN ONE FRAME,
by having the glasses to turn up on the side, &c.; but all such contrivances are at the expense of the Eye.

The Magnifying power of Spectacles has also been made to vary from 36 to 12 Inches focus, by having two Eye-glasses, of 72 Inches focus, one before the other, and separating them; but the vision cannot be so good as with the simple single Eye-glass — only those who do not think their Eyes worth half a crown a piece will run the risk of injuring them extremely, when they can purchase a pair of good Spectacles for Five Shillings. The most convenient plan, and also the least injurious to the Eyes, would be to have a pair of Spectacles glassed with Glasses of the focus required to see the distant object or sketch, &c., and other Glasses in a frame attached to the Spectacle frame, and moving on hinges, which, when brought down before the Glasses fixed in the Spectacle frame,

might make combined, the focus required for painting the Picture, and which, when it was requisite to refer to the Object or Sketch, might be turned up on the Forehead, quite out of the way.

“ The late President of the Royal Academy — BENJAMIN WEST, Esq. was in the habit of using *Divided Glasses* for many years; the upper half was of 30 inches focus, and the lower of 12. But for some time before his death, which happened when he was about 90 years of age, he had the upper half of 30 inches focus, and the under half of only 8 inches focus.” The Glasses were round, and an inch and a half in diameter.

The above account of Mr. West's Spectacles is another of the contributions of Mr. S. Pierce, who made the Spectacles.

By trying a variety of Glasses at an*

* Though in the choice of Spectacles, every one must finally determine for himself, which are the Glasses through which he obtains the most distinct Vision; — yet some confidence should be placed in the judgment of the

Optician's, the Sight soon becomes confused and tired, and for the moment quite unfit to appreciate what Glasses are exactly the best for it.

I advise persons who have never worn Spectacles — or are uncertain what Glasses will suit their Eyes best, to borrow One of the *Sets of Glasses*, which consist of Spectacles of regular gradations of power, set in a frame — the first Set of Convexes usually contains the first Seven Glasses mentioned in the Table at page 40 — if these cannot be had, choose at the Optician's, those Spectacles which they can see best

Artist of whom they are purchased, and some attention paid to his directions.

“ By trying many Spectacles the Eye is fatigued, as the Pupil varies in size with every different Glass, and the Eye endeavours to accommodate itself to every change that is produced. Hence the purchaser often fixes upon a pair of Spectacles not the best adapted to his sight, but those which seem to relieve him most, while his Eyes are in a forced and unnatural state: and consequently, when he gets home, and they are returned to their natural state, he finds what he had chosen, fatiguing and injurious to the sight.” — Mr. G. ADAMS *on Vision*, 8vo. 1789, p. 96.

with, and take home with them also, Two other pairs, one a degree more, the other a degree less Convex, or Concave, as they happen to be either Long, or Short Sighted: — they should try these for two or three days, both by Daylight and by Candlelight, in that posture of Body and that degree of Light in which they are accustomed to read and work, or for whatever purpose they wish to employ them: take care, that the Glasses they try are perfectly clean, and that they hold them as close and parallel to the Eye as Spectacles are placed.

They will perhaps find, if they try them by *Candlelight*, especially with a very small print or fine work, that one degree of magnifying power more than they require by *Daylight*, will show very small objects most distinctly; but I protest against such indulgence at first, which is rarely needful if they have plenty of Light from a shaded Candle or Lamp — and a small Magnifier and a *good Light* makes vision much easier to the Eye, than a *great Magnifier* and a bad Light: I have found very old persons who could not

by the light of a single Candle *unshaded* — read a small print without Glasses of 6 inches focus — who with a good and shaded Light (see page 73) read the same print easily with Glasses of 10 inches focus — when the Sight is impaired by Age, a pair of Glasses for use by Day, and another for Night, or for nibbing Pens, &c. are advisable comforts for the Eyes.

The best plan for the Preservation of the Eyes, is not to employ them in any work at Night that gives them any trouble: — let all Business which requires intense attention, such as mending Pens, &c. be done by “the better Day.”

At any age, the less the Eyes are actively employed at Night, the better — after the labours of the Day, the Eye participates in that languor which every other part of the Body suffers, and the tone of the Visual Organ is comparatively feeble — therefore avoid as much as possible, reading a small print, or any business which requires the earnest exertion of the Eyes — and *always use a Shaded Light.* — See Page 73.

The moment that your Eyes, by beginning to feel hot and fatigued, give you a hint, that they have done as much work for you as is agreeable to them — leave off exerting them.

*Forcing the Eyes to Work at Night,** even for a few moments after they are tired, — will often put them out of humour for the whole of the following Day, and is of all Eye-spoiling Acts the most mischievous; — want of Mercy in this respect, *has prematurely ruined the Eyes of Thousands!*

Several Young Ladies, of only about 25 years of Age, have complained to me that they could not see to do fine work without Spectacles of 36 Inches focus — these I found, on inquiry, very justly attributed this premature failure of their Sight to having been obliged frequently to sit up at Needle-work

* “The frivolous attention of a quarter of an hour of an Evening, has cost many, the comfortable and perfect use of their Eyes for many years: — the mischief is effected imperceptibly: the consequences are irreparable.” — Mr. G. ADAMS *on Vision*, 8vo. 1789, p. 98.

half the Night during the time they were with Dress-makers.

Those who have any regard for the Eyes of their Children—will make it part of the agreement, when they article them to any Business requiring the earnest exertion of their Eyes, that they shall never be required, on any pretence, to use them at latest, after *Nine* o'clock at Night.

A friend of the Author, who has passed his 60th year, and has found it necessary to use Spectacles ever since he attained the age at which they are usually wanted; whose occupations have occasioned his Eyes to be constantly employed on small objects in print, writing, and drawing, by Candle-light as well as in the Day, by careful management, is still enabled to see with Spectacles of the first power, or 36 inches focal length, for common purposes;—*i. e.* for reading moderately sized prints, and writing in Daylight.

His practice has been, from the period of first using Spectacles, never to employ a higher power than was absolutely wanted

for the particular occasion, for which purpose he constantly carries with him Two pair of Spectacles; one pair of 36 inches, and another pair of 24 inches focal length; the two pair put on together, serving him for a magnifying power of 12 inches focal length for extraordinary purposes.

The two pair of Spectacles are for the convenience of being carried in the pocket: at Home, in his study, he has by him all the gradations of 36, 30, 24, 18, and 12 inches focal length, to be used as required.

He observes, that immediately after using Spectacles of a high magnifying power, the Sight does not easily accommodate itself to a lower power; and in such cases, it is necessary to give the Eyes a little time to rest and recover themselves.

This strain of the Eye, and occasion for Spectacles of a high magnifying power, is particularly found in *Mending Pens*, when the inconvenience of the Eye not readily restoring itself to the capability of seeing with the ordinary Spectacles, is strongly evinced: and to avoid it he has a sufficient

number of Pens,* to prevent the necessity of mending any of them until he has finished writing. — This method of using the higher powers when the lower powers will not be soon after wanted, is always a provident procedure.

To those who find the *Mending of Pens* rather a difficult Job; I recommend the occasional use of a A RUBY or RHODIUM PEN, especially when they wish to write very small and very neatly.

The most permanent and perfect Pens I have met with, are DOUGHTY'S RUBY PEN and RHODIUM PEN. — The former was recommended to me by several persons who have written with it for several years, and find it just as perfect now, as it was the first day. — They are sold by MR. DOUGHTY, No. 10, Great Ormond Street.

The Best Cases for a *Ruby* — *Rhodium* — or *Steel Pen* — is a clamp holder enclosed

* *Mending Pens, and all operations requiring the Sight to be in its best condition, should be attended to early in the Day, while the Nerves are brisk, and before the animal spirits are exhausted and the Eyes are fatigued.*

in a Silver Pencil Case which will admit either a quill pen or any other; and if the point be injured, it is easily replaced by another, which cannot be so readily done if it is soldered on, — but in order to defend the point from dust, &c. have a Cap to fit on the end of the case.

Those who write with Ruby, or Pens made of Steel, &c. should have an Inkstand with an open cistern, the bottom of which is lined with a slice of Cork, which in case of dipping the Pen in in a careless manner will prevent its point being injured — the Ink should be sufficiently thin: have as *an Appendix to your Inkstand* a small cup containing a bit of sponge wetted with water — on which, when you have done writing, never fail to clean your Pen, and then dry it on a bit of silver paper; for if you wish to preserve it, *you must keep the point perfectly clean and dry*: if this care was taken of common Quill Pens, they would last ten times as long as they usually do — for their imperfect action most frequently arises from their slit

being clogged with Ink. — *The Hudson's Bay Pinions* are the most serviceable and clearest splitting Quills.

There is a convenience in Spectacles of a small power, while they can be used. No object can be distinctly seen through Spectacles which magnify very much, beyond their focal length; and in using the high magnifying power of 12 inches focal length, prints and writings to be referred to, must be placed within that distance of the Eye: but with the smaller power of 36 inches focal length, such objects may be placed to that greater distance from the Eye for being referred to.*

The smaller the power, provided it be sufficient, the more pleasant and convenient and least fatiguing to the Eyes will be the Spectacles.

By placing upright against a wall, a paper with moderately large printed letters, such

* This supposes a good Light, and the Object not very minute; but such as can be distinguished at the same distance by good Eyes without glasses.

as usually occur in the title-pages of Octavo books, he finds the greatest distance he can distinctly see the letters with a good light, to be the Focal length of the Spectacles. For the usual method of measuring *the Focal length of Spectacles* — see Chapter XV.

If any doubt should be entertained of the Two Glasses not being of the same focus, he tries each Glass separately with the same Eye, and the difference is immediately discovered.

Besides the alteration in the convexity of the Eye, and the muscular power of contraction and dilatation, Age reduces the vividness of the illumination on the Retina; in consequence of which, although objects may be sufficiently magnified by Spectacles, yet they may be scarcely visible when the light is not sufficiently strong: — on the other hand, a too powerful Light is injurious to the Eye. The Light should therefore be economized for the benefit of the Eye. — See Chapter XI.

The Artificial Light from Candles is rarely too strong; but “the Blaze of Day” is often

too intense on white paper, and should be moderated by placing the paper so as to reduce the reflection of the rays of light upon the eye: have enough Light, but no more than is sufficient.

CHAPTER XI.

HINTS TO PERSONS BEGINNING TO WEAR SPECTACLES.

AND OF READING LAMPS AND CANDLESTICKS.

WHEN persons first put on Spectacles, if they have chosen them ever so wisely, still, they frequently complain that their Eyes feel fatigued, and sometimes even ache, after they have worn them some time, especially by Candlelight. There is no wonder in this; it would only be wonderful if they did not.

It usually happens, that for some months previous to Persons wearing Spectacles, their Sight has either been strained and weakened by their trying to see what Nature had

decreed that they should not, — or, their Eyes have been Idle, and unaccustomed to work, especially by Candlelight.

The cause of the Complaint people so often make, that their Eyes very soon tire if they use them at Night, is not, as they seem to suppose, entirely from the inferiority of Artificial Light.

Mr. ARGAND's invention gave us all that we wanted as far as *Quantity* of Light — and Mr. DEVILLE informs me that the light from the Cocoa Nut Oil has the *Quality* of Daylight; and that with it, the difference of the colour of Flowers of Sulphur, and that of Wheat Flour, may be easily distinguished, which it is difficult, if not impossible, to see with any other Artificial Light.*

* “ The greatest part of Objects, in Candlelight, are always tinged with a Yellow Red, though we are not sensible thereof; because all the objects in view are changed in the same proportion. But if in the daytime you place Candles in a darkened chamber that every thing therein may be well illuminated, and then retire to another place illuminated with the Sun's light — the Objects illuminated with Candlelight, when viewed through the door

There are some perfectly authenticated instances of persons possessing their full share of the faculty of Sight as to the perception of Form — who had no sense of *Colours* — others who could not distinguish their difference by Candlelight — and one I have met with, who by Daylight cannot tell Red from Green, but recovers the power of discerning them correctly by Candlelight. The latter is a very singular anomaly of Vision. See *Captain Huddart's Paper* in the *Phil. Trans.* for 1777, p. 260: and *Mr. Scott's*, in the *Transactions* for 1778, p. 611; and some *Uncommon Observations about Vitiated Light* in *BOYLE'S Works*, vol. v. p. 445 — 4th edition, 1772.

of the room, will appear tinged with a yellow red, when compared with those that are seen at the same time illustrated with Daylight." — *Dr. PORTERFIELD on the Eye*, 8vo. 1759, vol. i. p. 127.

THE

CUMUMBRA AND SEMIUMBRA LAMPS.*

THE shade of this Lamp is so contrived that it completely prevents any of its rays coming to the Eyes — the pupil of which is therefore regulated solely by the object under examination. Every part of the Frame, &c. is coloured a dead black.

The faults of all the Reading Lamps which I have seen, are, that the Shade does not come either high or low enough to completely shade the Light, is partly composed of fretwork which shows the Light through it, and the frames are frequently painted with a light colour, and highly varnished.

The *Cumumbra* is simple in its construction, not liable to get out of order, and there is very little more trouble in trimming it for

* Made by DEVILLE, Strand.

Five hours, — than there is in Once snuffing a Candle.

It is cheap in the purchase, and in use, for I think it affords more light than Two Candles at the cost of one.

The Oil reservoir holds three-fourths of half a pint of Oil, which at the present price of the very best Lamp Oil, (5s. 6d. per Gallon,) costs 3 pence, which divided by 12, (the number of hours it will burn,) gives the expense of this Light, *i. e.* A Farthing per Hour.

The Light of the *Cumumbra* when properly trimmed, is so good, that Persons whose Sight is beginning to fail, and who cannot read by Candlelight without Spectacles of 36 inches focus, with this Lamp read as well as they can by Daylight; and so it deserves all the praise which the pickpocket gave to the Gas light — “It is as bad as Daylight!” — *i. e.* for Opticians; for by the help of this Lamp persons may read a year or two longer than they would be able to do without, — and always, with Glasses of the same magnifying power which they use by Day.

The effect of a strong Light * I have seen evidenced by the fact, that Persons who have many years used Spectacles, when the Sun shines on their Book, can see without.

The main Reason why the Sight is not so sharp at Night as it is in the Morning, is, that the Eyes are tired, by having been at work all Day — the Eye is quite as much restored by rest as the other parts of our machinery are.

The sensibility of the Sight is surprisingly recruited by Sleep. Dr. Porterfield, in p. 38 of vol. ii. of his *Essay on the Eye*, observes, “the Pupil is very large upon our first awaking.”

I have for many years been accustomed to sleep with a light in the Room — if at any time it has gone out, I have awoke just time enough before to previously light a Candle; and have often wondered, that

* “A person who has been obliged for some years to use Spectacles in reading, will, in the Sunshine, be able to read without them.” — Dr. PORTERFIELD *on the Eye*, 8vo. 1759, vol. i. p. 162.

the diminution of so faint a light had such a strong effect on my Eye, as to awaken me out of a sound Sleep.

I read the above to Mr. BUNDY the Engineer, and he said — “The very same thing happens to me — I always awake just before my night Lamp goes quite out.”

The best Light for burning all night is the *Semiumbra** Chamber Lamp, this may be set with perfect security on a Table by the Bedside within reach, and by turning it half round, you may in a moment, have either Light or Shade, a frame may be made to carry over it a *Bainmarie* Saucepan, like the Nursing Lamps for keeping children's food warm, which will keep half a pint of Tea or Broth warm all Night. This will be a *great Comfort to Invalids* — especially to those afflicted with Nightmare, Coughs, &c. for which a draught of hot fluid will give more immediate, and more permanent relief, than any remedy I have tried. — See the Author's own Case in pages 206 to 214 of “THE

* Made by DEVILLE, near Exeter 'Change, Strand.

ART OF INVIGORATING LIFE." Published by HURST and Co., No. 5, Waterloo Place, Pall Mall.

The strongest objection to Candlelight is, that the degree of Light given by *A Candle*, and its distance from the Eye, is varying every moment; — *A Lamp* has not this disadvantage: by merely bringing it nearer to, or removing it farther from the object under examination, its Light may be either increased or diminished, may be adjusted to almost any degree; and will continue the same for several hours.

Those who cannot recollect having played so much with a new Plaything, "and fancied Toil a Pleasure," till they found the pleasure a Toil, — must have a much worse Memory than I hope you have, gentle Reader!

I dare say, that "many a time and oft," this has happened to most of my Readers, — with much less bewitching Playthings than a pair of Spectacles must at first be to a person who after Old Time has for several months interdicted him from the amusement of Reading, &c. by this inestimable invention,

finds the full enjoyment of his precious Sight suddenly and perfectly restored!

From one of the causes above mentioned, when persons first put on Spectacles, their Eyes are generally in a state of weakness, if not of disease: — moreover, at the Age which people usually find their Eyes refuse to be employed on actual service without optical aid be allowed to them, — (which, as I have before said, happens soon after the 40th year), the Visual organs occasionally get out of tune, and participate in that general deterioration of action which every part of our Machinery then begins to suffer.

Very soon after we pass the Meridian of Life, every sense becomes duller and weaker, but no one fails so remarkably, as the fine faculty of Sight; and although Spectacles considerably revive the Visual powers, they cannot restore to them the untiring energy which they possessed during the Vigour of life.

Elderly Persons can no more play with their Eyes, either so well, or so long, as they did when they were Young, than they can

with their Legs and Arms, &c.!-- to expect that they can, is as funny, as it would be to fancy that Infirmary on Crutches, has any chance of rivalling the Champion of Pedestrians in walking 1000 Miles in 1000 Hours.

Those who consider these things, will soon cease to be very much surprised, that their Eyes tire sooner at 60 than they did at 16 — just in proportion, as all their other faculties become sooner fatigued.

The effective state of the Eyes, like that of every other part of the Human frame, depends upon that of the Circulation, — which depends upon the condition of the Stomach, and the more or less stimulating Quality, and the Quantity of the material that it is supplied with.

Several Studious Persons have told me, that their Eyes are never in good order till they have had their Breakfast — that then, they feel as if they were all Head for three or four hours — and then, have as irresistible an inclination for Bodily Exercise, as they had previously for exercising their mind, and felt as if the Activity which they

had enjoyed in their Head had descended into their Legs.

Over-exercise * of the *Eyes*, will occasion a temporary exhaustion of them, just in like manner as over-exercise of the Legs will disable a person from walking with his wonted energy — till Rest restores vigour to him.

I have often heard people complain of their Eyes being out of humour for several days, after being exposed to the glare of the lamps at the Theatre, &c. — from being fatigued by sitting up after their accustomed Hour, or from other causes which distressed their Nervous System.

When I was 45 years old, I was employed some hours during several Nights, in looking intently through Reflecting and Achromatic

* “ The instances of *Weakness of Sight* which occurred in the early part of my Ophthalmic practice, were marked by great constitutional delicacy, and the individuals had clearly brought it on, either by excessive attention to fine dazzling work, or by inordinate indulgence in literary pursuits protracted to late hours.” — Mr. J. STEVENSON on *Weakness of Sight*, 8vo, 1819, p. 57.

Telescopes, endeavouring to ascertain the comparative Illuminating powers of various Instruments, — and the effect of variously constructed Magnifiers, for shewing *the Division in the Ring of Saturn*,* and for separating some of the faintest and closet *Double Stars* — my Eye became so extremely tired, that the sharpness of my Sight was so sensibly impaired, that for two or three days after, I hardly knew any face that was 20 feet from me, — and became so much alarmed that I mentioned it to an eminent Optician, who said, “ Don’t be uneasy, the same thing has happened more than once to myself; your Eye has been over-worked — give it a few days’ Rest, and I dare say it will soon come round again.” — His prediction speedily proved true.

One of the tests to which I put my Eye, and my 5 feet Achromatic, which has a double object glass of $3\frac{8}{10}$ aperture, — was, to ascertain with how Low, and how High

* See a Portrait of *Saturn* in the Frontispiece to the Second Part of this Work on TELESCOPES.

a power I could see the small Star near *the Pole Star* : — it was a decidedly detached point of light with a single eye-glass, which gave the Telescope a power of only 28, *i. e.* with the 2d E. G. of an Hugenian Eye-piece which magnifies = 44 times — and it was visible with 20 intermediate Eye-tubes, the highest of which magnifies 1386 times, and is a single Convex lens of the 22d of an inch focus. — The Object Glass of

63 Inches focus,

gave, multiplied by 22

126

126

The Magnifying Power 1386.

The foregoing subject is fully illustrated
*in the Second Part of "THE ECONOMY OF
THE EYES,"—*

AND OF

TELESCOPES,

OF ALL SORTS, AND OF ALL SIZES — HOW TO
CHOOSE AND HOW TO USE THEM FOR
ALL PURPOSES :

AND

OBSERVATIONS AND PORTRAITS

OF

SATURN AND DOUBLE STARS.

THE WHOLE WRITTEN IN PLAIN TERMS WHICH ALL
MAY EASILY UNDERSTAND ;

BEING THE RESULT OF EXPERIMENTS

MADE WITH

FIFTY-ONE TELESCOPES,

OF FROM ONE TO NINE INCHES APERTURE,

IN THE POSSESSION OF

WILLIAM KITCHINER, M.D.

TO WHICH IS ADDED,

An Abridgement of the Practical Parts of

SIR WM. HERSCHEL'S

*Observations on Telescopes and Double Stars, &c. ; some Observa-
tions thereon, and Original Letters from*

EMINENT PRACTICAL OPTICIANS.

relating experiments which All who have Instruments of the like dimensions, may easily verify at the expense of a few shillings.

A circumstantial account is given of their several performances and powers, as Astronomical and Day Telescopes.

To enable my Readers to measure the respective merits, and the relative reflective powers of *Convex* — *Concave* — and *Plane* Small Specula — I have laid before them, an abstract of their several pretensions as stated by Sir Isaac Newton, — Sir Wm. Herschel, &c. &c.; — then those Practical Observations which I have made myself, and those which I have been favoured with by several scientific Opticians, and amongst them those experienced and excellent Makers of Reflecting Telescopes, Messrs. Watson — Tulley — and Cuthbert — who have given me their Notes and Observations of the Facts which they have ascertained in the course of their numerous experiments with Telescopes of various constructions. I have only room in this page to add, that the Opin-

ions of these last-mentioned eminent Practical Opticians are perfectly unanimous with my own, — and that I believe, that our Evidence and Arguments are so true, and so convincing, and so plainly stated, that they will be perfectly satisfactory to the Reader, and will finally settle certain important points, which without such Illustration, seem to me, likely to remain as they are present—

“Puzzled with Mazes, and perplexed with Errors.”

N.B. *Contributions on Optical Subjects, addressed to the Publishers of this Work, will be gratefully acknowledged.*

I have mentioned my own case of *dimness of Sight*, because, I believe many Artists, from the want of such a hint, have greatly injured their Eyes, by having been induced by similar Symptoms, prematurely to put on Spectacles: but, in all such cases, “*Rest is the best Remedy.*”

“So great is the calamity entailed upon the makers of fine Pieces of Workmanship, such as Clocks and Watches, that many of

the Workmen are almost Blind before they arrive at Old Age. I know a Jewish Woman in this City that had a peculiar way of stringing Pearls, so as to cover their blemishes if there were any, and by that means got a deal of money; but when she came to be 40 years of age, finding no manner of relief from Spectacles, she was forced to leave off the Business. I remember likewise to have heard several *Printers* complain, that they have given a considerable shock to their Eye-sight by composing small types.

“ In earnest, *I do not see how we can afford any Relief to the Workmen we now treat of: for it is not easy to persuade them to leave a beneficial and lucrative trade; and Physic is unprovided with any Remedy that can restore the primitive Strength and Mobility of the Eyes, after the Disorder has become inveterate: for neither Purging, nor Bleeding, nor other Medicinal Means, can take place in this Case, in regard the Patients are otherwise Well and Brisk, and their Spirits being*

neither clouded nor incrassated, it would be improper to punish an innocent and sound Head with the Commotions of Medicines.

“ However, I would advise such Workmen not only to use Spectacles, but to *intermit from their Work now and then*, and refresh their Eyes by Diversity of Objects. For we can't imagine How much the Mobility of the Membranes of the Eyes, and the native Fluidity of the Humours, is kept up by viewing divers Objects; some near at hand, some remote, some directly, others obliquely; and, in fine, all manner of ways: for by this Means the natural Disposition of the Eye is preserved, so that the Ball is sometimes contracted, and sometimes dilated; and the Crystalline Humour approaches more or less to the Pupilla, according as the remoteness or nearness of the Object requires. Without this Diversity of Action, the Eyes undergo the same Fate with the other parts, that, by being long detained in one position, grow stiff and unfit for Motion.” — RAMMAZZINI *on the Diseases of Tradesmen*, chap. xxix. of the Eng. Trans. 8vo. 1705, p. 219.

WATCH-MAKERS, ENGRAVERS, and those who are in the habit of using *Strong Magnifiers*, would feel their Eyes much less fatigued, if the objects they examine were always placed at once, and kept at the proper focus : — this might be contrived very easily, by fixing the Magnifying-glass in the opening of a Spectacle frame, or on a stand, with an adjustment by a Tooth and Pinion to bring it to distinct vision, and which would also support the Object which might be fixed by a simple apparatus, and so, both the Hands and the Eye might work at it with great ease and advantage to what they do now without such holders, which in fact would be equal to another pair of Hands.

Nothing can be more detrimental to the organ of sight than the clumsy practice of Watchmakers holding a glass by squeezing the *orbicularis muscle*, — which cannot be done without distorting, and distressing, and much injuring the mechanism of the Eye.

Those who work with MAGNIFIERS should always remember, that the less the Magnifying Power of the Glass, the less the Eye

will be fatigued by it, the less distressing the position of the Body in working with it, and the larger and more uniformly distinct the field of view.

Where a moderate Magnifying power is sufficient — instead of a single magnifier, it will be better, especially for Etching, and for examining the general Effect of Engraving, &c. to wear Spectacles of 9 inches focus, with which I think that Artists might work much longer than with only one Eye.

The *Compound Magnifiers*, which are composed of two plano-convexes with their plane sides outwards, are very pleasant, as they have a large and uniformly distinct field. — I have not met with any body who was aware that this construction of Eye-glass was invented so long ago as appears by the quotation I here insert :—

“ *Eustachio Divini* hath made a Microscope with two plano-convex Glasses, which are so placed as to touch one another in the middle of their convex surface — and hath this peculiar quality, that it shews the object flat and not crooked ; and although it

takes in much, yet magnifieth extraordinarily."— See *Phil. Trans.* for 1668, vol. iii. p. 842.

Concaves which make objects appear the size Artists wish to draw them, are very useful to *Miniature Painters*, who should have them of different degrees of Concavity so mounted on a stem that they may be used separately or altogether: thus they may see an object of 6 Feet in diameter reduced to exactly the size it is to be delineated, *i. e.* to any degree between 6 Inches in Diameter, and half an inch in Diameter.

The condition of our Corporeal Machinery, has great influence on that of our Eyes; and indeed of all our Senses. — During that state of collapse which it is just now the fashion to call “*a Bilious Attack*” — or “*a Nervous Paroxysm*” — just in proportion that we are out of Heart, the Circulation is feeble and languid, and every sense performs its functions imperfectly. — During such prostration of the Vital powers, it is not uncommon to hear people complain of NER-

VOUS DEAFNESS. — It is equally common for them to be afflicted in an equal degree with NERVOUS DIMNESS OF SIGHT — *Muscæ Volitantes*,* &c. — these, when first observed occasion considerable alarm, but I have known many people who have had them for twenty years without scarcely any visible increase or any perceptible deterioration to their Sight.

This occasional *dulness of the Ears*, is

* “The common kind of *muscæ volitantes* appears to be of two kinds: the one, a simple dark spot which appears to float with the motion of the eye: the other, a congeries of small lucid spots, or sometimes circles, which give the idea of air bubbles on water, when we look at the sky they likewise move with the motion of the eye: they are generally seven or eight in number, and appear irregularly clustered together like the Pleiades. I have been inclined to ascribe them to small air bubbles floating in the lacryma, from a disposition in the secretory organs to eliminate air.

“After looking long on the bright blue sky, the eye becoming fatigued, myriads of small lucid specks appear all in motion, which some have attributed to convulsive motions in the extremities of the supposed minute muscular fibres of the retina, from being over-fatigued!” — T. FORSTER’S *Physiological Reflectors*, 8vo. 1812, p. 55.

oftener observed, than the *dimness of the Eyes*; — because the former defect is obvious to others, the latter is confined very much to ourselves; and unless we happen to want to minutely examine some *minimum visibile*, which requires all the powers of the Sight to be in full force to be discernible, such a paroxysm of Ocular obtuseness often passes unnoticed, and is seldom strong enough to excite the attention of healthful persons, until they have passed their 40th year; who will then generally find, that dimness of the Sight may be traced either to over-exertion of the Eyes, or to some Disorder of the Digestive Organs. I understand that such Disorders of the Eye and Ear have increased prodigiously since the filthy fashion of smoking CIGARS has been the rage here; and the sickly sallow complexion of those who have made themselves Slaves to them, shews evidently enough their pernicious effect on their General Health.

During derangements of the Restorative Process, the Eye-lids are often affected with "*Ophthalmia Tarsi*," *i. e.* a slight in-

flammation and an increased secretion of the glands about the Eye-lids — which (in plain English) become gummed, and when the Eyes are first opened in the Morning, the Eye-lids feel stiff, and the Eyes are irritable.

The Eye-lids are much oftener disordered than *The Eyes*; — perhaps three-fourths of what common people commonly call “*Bad Eyes*” are merely disease of *The Eye-lids*.

I have not space in my little Volume to descant on One of the 118 Principal Diseases of the Eye enumerated in the Work of the elaborately minute St. Yves, — but having had Ocular demonstration of the efficacy and innocence of the following OINTMENT* FOR THE EYE-LIDS — I here set it down.

One part of Citrine Ointment,
Three of fresh Lard — mix them thoroughly together with an Ivory knife.

* “Whenever I am informed that the edges of the Eye-lids have a disposition, be it ever so slight, to adhere to each other after they have been long in contact, as

The Eye-lids are to be anointed with a *very little* of this Ointment immediately before going to rest.

The Eye-lids should be washed in lukewarm water as soon as you rise in the morning, and every particle adhering to them, completely, but very gently and carefully removed — which is easiest done by soaking the Eye-lids by the repeated application of a Sponge or of a soft cloth dipped into warm water, till whatever sticks to them is loosened, — then, proceed cautiously to clean them.

during the time of sleep, and when this is accompanied with an uncomfortable sense of weight in the lids on the approach of night, in consequence whereof the patient involuntarily shuts them without being drowsy, and without any particular stimulus being applied to the Eye to give it pain, I always suspect that the secretion of the ciliary glands is in a diseased state; and in many such cases I have found the success attending the use of the *Unguentum Hydrargyri Nitrati*, recommended for the cure of this disorder, quite as effectual as in those other instances, where the excoriation and redness of the Eye-lids have been visible on the slightest inspection." — Mr. WARE'S *Chirurgical Obs.* vol. i. p. 116.

CHAPTER XII.

PRECEPTS FOR IMPROVING AND PRESERVING
THE SIGHT.

THE Sensibility of the organ of Sight, is in proportion to the expansion of the Pupil of the Eye, whose mean diameter is calculated to be about one 10th of an inch — varying in magnitude, from One to at least Two tenths, according to the brightness of the object which is presented to it. — See DR. HERSCHEL'S Paper in the Appendix.*

When the Light is too strong, or the object too bright, the Pupil closes in order to inter-

* In the 91st vol. of the Phil. Trans. page 86, in Dr. T. Young's paper on the Mechanism of the Eye — the Dr. has given in *Plate v. Fig. 19*, a drawing of the front view of his left Eye; "*when the Pupil is contracted,*" the diameter of it is rather more than a tenth of an inch: and in *Fig. 20*, "*The same view when the Pupil is dilated;*" the latter measures almost two tenths and a half.

cept that excess of Light,* which would otherwise offend the Eye : — when the Light is faint, the Pupil expands, that a greater quantity of it may enter the Eye, and thus make a stronger impression upon it.

This contraction and dilation of the Pupil, you may easily discern by holding a looking-glass before your Eye at a window, and turning gradually round from the window continually looking at your Eye in the looking-glass — the lowest small speculum of a Gregorian Telescope, as it magnifies a little, will shew you this still plainer : and it

* “ 95. The sensibility of the Eye, and its power to discern objects without inconvenience by different quantities of Light, is vastly extensive. For instance, the disproportion in the quantities of Light cast upon the horizon by the *Sun*, and *Moon*, at equal altitudes, I find is no less than 90,000 — to 1, when the Moon is full.

“ *Day-light* is to *Moon-light*, as the surface of an Hemisphere whose centre is at the Eye, to the part of that surface which appears to be possessed by the enlightened part of the Moon : so that the whole Heavens covered with Moons would only make *Day-light*.” — Dr. SMITH'S *Optics*, 4to. 1738, p. 29.

may be easily and perfectly observed by attentively watching the Eye of another, during such a change of position:—it is most visible in a fine full bright blue Eye.

The fact that the sensibility of the Sight* is in proportion to the diameter of the Pupil, is strongly illustrated by the following circumstance. — “What can be the reason,” an intelligent and accurately observing Artist said to me, who was sitting by the side of his window, “that when I look at that

* “We can never be certain that an Object does now appear to us of the same precise Colour of which it appeared last Day or last Week: neither can our being insensible to any change ever prove to us that the Colour is the same. Not only different Persons may have different sensations of Colours, proceeding from the different dispositions of their optic nerves and retinae, or from the different tinctures wherewith their Eyes are tinged, but also the same person may, from the same causes, see the same Object differently coloured at different times, without being sensible of it; and experiments are not wanting, whereby it appears, that the same object was seen of different colours, according as it was viewed with the right or left Eye.” — Dr. PORTERFIELD *on the Eye*, 8vo. 1759, vol. i. p. 128.

portrait opposite to me, it looks *Warm* with my left Eye, and *Cold* with my right; *i. e.* with my Left Eye, which is from the window, it appears considerably brighter, than it does when I look at it with my Right Eye?"

I gave him a "*Circumspector*,"* and desired him to attentively examine the size of the Pupil of each Eye while his head remained in exactly the same position, and tell me in which Eye the Pupil was largest: his answer was, "Why, in the left, certainly," *i. e.* in the Eye least exposed to the Light.

Mr. BUTT, of Bath, informed me that he saw the Five first-discovered *Satellites of Saturn* in an Achromatic Telescope of 44 inches focus and $2\frac{3}{4}$ inches aperture — by

* The CIRCUMSPECTOR, or "*Diagonal Eye-glass*," is a convenient assistant to a Portrait Painter, who wishes to catch a likeness unobserved, which is perhaps the only way of obtaining the natural expression of a Countenance — and is also an invaluable Oracle for a fair Lady to refer to, to adjust the irresistible Artillery of her Eyes and Smiles.

placing a patch before that part of the field of the Telescope where Saturn appeared and thereby enabling the Pupil to expand, and the Eye to adjust itself for discerning the fainter objects, the Satellites.

In observing *Double Stars*, the very minute Star which accompanies some large Stars, (for instance the small Star near *Alpha Lyræ*) is visible when the large Star is out of the field, with a Telescope with which it is not discernible, while the larger Star is stimulating and shutting up the Pupil.

These striking Facts sufficiently establish the position laid down in the commencement of this Chapter, that, "*cæteris paribus*," the impressions on the RETINA are vivid, in proportion as the *Pupil* is expanded.

These observations led me to consider how beneficial it would be to the Eyes of Painters, Engravers, and those Artists whose Eyes are irritable from over-exercise, if they could be so shaded, that the Pupil might be secured from being interrupted in its adjustment. For which purpose I recommend a shade made of black silk, stiffened with

gum or wire, and fixed on a Spectacle frame something like the contrivance of Tubes* which are made for viewing Pictures; —such assistance to the Sight is quite as advantageous to the Artist to finish his Picture with, as it is to the Amateur to examine his work.

The Eye cannot adjust itself perfectly, while it is exposed to the stimulus of surrounding Objects — a defence from the intrusion of collateral rays will prevent the picture on the Retina being confused by those adventitious rays which otherwise distract it; and if only those rays are admitted into the Eye which come direct from the object under examination, it will make a much more vivid impression on the Sight, which will be sharpened and strengthened very much.

This is worthy the attention of all who wish their Eyes to enjoy the utmost sen-

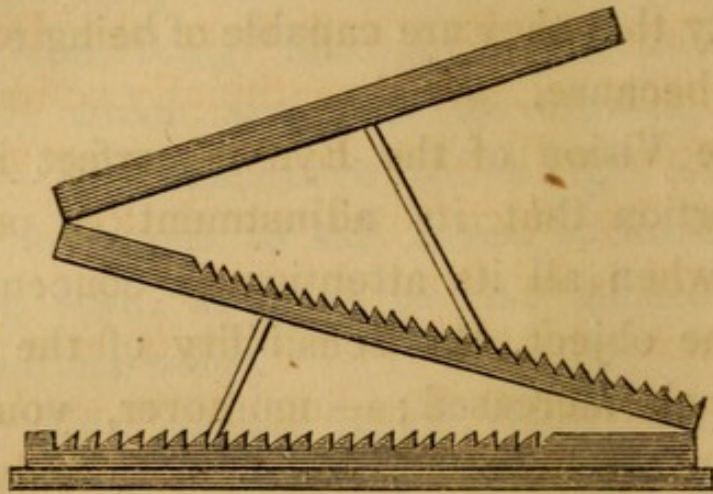
* See an Account of Spectacles with Leathern Tubes, in the 3d vol. of the *Phil. Trans.* for the year 1668, pp. 727 and 765; and for 1684, in vol. xiv. p. 474.

sibility that they are capable of being excited to — because,

The Vision of the Eye is perfect in the proportion that its adjustment is perfect, and when all its attention is concentrated on one object, the sensibility of the Sight is much increased; — moreover, you will not only see better, but Vision being rendered easier, your Eyes may be employed longer, with less fatigue.

The Pupil of the Eye is larger when shaded by a *Broad Brimmed Hat* — such as Coachmen wear, who probably adopted this costume from its advantage in sharpening their sight.

There is no part of the Economy of the Eyes more important, than that the object they are at work upon should be placed at exactly that distance from them at which they see with the greatest ease: — this may be easily accomplished by the assistance of
A DOUBLE-RISING DESK :



and hard Students will do wisely to have a High Desk, at which they can occasionally stand — instead of always sitting.

Those who are much occupied in Engraving — Painting — Writing — Reading — &c. or works which require all the power of the Eye to be exerted to the utmost — should be careful not to offend it by *too much Light*, which is quite as prejudicial as *too little light*.

Light enough to illuminate the object, and to make it easily and perfectly visible, is all that is wanted: — on this occasion, the Old Proverb, “Enough is as good as a Feast,” is quite true, — more, is not only unnecessary, but injurious, and will not only over-

stimulate the Eye and force the Pupil to shut itself up, but if continually so irritated, the Eye will soon become as much impaired by such over-stimulation, as the Stomach is by Dram-drinking.

I have observed in my visits to a numerously attended Reading Room — that the seats next the windows were generally filled by persons wearing Spectacles, who had no doubt accelerated the necessity for seeking so much light by a habit of over-stimulating their Eyes with superabundant Light.

The proper way of defending the Eyes from too much Light, is by preventing all that is superfluous from entering the Room, by means of Blinds or Shutters — thus, you may admit only just such a degree of Light as you find most agreeable to your Eyes.

Choose a Room *lighted only from one aperture* — and if possible with the steady *North* aspect; that is the best place in the room, indeed the only proper place for Study for those who have any regard for their Eyes, where the light falls on their work or book coming from the side or from behind.

“ It is requisite always to have an equal, well-regulated Light in every employment, particularly in the Evening; the Eye may be seriously strained and injured by working, writing, or reading with either too much or too little Light: for want of a due attention to preserve the visual organ, and from using the Eyes very much during the busy part of life, a morbid sensibility is brought on, an unnatural weight of the Eye-lids, a great deficiency of distinctness, and occasionally a distressing, undulatory quivering appearance of refrangible colours on either side. To remedy this, washing the Eyes with clear cold water, and keeping them from the Light for an hour, or taking a Nap, will be found most efficacious.” — S. PIERCE.

If your Eyes are much employed in Reading, &c. and are extremely irritable, you may have your window glazed with Green Glass, — or a blind of it to put up occasionally — or a rolling blind of Green Silk or Muslin — or FELBRICK'S *Patent Sight Preserver*, which was sold at No. 9 Coventry Street, and consists of a plate of Green

glass, fixed in a Frame, which may be placed so that the Light may pass through it to your book or work. But do without these if possible, for if they alleviate the irritation while you use them — they will render the Eyes more morbidly irritable after.

AT NIGHT — use a *Reading Candlestick or Lamp* with a shade to shield the Eye from the glare of the Light;* which is of much greater assistance to the Sight than those who have not tried it can imagine: — *One* candle so shaded will enable a person to see better than *Two* without such a shade, and with a *Cumumbra Lamp* you may see, I think, quite as well as by Daylight, the sensibility of the Eye is preserved in such perfection.

The Optic Pupil inevitably adjusts itself to the brightest object, which therefore

* “Every thing is best seen when the light of the candle is intercepted: the bright light of the Candle not only makes the pupil contract, but by mixing itself with the images of other objects, it in some measure obliterates them, so as they cannot be so well perceived.” — Dr. PORTERFIELD *on the Eye*, 8vo. 1759, vol. ii. p. 188.

should be that which it is its business to attend to, — not the flame of a Candle, but the Book you are reading.

GREEN, or any COLOURED GLASSES, veil objects with a gloomy obscurity, and can never be recommended, except to those who have to travel over a white sand, or are much exposed to any bright glare, which cannot be otherwise moderated.

Light reflected from any white surface, is very piquant and injurious to the Sight, whether proceeding from Water — Snow, &c.

Gogglers — or black cups, glassed with plain glasses, and mounted in double-jointed frames formed to the shape of the face, are preferable to those which are fixed in Leather and Silk, and tied on with riband; the latter come so close to the face, that they soon become a Vapour Bath for the Eye — but the former are occasionally found very serviceable to travellers to protect their Eyes from Wind and Dust, and to shield* them

* “Xenophon relates, that many of his Troops were blinded by the strong reflection of the light from the Snow over which they were obliged to march.

from a strong Reflected Light; Blue or Green glass may be fixed in them, but it must be of a very light Colour.

Some more nice than wise folks, among other ridiculous refinements, have recommended thin *Green-Gauze* or *Crape* instead of Green Glass, under the pretence, that while it moderates the Light, it admits the Air, and is, therefore, cooler to the Eyes.

All Coloured Glasses, however slightly tinted, increase the labour of the Eyes, and soon bring them into such an irritable state as unfits them for all the ordinary purposes of life:—there is scarcely an external or

“Dionysius the Tyrant of Sicily, among other means which he took to gratify his revenge, and satiate the savage cruelty of his Temper, was accustomed to bring forth his miserable Captives from the deepest recesses of the darkest Dungeons, into white and well-lighted Rooms, that he might blind them by the sudden transition from one extreme to the other.

“Actuated by principles equally barbarous, the Carthaginians cut off the Eye-lids of Regulus, and then exposed him to the bright rays of the Sun—by which he was very soon blinded.”—G. ADAMS *on Vision*, 8vo. 1789, p. 8.

internal Sense, but may be brought by extreme indulgence, to such a degree of morbid delicacy and acuteness, as to render those organs which nature intended as sources of gratification — the frequent sources of Disappointment and Pain.

“ And as no Rose without a Thorn,
No Sweet without alloy —
So Sensibility indulged
Will Peace of Mind destroy.”

The most proper material for Spectacle Glasses, is that which shews objects the nearest to their natural Colour.

Lastly — Whatever Glasses you use — take care to “*keep them perfectly clean;*” this is as important, as the choice of the Figure or the Colour of them.

Every time you wipe your Spectacles you scratch them a little, and “many a little makes a mickle” — therefore, when you have done using them, put them away carefully *

* “The Newspapers lately recorded a very curious instance, of the window-curtains in a *Farm-house* near Gedney, in Lincolnshire, being *set fire to by a pair of Spectacles* which were left in the window seat, and which

in their case, to prevent other people abusing them as the Naughty Boy did his Grand Pa's Specs — who took the Glasses out, and when the old Gentleman put them on, finding that he could not see, exclaimed, “ Marcy me, I've lost my Sight !” — but thinking the impediment to Vision might be the dirtiness of the Glasses, took them off to wipe them — when not feeling them, he, still more frightened, cried out, “ Why what's come now, why I've lost my Feeling too !”

CHAPTER XIII.

GLASSES FOR SHORT-SIGHTED PERSONS.

I HAVE met with several persons of 30 and 40 years of Age who had no notion that they

acting as a lens or burning glass, collected the rays of the sun, and produced an effect which would have set fire to the House, if it had not been speedily discovered. The curtains were burnt.” — N. BOSWORTH *on Accidents*, 12mo. 1813, p. 74.

were Near-sighted, until they accidentally looked through my Spectacles at a distant object; when they exclaimed with surprise, “ Bless me, how clearly I see! I never saw any Glasses before, that I could see so well with as with my naked Eye, and therefore had no idea that any Glass could improve my sight.

“ I can see to read a small print, as well as any body I believe, but I have sometimes suspected that I did not see any thing across the street, or at a Theatre, quite so plainly as I have heard other people say that they did; and I suppose that the Spectacles which I tried before were not suitable to my sight—I had no idea that any Glass could improve my Sight.”

For such Eyes I have procured a No. 1, or No. 2, *Concave*—and they have been delighted and said, “ Well, I see now that I have never before seen the distinct outline of any object which has been further than a few feet from me.”

Being a *Short-sighted* mortal myself, I write this Chapter with confidence, from my

own personal experience of upwards of 32 years, and hope to be able to give some good advice to those who are unfortunately what is called *Near-sighted*—by briefly narrating “*the History of my own Case of Spectacles.*”

I was about 15 years old, when I first discovered that I could not discern distant objects so distinctly as people who have common Eyes usually do.

Mr. WARE, whose paper on Short-sightedness I had not seen till after I had written this Chapter, has remarked, (see *Appendix*,) that Young People seldom find out that they are remarkably *Short-sighted*, until about the time that I did; which is true,—Young Folks seldom attend to any thing in earnest before they attain to that Age—when seeing, that I could not see what persons with common Eyes frequently pointed out to me as well deserving my attention, I paid a visit to an Optician and purchased a *Concave Eye-glass* No. 2.

After using this some little time, I accidentally looked through a *Concave* No. 3, and finding my Sight much sharper with

this, than with No. 2 — had my Spectacles glassed with No. 3, which appeared to afford my Eye as much assistance as it could receive.

After using No. 3 for a few Months, I chanced to look through No. 4, and again found the same increase of Sharpness, &c. which I perceived before when I had been using No. 2 and first saw through No. 3 — therefore concluded that I had not yet got Glasses sufficiently Concave, and accordingly procured No. 4: — however, this soon became no more stimulus to the Optic Nerve than its predecessors Nos. 2 and 3 had been.

I then began to think that the Sight was subject to the same laws which govern the other parts of our System; *i. e.* an increased Stimulus by repetition soon loses its power to produce an increased effect — therefore, I refused my Eye any further assistance than it received from Spectacles glassed with No. 2, which I have worn for upwards of 31 years, and it is very nearly, if not quite, as sufficient help to me now, as it was when I

first employed it — giving me a Sight (for objects *at a moderate* distance), as I find, by comparison, about upon a par with common Eyes : — without my Spectacles, I am quite as Short-sighted as some of my acquaintance who use Nos. 6 and 7 concave ; *i. e.* we read at the same distance.

Soon after I passed my 40th year I found my Sight become rather *Shorter* as to distant objects, and rather *Longer* with respect to near objects ; formerly, I usually wore Spectacles for Reading, Writing, &c. — but lately, the power of my Eye to adapt itself to various distances is so diminished, that when I read, &c. I am obliged to take off my Glasses — and objects that are more than 60 feet from me, I see better with one number deeper than that I commonly wear. — See a similar case in the *Appendix*.

The gradations of Concavity, in the Concaves of the common Spectacles which are marked *Cheap* in the windows of Sale-shops, — Toy-shops, &c. — who pretend to undersell the regular Opticians, (*Read* CHAPTER XIX. and see the *Appendix*,) are not always

worked to a certain standard, and what one calls No. 5, another rates as No. 3, or 4, or 6, or 7.

Mr. PIERCE informed me that the late Mr. JESSE RAMSDEN made the first No. of his *Concaves* to be equivalent to a *Convex* of 24 inches focus, — *i. e.* if a *Convex* of that focal length be united to a *Concave* No. 1 — the combination will form a Plane, and objects appear through it neither larger nor smaller than they really are.

A 21 Inch Convex - - No. 2.

An 18 Inch - - No. 3.

and that all regular Opticians proceed in like manner.

The following is a very important fact, which the *Short-sighted* cannot be too fully sensible of: —

“ I shall mention a fact with which I was made acquainted by Mr. GEORGE ADAMS, the late Mathematical Instrument Maker, who was not only well skilled in the theory of Vision, but, from his situation as an Artist, had better opportunities than most persons of learning such matters,

“ The fact is this, that he does not know a *Short-sighted Person* who has had occasion to increase the depth of his Glasses, if he began to use them in the form of Spectacles ; whereas he can recollect several instances, where those have been obliged to change their *Concave* Glasses repeatedly, for others of higher powers, who had been accustomed to apply them to *One Eye only*.” — Dr. W. C. WELLS *on Vision*, 8vo. 1792, p. 124.

The advantage of a pair of Spectacles over a Single Glass, is sufficiently obvious — as Objects appear considerably brighter when seen with both Eyes, than they do when seen with One only.

FOR THE CHOICE OF SPECTACLES FOR SHORT-SIGHTED PERSONS, — I have few Rules to offer — it is a defect which has no reference to Age — no stated progression that can be a foundation to guide an Optician, or lead him to recommend one Glass in preference to another, but all depends on the observation of the Short-sighted themselves — who I most earnestly advise, to be content with as Shallow Concaves as pos-

sible — *i. e.* to take the least Concave Glass through which they can distinctly discern the names on the corners of the Streets, and which gives a decided outline to objects whose distance does not exceed about 40 feet, and which renders them clear, without making Vision dazzling and glaring — the Glass which does, is too deep by a number. See *Appendix*.

After your Eyes have been long accustomed to the assistance of *Concave Glasses*, the smallest variation in the degree of their Concavity will be extremely distressing and injurious to them : — therefore when you have found Glasses which exactly suit you — have Two or Three pairs fitted to your Spectacles, that you may be provided if a Glass gets scratched or broken : — the best Spectacle Glasses cost but One Shilling each.

Near-Sightedness continues in nearly the same degree during Life, and precisely the same Glass continues to afford precisely the same assistance.

After persons have used the same Glass for some years — and it is broken, &c. it is

often extremely difficult to make them think, that any New one suits their Sight exactly so well as the Old one which they had been in the habit of long using: therefore *Pebbles* are especially desirable for the Short-sighted.

Persons who are extremely *Short-sighted*, to prevent their stooping in writing — to read Music, &c. &c. may wear Spectacles with very shallow Concaves, just enough to enable them to see such objects at the same distance which others do.

A Deeper Concave is wanted to see *very Distant Objects*. Dr. MASKELYNE,* the late

* “ When I look at the brighter fixed stars, at considerable elevations, through a concave glass fitted, as I am short-sighted, to shew them with most distinctness, they appear to me without scintillation, and as a small round circle of fire of a sensible magnitude. If I look at them without the concave glass, or with one not suited to my eye, they appear to cast out rays of a determinate figure not exactly the same in both eyes, somewhat like branches of trees (which doubtless arises from something in the construction of the Eye), and to scintillate a little, if the air be not very clear. To see day objects with most distinctness, I require a less concave len, by one degree than for seeing the stars best by night, the cause of which seems to

Astronomer Royal, to look at the Constellations, found it convenient to use a Concave one degree deeper than he wore for common purposes in the daytime — and the Author uses No. 2 in ordinary, but at Night sees many faint Stars well with No. 3, which he cannot see at all with No. 2. This is especially remarkable in the early part of the Evening, when the Stars first become visible. And at *Large Theatres*, he finds one Number deeper than that which he ordinarily uses is a very advantageous indulgence to his Eye.

To give more assistance to the Sight to see a

be, that the bottom of the Eye being illuminated by the day objects, and thereby rendered a light ground, obscures the fainter colours, blue, indigo, and violet, in the circle of dissipation, and therefore the best image of the object will be found in the focus of the bright yellow rays, and not in that of the mean refrangible ones, or the dark green, agreeable to Newton's remark, and consequently nearer the retina of a short-sighted person; but the parts of the retina surrounding the circle of dissipation of a star being in the dark, the fainter colours, blue, indigo, and violet, will have some share in forming the image, and consequently the focus will be shorter." — See *Phil. Trans.* vol. lxxix.

distant object, many persons hold a Concave Eye-Glass very obliquely to the Eye — in which position, a Concave No. 3 will give almost the same sharpness of outline to objects as No. $3\frac{1}{2}$ when held parallel to the Eye.

FOR DISTANT OBJECTS, extremely *Short-sighted* persons should use a SMALL OPERA-GLASS, which having an adjustable focus, if it only magnifies Twice,* will be infinitely better than any single Concave, because it can be exactly adapted to various distances.

My “*Invisible Opera-Glass*,” a contrivance of Mr. PIERCE and myself, is a great acquisition to Short-sighted Persons, and is an

* An Opera-Glass which only magnifies once, like the fashionable Grand Dandy Operas — of which the Eye-glass is as large as the Object-glass — is of no use to a *Near-sighted* person; — who, to receive the same benefit which a common Eye does, will require rather more magnifying power: — A very short-sighted person will receive very little more assistance from an Opera-Glass which magnifies *Twice*, than a person with a Common Eye will from one which magnifies *Once*.

inestimable little Instrument for Artists, &c. who wish to discern the distinct outline of objects at short inaccessible distances; *i. e.* for an Architect to see the exact outline of a Building a furlong off — or to examine the pointing, &c. of the walls of upper stories, &c.

When shut up in its case, this little Glass is only 2 inches in length; — when in use, about 3 inches: — it has a single plano-convex Object-glass $\frac{6}{10}$ of an inch in diameter, and its Magnifying power is about 3 times.

There is a very general *Vulgar Error*, that *Short-sighted* persons who use Concaves, as they get Older, become less Short-sighted: on the contrary, every Optician and *Short-sighted* person that I have consulted on this subject, have assured me, that as their Eyes become impaired by Age, to see distant objects sharp and distinct, they require rather deeper than shallower Concaves; and at a very advanced Age, sometimes complain that they cannot see to read so well as formerly, and require *Converes* of 36 or 30 inches focus.

MR. PIERCE informed me, that Dr. PARKER, the late Rector of St. James's, Piccadilly, had from his youth a short-sight; and when almost four score years of age, complained to him that he could not read so distinctly as he wished: with the help of Convexes of 36 inches focus, he was enabled to read and write with comfort to himself for several Years after. — See *Appendix*.

That a *Short-sight* is stronger and better than a *Common-sight*, I have always set down among the most absurd of *Vulgar Errors* — unless, to be half blind all their Life, as the Short-sighted are, is better than to be so only during about one-third of it, and that during the latter part of Life, as common Eyes are.

This prejudice is as foolish as the silly notion some people have, that a severe fit of Gout, is a thing to give a man Joy of, which our philosophical poet admirably illustrated when he said: —

“ So when small humours gather to a Gout,
The Doctor fancies he has driven them out.”

Essay on Man.

If the observations of Lord Chesterfield and Dr. Reid are true, a *Short-sighted Person without Spectacles* is under a sad disadvantage in the common business of Life. — The following is the advice this keen observer of Human Nature gave to his Son : —

“ Mind not only *What* people say, but *How* they say it : — if you have any sagacity, you may discover more truth by your Eyes than by your Ears. People can *Say* what they will, but they cannot *Look* just as they will ; and their Looks frequently discover what their Words are calculated to conceal.” — See Letter 77.

Dr. THOS. REID'S observation on the Eye, is—“ Of the faculties called *the Five Senses*,” Sight is, without doubt, the noblest : by means thereof we can perceive the tempers and dispositions, the passions and affections of our fellow-creatures, even when most they want to conceal them : and when the Tongue is taught most artfully to lie and dissemble, the Hypocrisy appears in the countenance to a discerning Eye ! and we can perceive what is straight and what is crooked in the

Mind, as well as in the Body." — *Inquiry into the Human Mind*, 8vo. 1818, p. 140.

However, it is some Consolation to the Short-sighted, to consider, that if the natural infirmity of their Eyes prevents their enjoying this advantage, the use of Spectacles, not only enables them to see what is passing in the Eyes of others, but that they form a veil over their own, which, in a great degree, prevents any such Scrutiny; and thus — their Weakness becomes their Strength.

CHAPTER XIV.

SPECTACLE FRAMES.

I PREFER a well-hammered SILVER FRAME with DOUBLE JOINTS, the Second joint of which may be turned on its pin over the First, so that they may be occasionally used with the Single joint only — they sit close and steady on the Head, and are convenient

to wear under a Hat — do not press either on the Nose or on the Temples — but their pressure is general and equal, and as it may be varied, may be rendered more agreeable than any other Frame.

Spectacles with only a *Single Joint*, must press hard somewhere.

TORTOISE-SHELL SPECTACLES have a gloomy heavy appearance, are no lighter than Silver ones, and are very easily and very often broken: — however, if you will have a Shell frame, let the front be all Black — variegated Shell is bad for the Eye.

The BLUED STEEL FRAMES are good looking enough when new, but soon lose their Azure lustre, and then look very shabby: there is a prejudice in favour of a Steel frame as being very light, and, from its elasticity, that its pressure on the Head is less than that of a Silver frame. — It may be for the first fortnight: but in the course of that time, such is the ductile nature of a *Silver frame*, which soon adapts itself exactly and comfortably to the Head, and becomes infinitely easier and pleasanter than the

springy Steel, which cuddles ones head rather too closely — the truth of the old saying, “as easy as an Old Shoe,” is remarkably felt in “an Old Silver Spectacle Frame.”

That *the Frame should be Light*, is the only point which either the Makers or the Wearers of it seem at present to pay any attention to — and to Lightness, every other property of it is willingly, but ridiculously sacrificed.

The actual difference in Weight between a Silver Front of that proper degree of strength which I have recommended, and one of the silly flimsy fronts which are commonly so much admired, does not exceed *Four Pennyweights*.

Let the Frame be large enough not to press on the Head, *or Head-achs, &c. &c.* will be the inevitable consequence.

THE LENGTH OF the BRIDGE, *i. e.* the distance between the Glasses, must be regulated by the distance between the Eyes, and *the Centres of the Glasses* must come exactly before *the Centres of the Eyes*; —

according to the coincidence of which, Vision will be perfect or imperfect.

The mean Distance between the centres of the Pupils of the Eyes of People in general, is about Two Inches and a Half.

The following are the usual proportions of Spectacle frames.

The Length of *the Bridge*, from an Inch to an Inch and $\frac{3}{10}$ ths.

Of *the Openings* which hold the Glasses, if they are Oval, the longest diameter should not be less than an Inch and $\frac{1}{10}$ th, the Shortest about $\frac{9}{10}$ ths.

The length of *the Common Knuckle* is about $\frac{4}{10}$ ths of an Inch:—in some peculiarly formed Faces, this must be wider, and in others narrower.

The Length of *the Knub Knuckle* (which is decidedly the most elegant) is only $\frac{2}{10}$ ths of an Inch.

THE WIDTH OF A COMMON FRAME.

| | Tenths. | Tenths. |
|--------------------------|---------|---------|
| Bridge - - - - - | 1 | 1 |
| Openings for the Glasses | 2 | 4 |
| Rims for ditto - - - - - | | 2 |
| Common Knuckles - - | | 8 |
| | 4 | 5 |

To assist the Optician to *ascertain exactly what ought to be the breadth of the Bridge*, I recommend him to have a Trial Frame, with an adjusting Bridge which will separate half an Inch — and such separating part graduated 1. 2. 3. 4. 5. for each $\frac{1}{10}$ th of an Inch — put these on, and adjust them till *the centres of the Glasses* come exactly before *the centres of the Eyes*.

If his Frames are numbered 1. — 2. — 3. — 4. — 5. according to the width of the Bridge — the Eyes of his Customers may be immediately suited to a nicety.

The form of the Bridge must be regulated by the form of the Nose which it is to cross.

The closer the Glasses are brought to the

Eye the better, provided they do not come so close as to be touched by the Eye-lashes — if they do, the Glasses will be continually dimmed by the moisture from the Eye-lashes; * and what is worse, the Eye-lids will become irritated and inflamed.

In the course of time Spectacle frames get out of proper shape, and become too loose to keep the Glasses up to the Eyes: — this arises so imperceptibly, that I have found it occur to several persons who were unconscious of it. — The Optician easily remedies this, by restoring the bend of the Sides to their original form, and new pinning the Joints of them.

Nothing can look more ridiculous, than the

* The quantity of TEARS spread over the Globe of each Eye in the space of 24 hours, amounts to *Two Ounces* and upwards; *i. e.* a common sized wine-glass full. — People who make use of Spectacles have opportunities of observing, that the evaporation of Tears tarnishes very much the Circles which surround the Glasses. — Dr. P. DEGRAVERS, *on the Eye and Ear*, 8vo. 1800, p. 116. Surely the subject on which the Doctor made this experiment must have been, “like *Niobe* all Tears.”

trick which some idle persons have, of suspending their Spectacles on the very tip of their Nose: — this is as *injurious* to their own Eyes, as it is *absurd* to the Eyes of others.

The Bridge of Spectacles *for Long-sighted Persons*, who wear them to read with, is best of the form, which, when the Eyes are employed in Reading or Working, &c. brings the Glasses parallel to the centres of the Eyes.

For Short-Sighted Persons, it should be straight — because the Glasses are required to be parallel to the Eyes when you look straight forwards horizontally.

The proper Shape for the Openings which hold the Glasses, is the true regular *Oval** — which form is similar to the Opening of the Eye — The Vulgar opinion is, that *Circular Eye Glasses*, are ground of the most perfect

* Spectacle frame-makers complain that the Glass grinders have a barbarous custom of distorting their Ovals, by putting in ill-shaped Glasses — and forcing the openings to adapt themselves to them.

Figure — the Fact is, that *the Oval Eye Glasses* are ground Round at first and then clipped Oval.

The Front of the Frame should project beyond the Glasses far enough to protect the Glasses when people carelessly lay them down on their surfaces — and also to prevent their being injured by rubbing against the Case, when passing in or out thereof.

The Front must be Strong enough not to bend in the smallest degree — or the Glasses will lose their parallelism with the Eyes, vision will be distorted, and the Sight distressed.

The whole of the elasticity of the Frame must be in the sides.

The First Joint should be of Silver wire of the $\frac{1}{15}$ th of an Inch in Diameter, and Four Inches and a half in length, and so curved as not to touch the Head except by the last half inch of it.

The First Joint is seldom more than $4\frac{1}{4}$ inches in length — but the apparently trifling addition of a quarter of an inch in its length, gives it a much more steady and comfortable attachment to the Head, than can be

imagined by those who have not tried it— especially when *the Second Joint* is turned down and you use it with *the First Joint* only.

The Second Joint should be flat, about the $\frac{1}{8}$ th of an inch in breadth, and $2\frac{3}{4}$ Inches in length, with a loop end — and the Pin which fastens it to the First Joint should be kept tight enough to preserve the Second Joint in whatever position the wearer finds easiest and most convenient. If this becomes loose it is easily tightened by placing the pin on which it turns, over a piece of Iron and giving it a gentle tap.

MEM. — If the Pin which fastens the Second Joint to the First is not rivetted very nicely and smoothly — every time You take off your Spectacles, you will find it *an Infal-
lible Depilatory* — and if

“Time has not thinn'd your flowing Hair,”
your Second Joint very soon will.

N. B. If the Second Joint be turned upwards to an Angle of about 30 degrees, it

will be in the best position for preserving the Frame in its proper place.

PRICES OF SPECTACLES.

| | £. | s. | d. |
|---|----|----|----|
| Best double-jointed silver Spectacles with Glasses | 1 | 1 | 0 |
| Ditto with Brazil Pebbles | 1 | 16 | 0 |
| Best single joint silver ditto with Glasses .. | 0 | 13 | 0 |
| Ditto with Brazil Pebbles | 1 | 8 | 0 |
| Double joint Steel ditto with Glasses | 0 | 5 | 0 |
| Single joint ditto | 0 | 3 | 6 |
| Ditto | 0 | 2 | 6 |
| Morocco Cases | 0 | 1 | 6 |
| Double-jointed Hand Spectacles in Pearl . | | | |

CHAPTER XV.

OF THE QUALITY OF SPECTACLE GLASSES,
AND HOW TO MEASURE THEIR
FOCAL LENGTH.

THE defects of Spectacle Glasses are either from Veins — Specks — Scratches — Colour — or false Figure.

1st. To discover *Veins* in a Convex Glass, place a Candle about 5 or 6 yards from you ; then look through the Glass, move it from your Eye till you find it full of Light, and you will then clearly see every vein, &c. in it which renders Vision imperfect by distorting the Objects.

2dly. *Specks* or *Scratches* are not so mischievous as *Veins* — for they do not distort the object, but only intercept part of the Light ; however, such defective Glasses will not be used, — except by such persons as think that their Two Eyes are not worth Two Shillings.

3dly. *False Figure*. To prove the Figure, lay a Book before you, hold the Spectacles in your hand, and looking through them remove them gradually from the Book. If the figure of the Glasses is false, the objects will appear distorted and confused. Thus if you view any cross lines which form small squares, through a falsely ground glass — some of the squares will appear with straight sides distinct and all of a size ; others with crooked sides of different sizes and confused ;

so that the whole will be neither like the original, nor all parts of it distinct at the same distance.

If you view it through a true glass, it will be exactly like the original figure and uniformly distinct, only magnified according to the degree of the power of the lens used; and as you gradually remove the Glass beyond the focus, if you take care to move the Glass perpendicular to the plane of the Paper, all parts of the object will become equally indistinct at the same distance.

4thly. *The Colour of the Glass* — That is the best material for looking through, through which Objects appear nearest to their natural Colour — the easiest way of examining the Colour of Glass is to lay it upon a piece of White Paper.

TO MEASURE THE FOCAL LENGTH OF SPECTACLE GLASSES. — The usual manner of measuring the focus of Spectacles, is to hold them opposite a window against the side of a room, and draw them gently away forwards until the frame of the window can be seen, making a small image through the

Spectacle glass on the Wainscot or Side of the Room. When the window frame appears most distinct, the number of inches, measured by a rule between the glass and the wall, or partition opposite, will shew the real focal length.

CHAPTER XVI.

PEBBLES.

SOME folks have a notion, that "*PEBBLES are much cooler to the Eyes than GLASSES:*"—the relationship between "a Pebble" and "a Stone" and the Proverb "as Cold as a Stone" probably gave rise to this prejudice in favour of Pebbles.

It is quite impossible to distinguish between good Pebbles and good Glasses.

People call that Glass coolest to the Eye, which is of the most proper focus for it, and which therefore irritates and fatigues it the

least — and through which they can see easiest and best.

The only superiority of Pebbles over Glasses is, that they are not so liable to be broken; and as they cannot be scratched by any thing softer than a Diamond, they may be carried in the pocket without a Case, which are certainly great advantages, especially to Travellers and Short-sighted Persons — (See page 117) but I must warn my friend the Reader, that Pebbles are so very veiny, that it is seldom a bit is found so perfect as it ought to be, and *therefore* 1 pair of the Best Pebbles cost 16s. *i. e.* as much as 8 pair of Glasses.

OBSERVATIONS ON THE MATERIALS AND
MANUFACTURE OF GLASSES FOR
SPECTACLES.

THE best material for the formation of *Spectacle-glasses*, is the White Plate, commonly

termed Dutch Glass; * it is very clear and hard, without veins or specks comparatively, and bears an excellent polish: Crown-glass is too dark and seedy for the purpose; French or British Plate is more difficult to polish well, and Spectacle-glasses made therewith are generally Grey; that is, the fine grinding from the Emery is not sufficiently polished off.

Much has been said to persuade the Public that each Spectacle-glass ought to be ground and finished singly by itself, else its defects of variety of *foci*, incorrect representation of objects, and false colouring, must be considerable. But every one acquainted with Glass Grinding, is well convinced, and will be ready to assert, that a Glass of so small a diameter as an inch and a half, cannot possibly be worked so steadily, nor so true, by the hand singly, nor polished off so fair and regular, as when several are

* I am informed, that THE BRITISH PLATE GLASS now made in East Smithfield, is very superior to any that was formerly made in this country. — *Editor.*

worked together in a Block: this block may probably hold four dozen of glasses, which are worked, ground, and polished together in a tool of an exact radius to produce the focal length desired. The firmness of a Block of Glasses secures you against the possibility of forming any irregular sphericity, and gives it a decided advantage.

Some years since, Spectacles were brought from Holland, the glasses of which had been heated sufficiently to receive a Concave or Convex form, by being pressed in iron Pincers or Moulds of various curvatures, without any other process: — it is easy to conceive that each Glass must have had an inequality of *foci*, extremely injurious to the sight of the unfortunate user, yet these vile glasses were almost universal throughout France and Germany.

In England it is no uncommon thing to find the Spectacle-glasses of an itinerant optician, ground on one side only, while the other side remains as it was originally cut out from the plate, without being worked at all, and, moreover, full of veins, &c. which

refracting the light irregularly — distort the object, and distress and greatly injure the Eye, and are as detrimental to the Eyes as the former; but the article is sold cheap, which is too often the most tempting recommendation to the million: but as a pair of the very best Glasses, which are warranted free from all imperfections, may be purchased for only two shillings — who would be so mad as to run the risk of forfeiting the fee simple of his precious sight for four-and-twenty pence! — for *a Groat a Year!!* for the Glasses seldom require changing oftener than once in Half-a-Dozen Years, and sometimes not in a Dozen!!!

CHAPTER XVII.

ON THE VARIOUS DEGREES OF THE PERFECTION OF THE EYE AND EAR.

GOOD and well-educated Eyes are as much delighted with the Harmony of Colours, as fine Ears are with the Harmony of Sounds —

and a cultivated Eye is as much distressed by ill-according Colours as a cultivated Ear is offended by discordant Sounds.

I well remember that excellent Musician, Dr. Arnold, telling me when I was studying Composition with him, that when he first began to learn Counterpoint, his Ears were so excruciated by the Chord of the 2nd of the Key — *i. e.* *the Sharp 6th* — that he used to call it “*the Gritty Chord.*”

It has been recorded that the Eyes of some persons have been gifted with such *Penetrating* power (as Dr. Herschell termed what I call *Illuminating* power) — that they could perceive the Moons of Jupiter.

I have heard of, but never met with such Visual organs. — Common Eyes can scarcely perceive them with a good Achromatic Opera Glass magnifying 4 times. — See the *Second Part of the Economy of the Eyes on TELESCOPES*, page 367.

Father *Castel* invented what He called an *Ocular Harpsichord* — which was strung with coloured tapes instead of wires, and being placed in a dark room, when the keys were

touched, the transparent tapes which corresponded with them became visible. C. published a pamphlet describing this Curious Machine, which was translated into English, and I once had a copy of it.

I have met with some very sensitive Ears, and have known several extraordinary Musicians who have been able, if a handful of the keys of a Harpsichord were put down, so as to produce the most irrelative combinations — to name each half-note without a mistake. — When I mentioned this to that excellent Organ Player, MR. CHARLES WESLEY, he said, “At the age of twenty, I could do it myself — but I can’t now.” He was then in his 55th year.

The delicately discriminating power of the ear is more the gift of Nature than extreme sensibility of the Eye, which latter is I believe always in a considerable degree the result of cultivation, — MISS CUBITT, of the Theatre Royal, Drury Lane, when only six years old, surprised me very much, by the high degree she then was gifted with the former faculty; so was MR. WATSON, of

the Theatre Royal, Covent Garden: which they still retain.

MR. T. COOKE, the Singer, and Composer to Drury Lane Theatre, whom no one will contradict me when I style the most extraordinary Musician of the present Age, when I put down the following Notes on a Piano-Forte, — told me at once, “I think, Sir, that you have *Beef* in one hand — and *Cabbage* in the other.

Db. Minor

B E E F , C ABBAGE.

C ABBAGE . B E E F .

or G# Major

Some Eyes are doubtless of as superior quality as these Ears.

See the 505th Receipt in the “Cook’s Oracle.”

But the other extreme is more common, of the ears being so dull and badly provided with defining power, that their owners can hardly distinguish "OH THE ROAST BEEF OF OLD ENGLAND" from "*Buttered Pease*;" and are more delighted with the discordant screams of their Pet Parroquet, the snarling of their Darling Dog — or some such Barbarous Uproar — than with the sweetest Melody, or the sublimest Harmony that Arne or Handel ever imagined.

Sound passes through the thin Paste-board Party Walls of modern houses with such unfortunate facility — that the majority of *Dogs* — *Peacocks* — *Parrots* — *Piano-fortes*, &c. which are within ear-shot of you are — *Actionable Nuisances!!!*

I believe that many of those imperfect Performances, and erroneous Opinions, which are usually ascribed to want of Skill, or want of Industry, or *Good Sense* — would be more justly, and will be, set down to the want of *Good Senses* — by all who adjust the Microscope of Criticism with Good-nature.

When I have heard the works of various

Artists, of Painters, Engravers, &c. found fault with for either bad drawing, or bad colouring, or finishing, — I have often thought that such defects, in construction or arrangement, have been owing more to the Eyes of the Artists not being capable of shewing them how to do better — than to the carelessness, &c. which they have been inconsiderately censured for by those who had a sharper Sight.

A good Eye, is unhappy, till every part of its work is as perfect as it can make it: — the gratification which it then receives is so superior to all other considerations, that to obtain it Labour becomes Pleasure.

We find persons of profoundly Good Sense, have imperfect notions on some subjects, to a degree which is quite surprising until explained on these principles.

Few men are “framed so in the prodigality of Nature,” as to have all their Senses in perfection — very few have a single One, that approximates within many degrees of it, the Eye of *Raphael*, the ear of *Handel*, — or the sensitive Touch of the Blind Girl who

could *feel Colours*,* are pancratic faculties which are seldom produced.

The peculiar Genius and Character of each Individual originates either in the exquisite sensibility, or in the extreme obtuseness of some single Sense: — this makes one man a Painter, another a Musician, in opposition to all the influence which can be set up against it.

Many eminent Painters and Musicians were originally self-taught, and, unable to resist the fascination of their Eye or Ear, were so overcome by their love of their Art — that they have overcome all Obstacles which were placed in their way to prevent them pursuing it.

I have met with Persons in whom the sense of Seeing or Hearing was so absolutely predominant, that — the other Four appeared to be totally eclipsed :

“ And hence one MASTER PASSION in the breast,
Like Aaron's serpent, swallows up the rest.”

* In vol. vi. p. 555, of the 4to. edition, 1772, of MR. BOYLE'S Works, there is recorded a case of a blind

Where Nature has given an *extremely* sensible faculty to a man, the employment thereof is more delightful and easy to him than the employment of any other, and the cultivation of it, an irresistible enjoyment.

This is *Genius* in the proper sense of the word, whether in Mind or Body, and is the supereminent faculty which is born in man.

The possession of extraordinarily *Perfect Senses*, is by no means so enviable as people ordinarily imagine; — if their Pleasures are more exquisite, their Pains are in proportion more acute, — the works which they enable the possessors to produce, can only be properly appreciated by faculties equally perfect and equally cultivated.

The purblind

“ Undelighted, gaze on all delight.”

The Sagacity to comprehend, and to estimate the importance of any un contemplated improvement, is confined to the very few,

person at Copenhagen, who could distinguish Colours by the Touch.

on whom Nature has bestowed a sufficient degree of perfection of the sense which is requisite for the measurement of it.

The Candour to make a fair report of it, is still more uncommon.

The Kindness to encourage it — cannot often be expected from those, whose most vital interest it is, to prevent the development of that, by which their own importance — perhaps their only means of existence — may be for ever eclipsed ; and therefore,

“ ————— Many, are
Condemn'd in Business or in Arts to drudge,
Without an Equal — or without a Judge!”

Thus, the Inferiority of the Senses of others, prevents their deriving much advantage from the Superiority of their own.

When Ability and Industry have overcome the difficulties always attending the perfect execution of exquisite works, they have still to contend with the obfuscated imaginations of the Ignorant, — and the malicious misrepresentations of the Idle, — the Interested, —

and the Envious, — and are rarely repaid for their exertions, unless they are content to reckon with the Poet, that

“ One self-approving hour whole years outweighs
Of stupid starers, and of loud huzzas.
In parts superior what advantage lies?
Tell, for you can, what is it to be wise?
'Tis but to know how little can be known,
To see all other's faults, and feel our own;
Painful pre-eminence, yourself to view
Above life's weakness, and its comforts too.”

Persons who have *Bad Senses*, *i. e.* only just enough Ear and Eye to hear a Dinner Bell, and find a Spoon — often appear to be gifted with *Good Sense* in a very superior degree, and seem to think deeper than those who have the EXTERNAL SENSES in greater perfection. — When those avenues to the interruption of Intellectual abstraction, the Eyes and Ears, are half shut, — it is reasonable to suppose, that the Thinking Faculty may be more active, and more perfect.

Those persons whose External Senses are obtuse and imperfect, are generally close

Reasoners — subtle Calculators — rigid Economists, — and in all respects Persons of exemplary Prudence.

The Insensibility of people who have *Bad Senses*, exempts them from many diverting temptations, which assail those who *See* — *Hear* — *Feel* — *Taste* — and *Smell* in perfection.

That Paragon of *Good Sense* — Dr. S. JOHNSON, was *Short-sighted*, and could not see distinctly more than 4 or 5 inches from him.

His Ears were imperfect also, — when others expressed the delight they received from Music, he said, “ I should be happy to have that sense given to me ; ” — and when a celebrated Player had finished an elaborate Concerto, which they told him was extremely difficult, — he said — “ Sir, I wish it had been impossible.”

The slovenliness of his own Dress, — I dare say arose from the defect in his Sight, preventing him from being sensible of the agreeable impression produced by proper attention to Neatness.

We have irresistible evidence that *his Taste was defective*, — for his appreciation of a Good Dinner, was according to *the Scale which Tasteless people always measure by*, — the Variety, the Rarity, and the Costliness of it, — for he needed not Dainties to excite his Appetite, — that, we are told, was sharp enough.

CHAPTER XVIII.

OPERA-GLASSES.

“ Ne damnent, quæ non intelligunt.”

THIS entertaining Optical Instrument seems to have escaped the observation of preceding writers on Optics: — the whole, of the “*Lex Scripta*” which I have seen about it, is, that “*An Opera-Glass*” is like a Galilean Telescope, and composed of a concave Eye-glass and a plano-convex Object-glass — and that its Magnifying power will be augmented, in

the proportion that the focal length of the former is diminished, and that of the latter is increased.

As so little has been written on this subject, I have embraced this opportunity of endeavouring to communicate such information as I have collected concerning it.

Few persons know even

“ *How to Adjust an Opera-Glass* ” —

partly from the want of this knowledge, and partly from the very low Magnifying power, and imperfect construction of Common Opera-Glasses, I have not been much surprised, when I have heard people insist, that such Instruments are useless Machines, which are made merely to be sold. Others, from not knowing how to adjust them, I have heard complain that their Eyes are always so much strained by looking through them, that they are afraid to use one.

To look through a Good Opera-Glass, when it is properly adjusted, I have not found to be more fatiguing to my own Eye, than to look with as earnest attention at the same

Object, for the same length of time, with my naked Eye. These mistakes of Ignorance and Impatience, would not happen so often, if the Instruments were properly constructed, and if, in the case of every *Opera-Glass*, there were pasted *Plain Directions* for adjusting it to Distinct Vision.

The irritable state of the Eyes, which some Persons complain of, after having passed the evening at a Theatre, is not a mere local affection, — but is to be attributed chiefly, to that general exhaustion of their nervous Energy, which many suffer when they do not retire to rest at their accustomed hour.

To give some idea of *the Focus*, Opticians sometimes draw a line round the Tube,* where it is most distinct for a Common Eye at the distance commonly required in our Large Theatres, which, *to see the Scenery in*

* As the Reader may have observed, that the Spying Glasses which are in use at Watering Places, and at Sea, have a mark on their tube which is called *the place to set it to* — very few persons have any idea that every variation in the distance of the Object, or the Age of the person, requires a variation of the adjustment of the Glass.

perfection, is seldom less than about 50 or 60 feet.

When You use an Opera-Glass, — hold the Outer tube in one hand, and the Inner with the other hand, and *while looking through the Glass at the Object you wish it to shew you*, ADJUST IT patiently and precisely:—thus,—press the Eye-tube towards the Object-Glass, Vision will gradually increase in distinctness as the Eye-glass approaches its proper distance from the Object-glass, and when there, the Object will be seen perfectly and sharply defined — if the Eye-tube be put in beyond the proper distance, the object will again become indistinct, and in that case, the Eye-tube must be withdrawn again: — a very little practice, will enable a person easily to obtain the precise point at which the most perfect distinctness can be obtained. — This is a much better way of adjusting an Opera-Glass — than to put it up to the Eye, and then *pull out* the Inner tube, by which act, if the tube does not slide regularly, or is shorter than you expect, it may suddenly slip out, and strike your Eye,

and plant a *Cataract*. To prevent this, in the best-finished Opera-Glasses, the end of the inner tube is attached to the outer tube by a spring which screws in.

The greater the Magnifying power of an Opera-Glass, the greater nicety is required in adjusting it.

If You wish to see any thing 10 or 20 feet further off, or as much nearer, — for each variation of distance, a corresponding variation of ADJUSTMENT is required; i. e. of the distance of the Ocular Glass from the Object-Glass — which must be diminished, in the proportion that the distance of the Object is increased. This caution is quite necessary. I have met with many persons who have condemned an Opera-Glass, because they could only see some objects distinctly with it, and for others they found it useless — merely, because they had not been told, that every variation of the Distance of the Object, requires a corresponding variation in the ADJUSTMENT. More Opera-Glasses have been condemned for the want of this knowledge, and more Eye and Object-Glasses have been

spoiled than from all other causes put together. Those who are not aware of it, suppose, when they turn their Opera-Glass to an Object to which it is not adjusted, that its Glasses want wiping, and they keep rubbing, till in a little time they render them as unfit to look through as Ground Glass.

To See an Object distinctly at any given distance, *The longer and older the Sight of the Person*, the longer the tube must be drawn out. Thus — if a person of 20 years of Age, who has *a common Eye*, has adjusted an Opera-Glass with a power of 4, for distinct vision at the distance of 60 feet, and wishes to set it so that a person of 40 or 50 years of Age, who uses Convex Spectacles of 36 or 30 Inches focus, may see as distinctly with it an object at the distance of 60 feet, he must pull out the tube about the eighth of an Inch further, — more or less, as the Eye is longer or older, and the Magnifying power, and the distance of the Object, are more or less, — or they must look through the Opera-Glass with their Spectacles on.

Near-sighted People, when they wear their Spectacles, See at the same focus as persons who have a common eye; — without their Spectacles, the tube must be pushed in nearer to the Object-Glass.

If an Opera-Glass has been kept in a Cold place, it very commonly happens that soon after a person has taken it from its case, a Mist will spread itself over the Glasses, so as to prevent his distinguishing any Object. — This arises from the cold air within the Tubes becoming condensed on the Glasses, either by the heat of the hand or of the house, — if the Inner tube is drawn out from the Outer tube, the Mist will presently go off, and the Glasses become quite clear — without any wiping.

The best way of holding an Opera-Glass.

If you put it up to your Right Eye, hold it with your Left Hand, in such a manner, that the Left Arm forms a blind before the Left Eye.

Some Fidgety folks, when not looking

through their Opera-Glass, keep ever and anon, pawing and *wiping the Eye or the Object-Glass*; — neither of these should be touched, except when it is absolutely necessary to clean them, and then, only with a bit of soft Leather, fine Linen, or the finest Silver Paper.

The Sliding Tube soon becomes dirtied by the dampness of the hands; — to avoid this, *do not touch the Sliding Tube*, but take hold only of the Neck of the Eye-head, and adjust by that. *The Sliding tube must be wiped occasionally*, and at the same time wipe round the cloth lining of the larger tube, so that it may slide smoothly — if it will move only by fits and starts, you will not be able to adjust it accurately.

I have heard persons (unacquainted with the Laws of Optics) complain, that an Opera-Glass magnifying 4 times, has not so large a *Field of View* as a Glass which magnifies only 2 — this cannot be remedied; their only alternative, is to have a small Field distinct, or a large Field of little or no use; — with a power of 4 they have in quality, what with 2 they have in quantity, — the objects which

they do see, they see much more than twice as distinctly.

In 1821 there sprang up "*the Grand Dandy Opera-Glass,*" with a Great Eye-glass, as big, as its Object-glass! — it was imagined, — by the Amateur Optician who introduced it, — that by increasing the diameter of the Eye-glass, the field of view was proportionately increased, and that *the Stops*,* which had

* These are often opened too Large, especially in Opera-Glasses made with a Single Object-Glass. — As the Eye-glass should be a little Larger — so *the Stop* should be a little (*very little*), not more than $\frac{1}{20}$ th of an Inch, less than the cone of Rays coming from the Object-glass.

The effect of the Stop varies according to its distance from the Object-glass.

The Diameter of the Aperture of the Stop, must be proportioned to the Degree of the Magnifying Power — the former must be contracted, in proportion that the latter is increased — if it is too large, the Vision will be confused and indistinct by the intrusion of False Sight; if it is too small, part of the pencil of rays will be cut off.

The subject of STOPS is excellently illuminated in a Paper on "Indistinctness of Vision," caused by the presence of False Light in Optical Instruments; and on its Remedies, by C. R. GORING, M.D., in the Journal of Science, No. XXXIII. for April 1824.

heretofore been placed as Sentinels to prevent the intrusion of false light, — were impertinent impediments.

The fact is, — these great Grand Dandy Eye-glasses, actually magnified very little, and on that account had a very large Field :— hold a Card with an aperture of half an inch in diameter, before the large Eye-glass, you will find the field of view as large, and the Vision as bright through that, as through the Eye-glass of an inch and a half in diameter :— or, apply a Concave of an inch and a half in diameter, which makes them magnify 4 times, and you will find that the field of view is not a hair's-breadth wider through that, than it is through an Eye-glass of only half an Inch in diameter.

Vision through the Smaller, is more distinct than through the Larger Eye-glass :— the Eye is apt to wander about before large Eye-glasses, and the margin of the field of view is curved, — *Vision is perfectly distinct, only, when you look precisely through the centre of the Eye-glass.*

I have related some further Observations,

PRO AND CON *Concave** *Eye-glasses* — when I treated on the comparative Illuminating Powers of Cassegranian, Gregorian, Newtonian, and Achromatic Telescopes, in the *Second Part of this Work* ON TELESCOPES.

The field of view in Telescopes constructed with *Convex Eye-glasses*, is regulated by the Stop which is placed in the focus of the 1st Eye-glass, or that next to the Eye; — the diameter of the Stop is regulated by the diameter of the 2d Eye-glass, the diameter of which, varies according to the Magnifying power used. If the Stop be opened larger than the 2d E. G. it will produce a strong Orange Colour around a very indistinct margin — *with the same Magnifying power, the field of view is the same*, whether the Aperture of the Telescope be *One Inch*, or *Three*. This is easily proved, by contracting the Aperture of a *Three Inch* Telescope to *One Inch*, when the field of view will remain the same;

* See several Remarks on *Concaves* in Sir W. Herschel's paper on the Quintuple Belt of the planet Saturn. — *Phil. Trans.* for 1794, vol. lxxxiv. p. 28; and in vol. cv. p. 296.

you will find that the only difference in its appearance, is the diminution of the brightness of it.

But with Perspectives or Galilean Telescopes, or OPERA-GLASSES which have a *Concave Eye-glass*, the *Field of View*, when they do not magnify more than *Twice*, depends in a great measure on the *Diameter of the Object-Glass*.

If an Object-Glass of an Inch and a half in diameter, is made to magnify only twice, it will have a much larger field than an Object-Glass of an Inch in diameter.

But when a Magnifying power of 4 times is applied, an Object-Glass of *an Inch* aperture will have very nearly as large a field as one of *an Inch and a half*; but through the larger aperture, Objects will appear twice as bright as they do through the smaller, the Illuminating power of the larger, to the smaller aperture, being as 22 to 10.— These facts any body may prove, by looking through an aperture of *an Inch and a half*, and then contracting it to *an Inch*.

Some of our most valuable discoveries have

been purely accidental, and as little the result of scientific investigation as the Telescope, which was found out by Children playing with the lenses in a Spectacle-maker's workshop: — these Great Grand Dandy Eye-Glasses, as big as Object-Glasses, led me to consider — *what Diameter of Eye-Glass and Object-Glass is actually useful.*

Theoretical Opticians have said, — that if the Eye-glass be as large as the Pupil of the Eye, it will perform as well, as if it was as big as the Dome of St. Paul's.

The Opening of the Pupil of the Eye is in inverse proportion to the Brightness of the Objects presented to it — as the latter increase in Brightness, the former diminishes in Diameter; therefore the less the magnifying power, the less the Pupil of the Eye — which is always in an inverse proportion to the bigness and brightness of the pencil of Rays from a Telescope.

The ordinary opening of the Pupil, when the Eye is turned to the Light, has been computed to very little exceed $\frac{1}{16}$ th of an Inch in

Diameter.—See Figure 3 in the Engraving fronting the Title, and No. 10 of the APPENDIX.

Under the idea, that the opening of the Pupil when before an Opera-Glass, is of the like dimension, it has been assumed, that, no matter what be the Magnifying power, or what the Diameter of the Object-Glass of an Opera-Glass, an Eye-glass of $\frac{2}{10}$ ths of an Inch in Diameter, would be even larger than is requisite.

My Eye had for some time suspected the Truth of this Theory:—wishing to avail myself of the amusement of a change of Magnifying power, and to have an opportunity of illustrating its effects to others, I had a *Revolving Eye-head* made like the double Head of the French Opera-Glasses, invented by Mr. CAUCHOIX,* with two

* I have had Three very good *Achromatic Opera-Glasses* made for me by this Optician, of an Inch and a half, and One of Two Inches aperture; but the latter size is heavy, and inconveniently, and, I think, uselessly large,—its Double Object-Glass weighs 5 ounces, and the Instrument altogether 9 ounces, and cost £5 in Paris. — See an account

Glasses — one magnifying 3, the other $4\frac{1}{2}$; the Eye-glasses were $\frac{3}{10}$ ths of an Inch in

of Mr. CAUCHOIX's Opera-Glasses, in page 374 of the *Edinburgh Review* for October 1819.

MEM. — I do not quote this, because I am of the same opinion as the erudite Editor of the paper referred to: my own opinion of Opera-Glasses is impartially stated at the termination of this note.

LEMIERE, No. 6, *Palais Royal*, has introduced an Opera-Glass with a Screw adjustment, similar to what our One foot Achromatic Telescopes in a Brass Tube on a Stand have — but the adjustment is so fine, that it is more difficult to find the exact focus with it — than it is by moving the Tube, provided that be kept clean, and slides smoothly: his charge for an Opera-Glass with this adjustment, and an Achromatic Object-Glass of an Inch and a half in diameter, magnifying $2\frac{1}{2}$, is £2. 4s.

The machinery for adjusting the focus, may be as much too fine as too coarse. — The fine Screw adjustment, which still seems the best that can be applied to Gregorian Reflectors, was applied to the original 46 Inch Achromatics; but when even a power of 150 is applied to them, it is not quick enough, and the focal point is not half so easily and exactly hit, as with the more modern invention of the Tooth and Pinion adjustment on the side of the Tube.

I do not mean to insinuate, that I think the productions of our English Opticians are not equal to those of the Parisian Artists — I have had several Dozens of *Opera-*

diameter, and I was surprised to find, that on trying an Eye-glass of half an Inch in diameter, Vision was considerably brighter and easier to my Eye.

The Magnifying Power of an Opera-Glass may be varied several different ways.

1st, By having a Concave fixed in the Eye-head, which magnifies $2\frac{1}{2}$, for viewing Pictures, &c. — and another to screw on over that, which will increase the power to 4, for Theatrical purposes :

2dly, By having a Concave fixed in the Eye-head, which magnifies 4 — and a Convex to screw on over that, which will reduce the power to $2\frac{1}{2}$. I like this last plan best, because most light is required, with the power of 4, for theatrical purposes. The additional Glass may be attached to the Eye-head by a hinge on the side ; and when only one of them is wanted, the other may be turned up. The opening of the Stop in

Glasses, made by our London Opticians, which are as elegantly formed and finished, and the Optical parts are as perfect as Art can produce.

the Eye-head must be regulated to suit the deepest power:—or when that is used, a smaller Stop must be brought before the larger one, in the manner in which the Sun-Glass is brought before the Eye-Glasses in the 4 Eye-Glass Perspectives.

I am induced to offer it as an invariable maxim, — that although there may be no use in the Diameter of *the Eye-glass* being much larger, yet, it *should be somewhat larger than the Pencil of Rays transmitted by the Object-glass* — which, when an Object-glass of $1\frac{1}{2}$ Inch Diameter magnifies 3 times, will, if not cut off by the Stop,* be $\frac{1}{2}$ an Inch. (*See next page.*)

As I have before observed, it has been assumed that the opening of the pupil of the Eye, when before an Opera-Glass, is about

* *To ascertain whether any of the Object-glass is cut off by the Stop in the Eye-tube* — adjust the Opera-Glass to Distinct Vision — then, take out the Eye-glass, put your Finger on the edge of the outside of the Object-glass, and look down the tube — if you can see your Finger just peeping over the edge of the Object-glass, none is cut off.

$\frac{1}{10}$ th of an inch in diameter; — I believe it does not exceed $\frac{9}{10}$ ths: — that the Image is brighter with a pencil of three-tenths and three-quarters than it is with one of three-tenths, my Eye assures me is evidently true — but why the larger pencil of rays makes a stronger impression on the Eye, I will not pretend to offer any reason* — I know, it is contrary to the accepted Theory; however, it is True.

“ There are more things in Heaven and Earth, Horatio,
Than are dreamt of in your Philosophy.”

SHAKESPEARE.

The Diameter of the Eye-glass, for any Opera-Glass, and any Magnifying power — should be rather more than what is given by reducing the diameter of the Object-glass into *Tenths* of Inches, and dividing that, by the Magnifying power —

Thus: for an Object-glass of 1 Inch and a half, — or fifteen 10ths in Diameter, — if a Magnifying power of 4 times be desired,

* See *Sir Wm. Herschel's* observations on Night-Glasses, in p. 68 or 69 of vol. xc. of the *Phil. Trans.*

divide 15, the number of *Tenths* the Object-glass is in diameter, by 4, the Magnifying power: —

$$\begin{array}{r} 4)15(\frac{3}{10}\text{ths and } \frac{3}{4}\text{ths, the diameter of the} \\ 12 \qquad \qquad \qquad \text{Pencil of Rays.} \\ \hline 3 \end{array}$$

I would have the *Eye-glass* somewhat larger than the Pencil of Rays; *i. e.* for an Object Glass of $1\frac{1}{2}$ inch in diameter, and magnifying 4 times, I think that my Eye sees easiest, when the opening of the Aperture in the Eye-head is about $\frac{6}{8}$ ths of an Inch in diameter.

The Eye-head should be of Black Ivory, not less than an inch and $\frac{3}{8}$ ths in diameter, and made concave, something in the form of an Eye-bath — or a shade on the side similar to those prefixed to the Tubes used for viewing Pictures, so that it may form a Screen around the Eye, and prevent the intrusion of any rays upon the retina, except those coming directly from the Opera-Glass — this, will not only improve the Vision very much, but also render it much easier to the Eye.

The average Distance, at which a Common Eye, can see distinctly, the expression of the Human Countenance (in a good light) has been calculated to be about 15 feet.

The average Distance, between the Actor and the Spectator, in the Boxes of a Theatre, is about 4 times 15 feet, i. e. about 60 feet — therefore, to shew distinctly, — an Opera-Glass must magnify 4 times.

*The Operas which have only one sliding Tube are the Best; — in those which have more tubes, the centre of the Object-glass and the centre of the Eye-glass are very seldom exactly opposite to each other, and in proportion as they are Eccentric, Vision is Imperfect, and the Instrument (according to a very usual and very useful Optical phrase) is said, to be — *Out of Adjustment.**

Look with a scrutinizing Eye through *Operas which are elaborately ornamented* and have many Tubes, for it is one of those General Rules which has the fewest exceptions, that those which are so very pretty to look at, are — not seldom — mere Toys,

which are made to be looked at, rather than to be looked through.

This Caution is quite needful, friendly Reader — for I think I have been as much puzzled to produce arguments to persuade my friends that *Opera-Glasses* are not always to be chosen for their Tubes, as I have had to assure them that a *Piano-Forte* will not always make good its claims, to favour from the Ear, exactly in the proportion that its external appearance happens to please the Eye.

As ten are made of the plain mountings, to One of the other, it is, in like proportion, easy to pick out a fine one.

The majority of the Opera-Glasses which are sold at Trinket and Toy-shops, magnify so *little*, and are of so *little* use, that many people who have good Eyes, say with truth, that they can see as well with their naked Eye; I have met with many who have said so to me — but, when I have shewed them *a good Opera-Glass, magnifying 4 times, precisely tuned to the peculiar pitch of their Visual*

Organ — they have All, acknowledged, with astonishment and delight, the surprising aid that their Sight received from the Eye-invigorating power of Optics, which enabled them to *See Persons in the most distant parts of the Theatre, almost as distinctly, as those who were within 15 feet.*

After a deliberate, and fair trial of the Magnifying powers of 3—4—5—6, &c., my Verdict is, — that for use in the Theatre, for Common Eyes, *a Magnifying power of about 4 times, is decidedly, the most generally useful and agreeable,* — and what is of great importance, as the Eye is sometimes before it for a long time, it is *much easier to the Eye than a Higher Power.*

It is desirable, that the Magnifying Power be as *Low as can be*, that the Field of View may be as *Large as can be*; because the latter depends partly on the former — moreover, the vapour from the breath of a large Assembly, and the Smoke from the numerous Lamps, &c. prevent our using much Magnifying power.

When I suggested my opinion of what

ought to be the Magnifying power of an Opera-Glass to an Optician — I was told, “It has been tried — but the less they magnify, the more people like them; and indeed, those seem to be most approved, which magnify so little that they scarcely require any Adjustment.

Exquisite Opera-Glasses, that have no focus! — and are equally distinct, whether all the Eye-tube is pulled out, or all put in!! — or you put up the Large, or the Small end to your Eye!!! — My Optical friend added, with a smile, “You may laugh, Sir, — but every body has not time to listen to a Long Story about FOCUS, — ADJUSTMENT, &c. &c. &c. — Gentlefolks don't like a troublesome thing, that requires *Half a Minute* to set it in some particular form, before they can see through it.”

OPERA-GLASSES have been one of my favourite hobbies for the last Thirty Years — and to gain the information contained in these pages, I have carried my experiments to the greatest extent possible, for I think I have tried almost All Apertures and All Focal

Lengths — I had one Object-glass made by Mr. PIERCE, of 4 Inches in Diameter, and from that Brobdignagian, he made for me all the intermediate sizes, down to the Lilliputian, which I have called my “*Invisible Opera-Glass*,” whose Object-glass is only $\frac{6}{10}$ ths of an inch in Diameter, and of which an account is given in page 119.

My favourite *Single Object-glass Opera-Glass*, which is very portable, and very light, for it only weighs two Ounces, — has a Plano-Convex Object-glass, of one inch and $\frac{2}{10}$ ths in Diameter, and usually magnifies $2\frac{1}{2}$, but with a deeper Eye-glass of $1\frac{4}{10}$ ths for Common Eyes, or $1\frac{3}{10}$ ths for the extremely short-sighted, may be made to magnify about 4 times — its price £1 : 1.

The most effective Achromatic Opera-glass for general use, which I have seen, is of an *Inch and a Half* aperture, with a *Power of 4* — it is conveniently portable, an entertaining companion at a Play-house, and a very pleasant Prospect-glass.

If the Eye-glass is changed, for One which makes it magnify Twice, it will be an excel-

lent Instrument to assist the Sight to view distant *Pictures at Exhibitions, &c.* which it will shew with very beautiful effect — *Short-sighted* persons (especially) will find it an incomparable assistant to give them a *General View of the Constellations*, — and it also deserves to be recommended as an excellent Finder to such as are fond of turning out on a fine frosty night to sweep the sky for a *Comet*, — those who are not, or have not Courage or Constitution to brave the inclemency of midnight Frosts and Damps, without which, actual Astronomical Observations cannot be made in the noble Theatre of Nature, I recommend to pay a visit to the

OURANOLOGIA,*

in which is shewn the most beautiful and perfect Orrery ever exhibited, and is one of

* This *Lecture on Astronomy and the Phenomena of the Heavens and of the Earth*, is annually given during Lent, at the English Opera House, on a magnificent Orrery, of One Hundred and Thirty Feet in Circumference. In this immense Machine, the Sun, and all the Planets and Satellites revolving round him, are seen in motion, with

the most Instructive Exhibitions that youth can be taken to.

“ Stars teach as well as shine.”

“ An Undevout Astronomer is mad.”

“ The Heavens are telling the Glory of GOD, and the Firmament sheweth his handy work.”

“ These are THY Glorious Works,
PARENT OF GOOD, ALMIGHTY.”

“ A Deity believed, is Joy begun ;
A Deity adored, is Joy advanced ;
A Deity beloved, is Joy matured.”

DR. YOUNG.

The late Astronomer Royal, Dr. MASKE-
LYNE, who was short-sighted, had a *Bino-*
cular Opera-Glass, i. e. two Opera-Glasses,
magnifying about twice, fixed in the opening
of a Spectacle frame, which he placed before

their comparative Diameters and Orbits. *The Comet* of
1811, descending in its eccentric orbit towards the Sun,
arriving at its perihelion, and retrograding, being an
original and entirely novel mode of exhibiting and illus-
trating this beautiful Phenomenon.

MR. BARTLEY well deserves the fame he has acquired,
by the impressive manner in which he delivers his illustra-
tions of these sublime subjects.

his Eyes, like as you put on Spectacles. I remember seeing a pair of such Spectacles in the Observatories, of MR. LARKINS, on Blackheath Point; of MR. AUBERT, at Highbury; and of MR. HODGSON — at Hoddesdon.

For those purposes which do not require a Magnifying power exceeding $2\frac{1}{2}$ — a Single Object-Glass of $5\frac{1}{2}$ inches focus, and of $1\frac{2}{10}$ ths in diameter, is, very nearly, quite as good as an Achromatic, and costs only half as much.

The Colorific, and Spherical Aberrations, which cause that fringe of colour, and indistinctness around the margin of the field of view of Single Object-glasses — which arise in an extreme degree, when the Aperture of a Single Object-glass, is too large, for its focal length — or the Eye-glass is too short, and magnifies too much — and are sometimes so glaring when such a Glass is pointed at a highly illuminated object in the *Day-time*, are often hardly, it at all, perceptible in a *Theatre*, unless it be directed to the Lights. But half the errors of aberration arising from the over large apertures of

Single Object-Glasses are rendered imperceptible in most Opera-Glasses, either by a small Stop cutting off half of the cone of rays, or the Eye-Glass, or aperture in the Eye-head, not being half large enough to receive them, and while the observer imagines that his Object is illuminated by an aperture of $1\frac{3}{4}$ inches, perhaps he has, in fact, not the use of an aperture of $1\frac{1}{4}$.

Concave Eye-glasses may be had for 1s. 6d. each, and it will afford some amusement to have three or four, Magnifying 2 and 3 times, for viewing Pictures — 4 for the Theatre — and 5 or 6 as a Perspective Glass, for use at a Review, or on a Race-course, &c. For 15s. every degree of Concave may be purchased — that is from Two inches to One inch focus, proceeding by tenths of inches: thus — any one who is anxious to give his Eye all the assistance that Art can afford it, may readily do so to the utmost nicety.

The following Rules will serve for ascertaining the comparative degrees of the Magnifying Power of several Eye-Glasses, although, gentle Reader, you may think that the 1st — is one

of the completest Paradoxes you ever met with.

1st. “*The more a Glass Magnifies, the more it Diminishes ;*” — *i. e.* if you have two *Concaves*, or *Convexes*, and wish to know which magnifies most — hold one in each hand, about one foot from your Eye, and about five feet from a window frame — the Lens through which the panes of Glass appear *least*, magnifies *most* : or hold it a foot from two Candles which are near together — that Lens in which the candles appear closest together magnifies *most* — this is the readiest way of ascertaining the comparative power of various Lenses.

2nd. The further the Eye-glass requires to be removed from the Object-glass, and the more the Inner tube must be drawn out — the more the Eye-glass magnifies. If an Opera-Glass magnifies 3, and the Eye-glass is changed for a concave which is a little deeper to make it magnify 4 times, to obtain distinct vision the tube will require to be drawn out further.

The Double Object-glass before mentioned

is an Inch and a Half in Diameter: its length, when in use, when it magnifies 4 times, is about 4 Inches; and with its tubes weighs 3 and $\frac{3}{4}$ Ounces; — a larger Glass is cumbersome to carry, an unsightly machine to use; and the additional Illuminating and Magnifying power gained by a larger aperture and longer focus are in a Theatre of no use.

There is no need of a Magnifying power of more than 4 times, nor of a pencil of rays of more than three-tenths and three-quarters in diameter, which is given by an Object-glass of an inch and a half in diameter.

That *the Field of View* is considerably larger through an Object-glass of Two inches in diameter, if the Magnifying power be as much as 4 times, is a *Vulgar Error*.

The increase of the field of view in the larger Object-glasses is comparatively very trifling, and much more than counterbalanced by their unwieldy weight and length. — Moreover, the difficulty of making Object-glasses, as their diameter is increased, increases in so high a ratio, that those of Two

inches, very rarely define Objects so perfectly and sharply, as those of an Inch and a Half in diameter.

In every department of Art, the *acmé* of perfection is always partly accidental, and is not to be attained with undeviating certainty by any Rules; and as there are 100 of $1\frac{1}{2}$ made for 1 of 2 inches aperture — it is, in the like proportion, more easy to select a Fine One.

Imperfections in the Object-glasses of Opera-Glasses, like those of Telescopes, are magnified and become evident, as the Magnifying power of the Eye-glass is increased.

Defects in an Object-glass which, when it magnifies only *Twice*, are almost imperceptible — when it Magnifies *Four* or *Five* times, become too glaring to pass muster before a good Eye — the Vision, (especially the margin of the field of view,) becoming less Sharp, and the edges of the Objects being fringed with Colour.

Opticians charge £2. 12s. 6d. for the Best Achromatic Opera, in a plain mounting, with an Object-glass of $1\frac{1}{2}$ inch in diameter, and

which magnifies 4 times — £2. 2s. for the Common Achromatics, which magnify $2\frac{1}{2}$ — and £1. 1s. for those of like power with Single Object-glasses.

I must here caution my Reader, that the real, or the relative powers, of various *Opera-Glasses*, can only be accurately appreciated by actual trial in the Theatre, in which they are to be used — especially, comparisons of Achromatic and Single Object-glasses; and unless particular care be taken that they are glassed with precisely the same kind of Glass, with Concaves which give precisely the same Magnifying power, and the Glasses are directed to the same Object, at, as nearly as can be, the same time; and the Ocular Glasses and Object-glasses are all perfectly clean — Comparison will be in vain.

The difference of even $3\frac{1}{2}$ and 4 in the degree of Magnifying, will, with some objects, give quite a different character to an Opera-Glass, — even if the Object-glasses and Eye-glasses are equally good.

An inexperienced person, will say that the

Opera-Glass which magnifies 4 times *defines* some objects more *distinctly* than that which magnifies only $3\frac{1}{2}$ — but that there is a greater degree of *brightness* about the latter, and that the vision in it appears *clearer*:— This, is thus to be accounted for: *the lower the Power*, the clearer and brighter objects appear, and up to a certain maximum, (which I think for use in a Theatre is about 4 times,) *the higher the Power* the better minute objects will be defined, and the sharper and more distinct the Vision will appear.

The Achromatic Object-glass above-mentioned, is composed of a *Plano-Concave* lens, and a *double Convex*,* which, combined, are

* Sometimes a *Film or Fog* forms between the *Object-glasses*, or, as the Optical phrase is, “the Glasses sweat:” when this happens, they must be taken out of their cell, and wiped with a bit of soft Leather or of very fine Silver Paper; but never do this but when it is absolutely needful, and then, take care to replace them in the same position; it is seldom requisite oftener than once or twice in a Year. Nor wipe the Object or Eye-glass except they really require it— as often as you wipe them, you scratch them a little.

generally (in every part) of the thickness of about $\frac{3}{8}$ ths of an Inch.

The thickness of the usual *Plano-Convex Single Object-glass* of the like focus, — in the central and thickest part of it, is seldom more than $\frac{2}{8}$ ths of an Inch, and in the thinner parts, not half that: — however, such is the advantage of the *Achromatic* — that if you compare *a Single*, and *a Double Object-glass* of $1\frac{1}{2}$ inches in Diameter and $4\frac{1}{4}$ inches focus, and put to them Eye-glasses which make them magnify 4 times, you will find that Vision (except just in the centre of the field of view in the Single Object-glass,) is more distinct, and objects are more sharply defined through the Double, than they are with the Single Object-glass. If you contract the aperture of the Single Object-glass to $1\frac{3}{10}$, you will find the Errors of Aberration considerably diminished — more so, if you limit it to $1\frac{2}{10}$ ths; and if the focal length of your Single Object-Glass is increased from 4 to 6 Inches, its vision will be still more improved. If its aperture be $1\frac{2}{10}$ th, the opening of the

Stop must be limited to a little less than $\frac{3}{10}$ ths of an inch in diameter.

Tenths the Object-glass
is in Diameter,

Mag. Power 4) 12 ($\frac{3}{10}$ ths, Diameter of the
12 Pencil.

The Chromatic and the Spherical aberrations which produce prismatic colours, and distort the Vision in the Margin of the field of view, — exceedingly distress the Eye, and which are *the main Evil of Single Object-glasses* which have a larger aperture in proportion to their focal length than an aperture of $1\frac{2}{10}$ ths inches, to $5\frac{1}{2}$ — and which magnify more than 3 times, are in a great measure corrected in *Double Object-glasses*, with which the Image of Objects appears more Distinct, in proportion as the order in which the Rays proceed is better preserved.

The Grand superiority of the Double, or, as it is commonly called, Achromatic Object-glass, consists in the field of view being almost quite as distinct at the margin, as it is in the

centre, and thus, Vision is made easy to the Eye, with a considerable Magnifying power.

The Eye, is sadly puzzled, how, to adjust itself with a Single Object-glass, when it magnifies more than 3 times — (especially if its focus is less than $5\frac{1}{2}$ inches, and its diameter more than $1\frac{1}{4}$), which then becomes indistinct, except just in the very centre of the Field. I think that *in the very Centre of the field* of a Single Object-Glass, the vision is quite as vivid, if not more so, than it is in a double Object-Glass — but as only just the very middle of the field is distinct, looking through it soon becomes much more fatiguing to the Eye than with a Double Object-Glass.

Those who wish to prove this, may get a Single Plano-Convex Object-glass for five shillings, of exactly the same diameter and focus as the Achromatic one I have recommended in page 173, — and judge for themselves. If Vision is distinct, when the Single Object-glass is at the same distance from the same Eye-glass, as when the Double one is used, the Magnifying power will be the

same — if the Eye and Object-glass must be brought nearer together, the Magnifying power is less, and the Single Object-glass is of too short a focus — *to have a fair comparison, the focal length of each Object-glass, as well as of each Eye-glass, must be exactly the same.*

For a Single Object-glass, to be at the same distance from the Eye-glass as a Double One of the same focus, the Eye-glass must be brought, apparently, full $\frac{2}{10}$ ths of an Inch nearer to the Single Object-glass, to make up for the Double Object-glass projecting so much further up the Tube than the Single One does.

I formerly thought, that for use in a Theatre, the Single Object-glass was best.

Until Mr. PIERCE, about Five Years ago, just before he retired from business, made me an Achromatic Opera-Glass, which magnified 4 times, I had not seen a Double Object-Glass, nor do I think one had been made, which magnified more than $2\frac{1}{2}$, which is the power usually put to those commonly sold. — My own excellent Single Object-

glass, which Mr. P. made for me, magnified rather more than $3\frac{1}{2}$ —it is no wonder, then, that I preferred it to the ineffective Double ones which only magnified $2\frac{1}{2}$.

The reasons why Opera-glasses were formerly not made to magnify more than $2\frac{1}{2}$ —were, that the small size of the Theatres at the time these instruments were originally invented, did not require more magnifying power, — and that with such a low power, the imperfections in vision arising from the Spherical and Colorific aberration of the Single Object-glasses of the very large* Apertures, with which it has been the fashion to make them latterly, were comparatively trifling — indeed, an Opera-Glass seems hitherto, to have been considered as *a Pretty Thing to Look at, — or a Play Thing to Look through*, rather, than — AN USEFUL AND ENTERTAINING INSTRUMENT TO SEE WITH, its Proper Powers have never before been

* The origin of these *Great Single Object-Glasses* of so short a focus, was an attempt at an imitation of the *external* appearance of the *Achromatic Opera-Glass*.

explained — with such Low powers, they were easy to Opticians to make, and to their Customers to use.

I feel no awkwardness in publishing this recantation of my former opinion respecting Single Object-Glasses — but willingly embrace this welcome opportunity of acknowledging my Error — to want the Candour to do so, — would be to want the Courage to confess that I am wiser To-day, than I was Yesterday, — remembering the excellent Advice given by *Pope* in the 368th and following lines of his *Essay on Criticism*.

— “ Positive, persisting Fops we know,
Who, if once wrong, will needs be always so ;
But You, with pleasure own your Errors past,
And make each day, a Critique on the last.”

To measure the Magnifying Powers of Opera-Glasses.

Look at one object at the same time with both Eyes, — one eye viewing the object through the Glass, and the other without it.

You will find some difficulty at first in keeping both Eyes open in this unusual way,

while looking through the Glass ; but after a few trials you will be surprised at the great accuracy and ease with which the Powers can be ascertained.

The Object to be viewed, must not be more distant than what the naked eye can distinctly define ; and not less distant than 60 or 80 feet. For this purpose, the best Object to be viewed, is perhaps the front of a building of regular stone work, with indented horizontal joints : or when such an object does not readily occur, a building of good regular brickwork will in general be found to answer tolerably well : other objects, as the squares of glass in a long window, which are usually of the same size, will be found convenient for the small powers that are usually applied to Opera-Glasses.

It will be obvious, from what has been said, that the object to be viewed must consist of a number of equal divisions in the height. These divisions must be regarded by one eye through the Opera-Glass at the side, and close against the object as seen by the other eye ; and the number of divisions

seen by the naked eye in the height of one division as seen through the Glass, is of course the Magnifying Power.

The foregoing process gives the Magnifying power in whole numbers. It is, however, desirable sometimes to ascertain the power of an Opera-Glass to the fraction of one quarter: this may be done by marking every fourth course of brick-work with a chalk line; and the number of these chalked divisions and the additional joints of brick-work seen with the naked eye, in the space of one chalked division as seen through the Telescope, gives the Magnifying power in whole numbers and quarters.

The Magnifying Power of any Object-Glass of an Opera-Glass, is in proportion to its distance from the Eye-Glass — as I have before observed. Therefore — a person who is so *Short-Sighted* as to use a Concave No. 4, does not derive that degree of advantage from an Opera-Glass, that a *Common Eye* does — the same Opera-Glass which only magnifies $3\frac{1}{2}$ for him, — will magnify 4 for a *Common Eye*, and for a *Long Sighted Eye* of

60 Years old, which requires convex Spectacles to read with, of 18 inches focus, it may magnify $4\frac{1}{4}$, or perhaps rather more.

Short, and Long Sighted Eyes when they look through an Opera-Glass, with their Spectacles on, will see at the same focus, and consequently with the same Magnifying Power as *Common Eyes* — *Without Spectacles* the *Near Sighted* will have about, or almost, half a degree *less*, — the *Long Sighted*, about as much *more* Magnifying Power. The exact Focal length of the Eye-glass which is best for any peculiar Eye, will be best determined by Experiment. See page 177.

LASTLY — take care that the front edge of the cell containing the *Object-Glass* projects at least the 10th of an inch beyond the surface of the middle part of the Glass — that it may be properly defended when laid down; and that it may not be soiled by the stuffing in the top of the case coming against it; this said stuffing is a mighty silly decoration, and much better omitted — if the inside of the top of the case be required to be double natty, let it be lined with bright green velvet.

— *The Eye-end* should be sufficiently distant from the *Eye-glass* to prevent any thing touching it.

DIAGONAL OPERA-GLASSES. — To the object end of an Opera-Glass may be attached a plane mirror, placed at an angle of 45 degrees, like the small speculum in a Newtonian Telescope: if this be well made, and the lateral aperture is as large as the Object-glass, the Illuminating power is so sufficient, that the light lost by the reflection is almost imperceptible, and the Diagonal, is almost quite as bright as the Direct vision.

This is an entertaining Optical Plaything, with which, you may observe distant objects, as unobservedly, as you can those which are near with *the Circumspector*, — as the Instrument points to a different object from that which is viewed, and there is an aperture on the side, it is almost impossible to guess which way you are observing.

However trifling in value, or however imperfectly expressed the foregoing Observations I fear are in many respects, notwithstanding the extreme labour and care I have bestowed in order to be accurate and intelligible — I hope, that my Reader will give me credit for having done my best, to put him into complete possession of all the “Practical Facts” which I have been able to accumulate.

Of the many “Castles in the Air,” which Theory has built at the expense of Truth, — there are none more numerous, or less substantial, than those which have been set up by Speculative Opticians. — I have not aimed at amusing the Imaginations of such Ingenious Persons with abstruse Algebraic calculations, or of amazing the Reader with a confounding crowd of cramp Technical terms, which are only intelligible to Practical Opticians — by which, if some Writers have succeeded in exciting a few

“Wits and Philosophers, Scholars and Conjurors,”
to admire their amazing erudition — it has

been at the unwise expense, of rendering their works entirely useless to the Public.

The humble efforts of the Author, have been confined, to an ingenuous Endeavour to give a plain unvarnished account of the actual results of his experience, in so clear a manner that — All may easily and exactly Understand.

Truths interesting to All, should be told in Terms intelligible to All.

Errors, and Omissions, will no doubt be found, and from enlightened Readers, — will meet indulgence — They, — know, — how unavoidably, — and how often, — such defects, will escape the most persevering industry, and most unremitted attention.

Those who are already well acquainted with the subject, which I have devoted many an hour to illuminate so plainly, that I hope All may understand, may think I have upon some matters, been tediously minute, — but, if I had not written so fully and so plainly — I could not have enjoyed the main gratification I receive from publishing this little book, the pleasure, of hoping, that it will give

an attentive Reader, in a few Hours — what the Writer, has been collecting Many Years.

“ Content, if hence th’ unlearn’d their wants may view,
 The learn’d reflect on what before they knew :
 Careless of censure, nor too fond of fame ;
 Still pleased to praise, yet not afraid to blame ;
 Averse alike to flatter, or offend ;
 Not free from faults, nor yet too vain to mend.”

POPE.

CHAPTER XIX.

THEATRES.

I AM informed that the distance from the front of the opposite Boxes to the Curtain is—
 At the English Opera House 50 Feet.

| | | | | |
|---------------|-------|----|---|----------|
| Drury Lane | - - - | 60 | — | 6 Inches |
| Covent Garden | - - | 63 | — | — |

I am I believe correctly informed, that at the Theatre which GARRICK rebuilt in *Drury Lane*, and where he established his immortal

fame, *the distance from the Front Boxes to the Curtain was not more than 47 feet 6 inches*, — and am disposed to attribute no small part of the great admiration which I hear that he excited in those who saw him act, and who speak still of the extraordinary distinctness with which he spoke, and of the variable and incomparable expression of his Countenance, — to the Spectators being so much nearer to the Stage.

I understand from the best authority, that at the cotemporary Theatre of *Covent Garden*,* the distance of the Spectators from the Performers was then 8 feet further, *i. e.* 56 feet — and that the disadvantage of this greater distance, was then frequently remarked and complained of.

“ In most theatres, whoever wishes to have

* “ In this Theatre, 1 foot 9 inches was the whole space allowed for seat, &c. though a moderate-sized person cannot conveniently sit in less space than that of 1 foot 10 inches from back to front, nor comfortably in less than 2 feet.” — G. SAUNDERS, *Treatise on Theatres*, 4to, 1790, p. 84.

a tolerable view of the Stage, must be situated beyond the reach of the Actor's voice—but if he wishes to be near the Stage, he is (in the Boxes) miserably seated sideways—I am confident, that where the distance of 70 feet from the Scene to the opposite Boxes is exceeded, the Actor will be heard very imperfectly.

“ It is an universal custom to take *the point of Sight for the Scene Painting*—at the centre of the front of the opposite boxes; and this, not only for the flats or end scene, but for the side scenes also, in which it is necessary, in many instances, to represent one continued line, such as the side of a Room, &c.; in which case, the least remove from the centre breaks this line, and weakens the effect of the scene. This demonstrates that our painted Scenes can be viewed to a proper advantage in one situation only; and that they will appear defective in proportion as they are viewed at a distance from this point.

“ It has often been observed, that if we view a person at a greater height than an

Angle of 45 degrees, the features appear distorted, and the expressions grimace.

“To discern well the motions of the features, we cannot be too near the Actor: it is with great difficulty we comprehend them at the distance of 75 feet, and scarcely with satisfaction at more than one-third of that distance.

“OF THE EXTENSION OF THE VOICE.

“Having traced a Circle of 100 feet in diameter, I placed the speaker in the centre; the distance, therefore, was the radius of 50 feet every way—the hearer moving in the circumference of this circle, heard most distinctly when in front of the speaker, not much less so on each side, but scarce at all behind, and contrary to the common notion, that Sound ascends further than it descends— that

“THE DESCENSION *of Sounds exceeds* THE ASCENSION.”

Exp. 2. — “The Well-hole of the Staircase in St. Paul’s Cathedral, which is free

of any redundancy of sound, is about 8 feet in diameter, encircled by a stone wall, and covered with a skylight. At some distance from the bottom, and near the top, were alternately placed Speaker and Hearer; when the Voice descending was heard at the distance of 80 feet, ascending 70 feet." — From the interesting *Treatise on Theatres*, 4to, 1790 (published by Taylor at the Architectural Library in Holborn), pages 91, 2, 4, and 6: this entertaining Volume gives a Description, and the Plans and Dimensions, of all the principal Theatres in Europe; and in which those who desire further information on such subjects will find it both minutely and plainly set forth.

I attribute Mr. GARRICK'S superlative success, to his proximity to his audience — I cannot imagine, that there is any part which *the English Roscius* of that day played, — but that several of our present excellent Actors perform quite as well.

If our Actors appear to fail in any part, it arises from no other cause than occasionally

being obliged to overstrain their Voice, (which cannot be done without some distortion of the features,) from being *at Drury Lane* 13, — and at *Covent Garden* 15 feet 6 inches, further from the Audience than in Mr. Garrick's Theatre: — the very superior illumination given by the Argand lamp foot lights, side lights, &c. and the Brilliant Gas light Chandeliers which are suspended from the centre of the Ceiling, in a great measure counteract the disadvantage of the increased distance, as far as the Eye is concerned, especially when it is assisted by a good Opera-Glass.

The Magic power, which some Performers seem to possess, of making themselves heard distinctly all over the House, without any apparent effort — depends infinitely more on the faculty they have of catching and caging the intense attention of the whole Audience than upon any extraordinary exertion of their Voice.

In MR. ARNOLD'S Theatre, the distance between the Performer and the Spectator is

only 2 feet more than it was in Mr. GARRICK'S House.

The following accurate account of the Building of the present DRURY LANE THEATRE will, I think, be as interesting to the Reader as it is honourable to the Judgment and the Integrity of Mr. BENJAMIN WYATT, the Architect who built it.

The Amount of the Original Estimate for the present DRURY LANE THEATRE, as designed by Mr. BENJAMIN WYATT, was £118,850, calculating on the work being completed on the 31st of December, 1812.

It being subsequently decided, that the Portico and the external Composition upon every front, excepting the West front, should be omitted, the Estimate was reduced to the sum of £112,750; those Items having stood in the original Estimate at the sum of £6,100.

After the Estimate had thus been reduced to the sum of £112,750, certain extra works were decided upon, which (*previously to*

such decision) were computed at - - - - - £11,540

During the progress of the work it was decided that the Theatre should be opened to the Public on the *10th of October*, instead of on the *31st of December*, 1812, as at first intended; the additional expense arising from which alteration was calculated at the sum of - - - - - £1,500

Making, together with the foregoing sum, a total of - - - - - £13,040 above the reduced Estimate.

Which sum of £13,040 added to £112,750, (the amount of the reduced Estimate) makes a total of - - - - - £125,790 which was the precise sum actually paid for the Building; so that in fact *the Proprietors*

never were subjected to One Shilling of expense for the Building beyond the amount at which it was estimated; although, from the alterations above stated, in the work executed, the Estimate was, from time to time, either diminished or augmented.

The Building was commenced on the 21st of October, 1811, and opened to the Public on the 10th of October, 1812, a period of little more than eleven months.

| | Distance from the Curtain to the Front Boxes. | Number of Per- sons the Seats in the Boxes will contain. | The Pit will contain. | The Lower Gallery. |
|--|---|---|------------------------------|-----------------------|
| At the English Opera House, in 1823. | Feet. 50 | 700 at 5s. £175 | 650 at 3s. £97 10 | 400 at 2s. £40 |
| Drury Lane, in 1823. | 60—6 | 1134 £396 18 | 700 £122 10 | 500 £50 |
| Covent Garden, in 1821. | 63— | 1000 at 7s. £350 | 700 at 3s. 6d. £122 10 | 500 at 2s. £50 |
| Haymarket, in 1823. | | 700 at 5s. £187 10 | 400 at 3s. £60 | 320 at 2s. £32 |

For the above Calculations I am indebted to Mr. ARNOLD, Mr. WINSTON, and Mr. JAMES BRANDON.

“When HIS MAJESTY went to *Covent Garden Theatre*, on February 7th, 1821, the Performances were *Twelfth Night* and *Harlequin* and *Friar Bacon*—Twelve Hundred People paid to the Boxes—but there is not Sitting room for more than a Thousand.”—

| The Upper Gallery. | Total Number of Seats. | Money. | Private Boxes. |
|-------------------------|---------------------------|---------|---|
| 250 at 1s. £12 10 | 2000 | £325 | In the Private Boxes, 160 Persons. |
| 300 £15 | 2634 | £584 14 | 16 Family Boxes, 124 Persons, 24 Private Boxes, 192 Persons. |
| 300 at 1s. £15 | 2500 | £537 | 26 Private Boxes, 172 Persons. |
| 200 at 1s. £10 | 1670 | £289 10 | 14 Private Boxes, 98 Persons. |

Mr. J. Brandon, late Box Book-keeper to *Covent Garden Theatre*.

When HIS MAJESTY visited *Drury Lane Theatre*, on Monday the 1st of December, 1823, every part of it was crowded to excess; but I could not learn the exact number of the Spectators.

When THE KING went to *Covent Garden Theatre*, on Wednesday the 3d of December,

1823, the Performances were *The Cabinet* and *Timour the Tartar*, and the number of Persons who paid to the

| | |
|-------------------------|-------|
| Boxes - - - - - | 1936 |
| Pit - - - - - | 1123 |
| Gallery - - - - - | 776 |
| Upper Gallery - - - - - | 420 |
| | <hr/> |
| | 4255 |

exclusive of *Private Boxes*.

The above account was given to me by *Mr. Robertson, the Treasurer to Covent Garden Theatre*.

It appears by this Document, that such was the universal and earnest desire of HIS MAJESTY'S Loyal Subjects to behold their GRACIOUS SOVEREIGN—that a greater number of Persons assembled in the Theatre on that Evening, than had ever been within it on any previous performance: the whole scene was most brilliant.

“ GOD! SAVE THE KING ”

was sung several times. Many appear to have taken much pains to shew *When* our favourite National Anthem was *composed*,—

I have endeavoured to shew HOW it ought to be SUNG* with

“ Good Emphasis and Good Discretion.”

See No. 4. of “the Loyal and National Songs of England.”

Perhaps the latter information, may be as useful as the former—for I remember to have read in “*The Cook's Oracle*,” that “it is no matter how Good your Meat is, if it is not well Dressed.”

* Never having seen a Complete Score of “GOD SAVE THE KING” for a full Band, Vocal and Instrumental,—I have given one, and have marked the Words as they ought to be expressed, in “The Grand Selection of THE LOYAL, NATIONAL, AND SEA SONGS OF ENGLAND, published in Commemoration of the Coronation of KING GEORGE THE FOURTH, and most humbly Inscribed, and with Gracious Permission dedicated to THE KING'S MOST EXCELLENT MAJESTY by William Kitchiner, M.D.

Printed for Hurst, Robinson, and Co. Booksellers to His Majesty, No. 5, Waterloo Place, Pall Mall, in which is now first printed, from the Original MS. in the possession of the Editor, DR. JOHN BULL'S “*God save the Kinge*” — A.D. 1616, and a Fac-simile of the earliest printed Copy of “God save the King” (1745), and 110 other LOYAL, NATIONAL, and SEA SONGS of ENGLAND.

I believe, I am entitled to the honour of having given the first hints which have been written, as to *How what is Sung so often ought always to be Sung.*

“*The Words being marked with proper Emphasis*—it is presumed will infinitely heighten the effect, and may be a standard for the performance of it, and *ensure the proper pronunciation of the Words, and the effective expression of the Music*; and revive that harmonious combination of them, the want of which has long been deplored,—by all who have faculties to comprehend how great is their power when united, and

‘Sound is married to immortal Verse.’—MILTON.

“As soon as this is generally considered, Singers will see their readiest road to fame, is to avail themselves of the double power of making the words an appeal to the Hearts and Understandings of their Auditors—as well as attacking their Ears with everlasting Volatas and obstreperous Cadenzas, &c.

“To produce effect on others—Actors must themselves feel the passion they wish to

inspire their audience with — and to sing with proper and effective expression, must give to every Syllable, and to every Quaver, its exact relative value ; but not *SHOUT* and *BOWL* upon *From—To—Of—In—And—But—On*, &c. &c. merely because they happen to be placed (improperly) under the accented part of the Bar, or under a long note, — or a favourite note in their voice.

“ *MELODY* is the soul of *MUSIC* — *POETRY* is the soul of *Melody* — the warbling of Sounds without the distinct articulation of words pronounced with proper accent and emphasis does not deserve to be called *Singing* : — it is merely playing upon the voice — a *Concerto on the Larynx*, and comparatively, as uninteresting as a *Frame* is without a *Picture*. Briefly — *THE ART OF SINGING EFFECTIVELY* — is to *Sing every word with the same Accent and Emphasis as You would Speak it.**

* “ The Pupils of our excellent English Composer *Dr. ARNE*, were remarkable for their proper pronounciation. — It will be thought almost incredible when I relate that all

In singing "GOD! SAVE THE KING," if every Syllable be sung, as it commonly is,

"GOD save great George our King,"

these words are pronounced as if they were spelt —

Gaw-od say-eev grey-eat Jaw-orge ow-er Kee-ing ;

thus making Monosyllables into Dissyllables.

the fine and clear pronounciation of the words which distinguished the late Mrs. Kennedy, natural as it appeared, was the entire effect of hard up-hill application of the Doctor's lofty conceptions of what was calculated to touch the Hearts and Understanding of the Auditors. This immense difficulty was often accompanied by tears and sobbings, as impossibilities ; but ARNE knew otherwise, and 'Omne tulit punctum.' I say it is inconceivable what lights the Doctor threw on the accentuation of each Word, nay on every Letter of every word, whether commencing or finishing with either vowels or consonants, so as to render the Sense of the Song intelligible to the most common ears as well as to the most refined. He would pass whole mornings, and never give up the Idea, that *the Poetry of a Song ill expressed* was a Nullity to the Understanding, instead of a Blaze of Light ; and thus he succeeded with the British Public."

“ If the proper pronounciation be preserved, it must be thus —

$\overline{\text{GOD!}} \text{ save } \overline{\text{great}} \overline{\text{George}} \text{ our } \overline{\text{Kin`g}};$

the only syllables in this line which should be sung, the time indicated by the notes, are — $\overline{\text{GOD!}} \text{ save} —$ and — $\overline{\text{George}}$.

“ *This Solemn Invocation to the ALMIGHTY!* as commonly sung, sounds more like a *Song of Triumph*, than a *Prayer* for the preservation of our SOVEREIGN — hardly a word of it, except the first and last line, is heard distinctly.

“ How much would the effect of this Loyal Anthem be increased, if the name of GOD! was uttered with due reverence!!! And if Singers would consider, that “ GOD save the King,” is not a florid Song, but an Anthem, — and like other Anthems admits of hardly any ornament beyond an Apogiatura —

“ *Sing ye Praises with Understanding.*”

PSALM xlvi. ver. 7.

Instead of vying with each other, which shall

introduce most Trills — Shakes, &c. try who can most distinctly articulate every Syllable, and most effectively utter every Word!

“*The Loyal Anthem* is not a singular example of the want of the coincidence of the Musical, and the Prosodical Accent.

“It is almost impossible to point out a Song that can be sung, exactly, as it is set down, from this want of the coincidence of the Rhythms of the Poetry and the Music, — which it is no easy task, even to Singers of superior ability, to adjust perfectly — so as to give full effect to the Poetry; and, at the same time, preserve the Melody.” — See *Observations on Vocal Music and Singing*.*

The following is a *Specimen of the manner of marking the Words* which it is recommended to Composers to avail themselves of, as a means of avoiding false Accent and Emphasis of the Poetry they are going to set — and to Singers, to *mark the WORDS* of Songs (as they would speak them) *before they think*

* Printed for Hurst and Robinson, No. 5, Waterloo Place, Pall Mall, 12mo. 1821, price 4s.

about the TUNE, which will enable them to correct any little errors of accent, which may have inadvertently occurred in Songs already set to music. This may almost always be accomplished without any detriment to the Melody, and to the infinite improvement of most Songs.

1.

GōD ! sāve Great Geōrge, oŭr King,
 Lōng live oŭr Nōble King,
 GōD ! sāve the King ;
 Sēnd Hīm victōriōūs,
 Hāppŷ, and glōriōūs,
 Lōng tō reīgn oŷer ūs,
 GōD ! sāve the King.

2.

Ō Lōrd, oŭr GōD ! ārise,
 Scāttēr hīs enēmies,
 Ānd māke thēm fall ;
 Cōnfoūnd thēir pōlitics,
 Frūstrāte thēir knāvish tricks,
 Ōn Thēe, oŭr hōpes āre fix'd,
 Ō sāve ūs āll.

3.

Thŷ chōicest gifts īn stōre,
 Ōn Geōrge bē pleās'd tō pōur,
 Lōng māy Hē reīgn ;

Mày Hē dēfēnd oŭr Lāws,
And èvēr gīve ũs cāuse,
Tō sīng wīth Heārt and vōice,
GōD! sāvē thē King.

APPENDIX,
RESPECTING SPECTACLES.

No. I.

RULES FOR CHOOSING SPECTACLES.

BY G. ADAMS, OPTICIAN.

“ WHEN the eye sensibly flattens, all delay is dangerous ; and the longer those who feel the want of assistance, defer the use of Spectacles, the more they will increase the failure of the eye: there are too many who procrastinate the use of them, till at last they are obliged to use glasses of 10 or 12 inches focus, instead of those of 36 or 40, which would otherwise have suited them ; thus preferring a real evil, to avoid one that is imaginary. Mr. Thomin mentions several deplorable cases of this kind, particularly one of a lady, who, through false shame, had abstained

from wearing Spectacles so long a time, that at last it was impossible to suit her, but with those adapted to eyes that have been couched. Whereas the instances are numerous of those who, by using glasses of a long focus at the first approach of Short-sightedness, have brought back their eyes to their natural sight, and been able to lay aside their spectacles for years.

“These considerations point out clearly the advantages that may be obtained by a proper choice of spectacles on first wearing them, and the importance of making such a choice; as the eye will endeavour to conform itself to any improper focus, and thus be brought into a state of extreme age, at a much earlier period than would have happened had they been suited with judgment. There are very few Opticians but what must have seen instances of those, who by habituating their eyes to too short a focus, or too great a magnifying power, have so injured those tender organs, as to deprive them of future assistance from glasses. This frequently happens to those who purchase their spectacles of

hawkers and pedlars, men equally ignorant of the science of optics and the fabric of the eye.

“ Let it, therefore, be carefully remembered, that magnifying power is not the point that is most to be considered in the choice of Spectacles ; but their conformity to our sight, their enabling us to see distinctly, and with ease, at the distance we were accustomed to read or work, before the use of Spectacles became necessary : or, in other words, glasses should so alter the disposition of the rays, at their entrance into the eyes, as will be most suitable to procure distinct vision at a proper distance ; an end of the highest import, as in this respect it places the aged nearly on a level with the young, and enables him to read a common print with ease, at a period when, without assistance, he could hardly distinguish one letter from another.” — G. ADAMS *on Vision*, 8vo. 1789, p. 105.

No. II.

MR. G. ADAMS' OBSERVATIONS ON
SHORT-SIGHTEDNESS.

“ It is generally supposed, that the *Short-sighted* become less so as they advance in years, as the natural shrinking and decay of the humours of the eye lessen its convexity, and thus adapt it better for viewing distant objects: but among the great number of *Short-sighted* that I have accommodated with glasses, I have ever found the reverse of this theory to be true, and their eyes never required glasses less Concave, but generally more Concave as they grow older, to enable them to see at the same distance.” — G. ADAMS *on Vision*, 8vo. 1789, p. 126.

“ I have found it necessary, in some instances, to give Convex Glasses to the Short-sighted when very far advanced in age, not because their Eyes were grown less convex, but to give them more light, and counteract an extreme contraction of the pupil.” — *IBID.* p. 127.

No. III.

OPTOMETERS.

DR. PORTERFIELD invented an Instrument for measuring the focal distance of the Eye, which he called an *Optometer*. — See *Edinb. Med. Ess.* vol. iv. p. 85.

This *Optometer* has been considerably improved by DR. T. YOUNG, and has been made by MR. W. CARY, of the Strand, and is easily applicable for the purpose of ascertaining the focal length of Spectacles required for Myopic or Presbyopic Eyes. — See an Account thereof in DR. YOUNG'S interesting Lecture on the Mechanism of the Eye in page 36 of the *Phil. Trans.* vol. xci.

This ingenious Instrument is a valuable succedaneum to a person residing at a distance from an Optician; — but when the choice of Glasses can be obtained, the plain plan I have laid down in Chapter X. is more accurate, and more satisfactory.

No. IV.

DR. SMITH'S RULES FOR CHOOSING
SPECTACLES.

“ 51. In order to determine the properest Glasses for defective eyes, the distance from the eye, where an object begins to appear confused, should be found — by measuring the least distance from which a *Long-sighted* person can read a newspaper distinctly and readily: and likewise by measuring the greatest and the least distances from which a *Short-sighted* person can read small print readily.” — DR. SMITH'S *Optics*, *Rem.* p. 8.

“ Those Glasses are the properest for defective Eyes, which are the least *Concave*, or the least *Convex* of any that will answer the purpose of distinct vision.” — *Ibid.* p. 8.

“ 58. Thus, any person may be fitted with the properest Glasses though he lives at a distance from the shops where they are sold, by sending their focal distances computed by the foregoing rules. But if choice

of Glasses be at hand, they may be better fitted by trial; observing only to use those Glasses which are the least *Concave* or the least *Convex* of any that will fit the eye. For since they cannot be put quite close to the eye, the less any glass is *Concave*, the less it diminishes the pictures of any objects upon the retina. It will also accustom the eye to that conformation of its coats and humours, which is proper for seeing objects as far off as it can; and consequently may prevent the eye from growing more Short-sighted.

On the other hand, the less any glass is *Convex*, the less it magnifies the pictures of objects upon the retina; and also obliges the eye to that conformation, which is requisite for seeing the objects as near as it can. Both which may prevent the Eye in some measure from growing more and more Long-sighted." — Page 9.

No. V.

Reasons why Elderly Persons want Spectacles to read or work with. — BY DR. JURIN and DR. SMITH.

INDISTINCTNESS IN OLD MEN'S EYES, HOW CAUSED, AND HOW MENDED BY CONVEX GLASSES.

“ 88. If the humours of the eye decay by old age, so as by shrinking to make the cornea and coat of the crystalline humour grow flatter than before, the light will not be refracted enough, and for want of a sufficient refraction will not converge to the bottom of the eye, but to some place beyond it — and by consequence will paint in the bottom of the eye a confused picture; and according to the indistinctness of the picture, the object will appear confused. This is the reason of the decay of sight in old men, and shews why their sight is mended by Spectacles. For the *Convex* glasses supply the defect of

plumpness in the eye, and by increasing the refractions make the rays converge sooner, so as to convene distinctly at the bottom of the eye, if the glass has a due degree of convexity.

“ 89. The contrary happens in SHORT-SIGHTED men whose eyes are too plump. For the refraction being now too great, the rays converge and convene in these eyes before they come to the bottom, and therefore the picture made in the bottom, and the vision caused thereby, will not be distinct, unless the object be brought so near the eye, as that the place where the converging rays convene may be removed to the bottom, or that the plumpness of the eye be taken off, and the refraction diminished by a concave glass till it come to a due figure.” — DR. SMITH'S *Optics*, 4to. vol. i. pp. 27 and 28.

“ Elder persons do not see so well at small distances as those of less age. This happens partly from the shrinking, and partly from the rigidity of the *Cornea*, which increases with our age, and may carry out the nearest limit of *Perfect Vision* from 3 or 4

inches, as in children, and from about 5 or 6 inches in young adult persons, to 23, 30, 40 inches, or a greater distance; and in this case the eye has no assistance in viewing near objects, but only from the contraction of the pupil; and this is not sufficient for *Distinct Vision*, unless in a strong light."

"If the arc of the cornea shrink $\frac{1}{200}$ th part of an inch, this will remove the natural distance from 15 to 77 inches: and the *cornea* being now grown more rigid, the *uvea* will be less able to contract it into a greater convexity. While the *cornea* was more flexible, the *uvea* was able to render it so convex as to reduce the natural distance from 15 inches to 5, that is, to a third part; but now probably the new natural distance of 77 inches can hardly be reduced to less than one half, that is to 38 or 39 inches.

"Now as this is probably the case of many persons above 50 years of age, and particularly my own, not to have perfect vision at a distance less than 38 or 39 inches." — DR. JURIN'S *Essay on Vision*, at the end of DR. SMITH'S *Optics*, p. 148.

No. VI.

CURIOUS EXPERIMENT.

“ INTO the rings of a pair of common Spectacles let two pieces of Stained Glass of different colours be fixed; and if these Spectacles should be worn in the common manner, it is evident that over one of the retinae will be diffused rays which excite some other colour: and the consequence will be, that neither colour will be singly perceptible, but that some intermediate colour will be seen. — If the Eyes are alternately closed, so as to exhibit the Two Colours singly, one succeeding the other, — and immediately after both Eyes be kept open, the intermediate colour will be very perceptible.”

“ If a *Blue* and a *Yellow* glass are placed one before the other, and applied to one Eye, the appearance will be that of a full *Green*; but if the same glasses should be applied one before each Eye, as in the experiment of the Spectacles or tubes, the colour

will be *Green*, diluted with much white light, or a pale *Green*; for when the Glasses are placed one before the other, the two in this position intercept much more light than when they are separate; and this for a reason which must be obvious to all who are acquainted with Optics. — DR. CRISP *on Vision*, 8vo. 1796, pp. 161 and 166.

No. VII.

DR. WELLS ON THE CHANGES WHICH THE
VISION OF SHORT-SIGHTED PERSONS
UNDERGOES FROM AGE.

“ It has been very generally, if not universally, asserted by systematic writers upon Vision, that the Short-sighted are rendered by Age fitter for seeing distant objects than they were in their Youth. But this opinion appears to me unfounded in fact, and to rest altogether upon a false analogy. If those who possess ordinary Vision, when young,

become, from the flatness of the cornea, or other changes in the mere structure of the eye, Long-sighted as they approach to old age, it follows, that the Short-sighted must, from similar changes, become better fitted to see distant objects. Such appears to have been their reasoning. But the course pursued by nature seems very different from that which they have assigned to her. For, of four Short-sighted persons of my acquaintance, the ages of whom are between fifty four and sixty years, and into the state of whose vision I have inquired particularly: Two have not observed that their vision has changed since they were young, and two have lately become, in respect to distant objects, more short-sighted than they were formerly. As the manner in which this change has occurred is unnoticed, I believe, by any preceding author, I shall here relate the more remarkable of the two cases.

“ A gentleman became Short-sighted in early life, and as his profession obliged him to attend very much to minute visible objects, he, for many years, wore spectacles

with Concave glasses almost constantly, by the aid of which he saw as distinctly, and at as great a variety of distances, as those who enjoy the most perfect vision. At the age of fifty, however, he began to observe that distant objects, though viewed through his glasses, appeared indistinct, and he was hence led to fear, that his eyes were affected with some disease. But happening one day to take up, in an optician's shop, a single concave glass, and to hold it before one of his eyes, while his spectacles were on, he found, to his great joy, that he had regained distinct vision of distant objects. With regard to such objects, therefore, he had lately become shorter-sighted than he had formerly been. But along with this change, another occurred of a directly opposite kind. For when he wished to examine a minute object attentively, such as he used to see accurately by means of his spectacles, he now found it necessary to lay them aside, and to employ his naked eye. He had become, therefore, in respect to near objects, longer-sighted. The power, consequently, in this gentleman,

to adapt the eye to different distances, is either totally lost or much diminished; but the point, or small space to which his perfect vision is now confined, instead of being the most remote to which he could formerly accommodate his eyes, as is commonly the case with the ordinarily sighted, when they are becoming old, is now placed *between* the two extremes of his former range of accurate vision. The eyes of the other short-sighted person, a physician of considerable learning, whose vision has been altered by age, have been affected in a similar manner, but not in so great a degree.

“The only change which had occurred from age, in the sight of such of my acquaintance as were considerably myopic, was a lessening, on both sides, of their range of perfect vision.” — From Dr. WELLS, *on Vision*, in the *Phil. Trans.* Vol. CI. p. 385.

No. VIII.

MR. JAMES WARE THE OCULIST'S OBSERVATIONS RELATIVE TO THE NEAR AND DISTANT SIGHT OF DIFFERENT PERSONS.

From the 103d Vol. of Phil. Trans. p. 31.

“ THE fact that *Near-sightedness* most commonly commences at an early period of life, and *Distant-sightedness* generally at an advanced age, is universally admitted. *Near-sightedness* generally comes * on between the ages of ten and eighteen. The discovery of it most commonly arises from accident; and, at first, the inconvenience it occasions is so little, that it is not improbable the imperfection would remain altogether unnoticed, if a comparison were not instituted with the sight of others, or if the experiment were not made of looking through a Concave glass.”

“ It should be remembered, that for com-

* It is generally observed as soon as persons begin to use their Eyes in earnest. — W. K.

mon purposes every Near-sighted Eye can see with nearly equal accuracy through two glasses, one of which is one number deeper than the other; and though the Sight be in a high degree more assisted by the deepest of these than by the other, yet, on its being first used, the deepest number always occasions an uneasy sensation, as if the Eye was strained. If, therefore, the glass that is most concave be at first employed, the Eye, in a little time, will be accommodated to it, and then a glass one number deeper may be used with similar advantage to the Sight; and if the wish for enjoying the most perfect vision be indulged, this glass may soon be changed for one that is a number still deeper, and so in succession, until, at length, it will be difficult to obtain a glass sufficiently concave to afford the assistance that the Eye requires.* p. 34.

* I have observed, that most of the Near-sighted persons with whom I have had an opportunity of conversing, have had the right eye more near-sighted than the left; and I think it not improbable, that this difference between the two eyes has been occasioned by the habit of using

“ Although old persons lose the power of distinguishing correctly near objects, and require for this purpose the aid of convex glasses, they usually retain the sight of those that are distant, as well as when they were young. Instances, however, are not wanting, of persons advanced in life, who require the aid of convex glasses to enable them to see near, as well as distant objects. p. 43.

My own case, Mr. WARE observes, “ militates against the common observation, that, as Near-sighted persons grow older they become less Near-sighted; since my Eyes, on the contrary, are more Near-sighted, at the age of fifty-five, than they were at twenty-five, and I am now obliged to employ deeper concave glasses than I then used to see distant objects, though I am not able to see distinctly through them things that are near.

“ The alteration which has taken place in *a single concave hand-glass*; which, being most commonly applied to the right eye, contributes, agreeably to the remark above mentioned, to render this eye more near-sighted than the other.

my range of vision, I have reason to believe, is not unusual. — The following is an instance of this kind, that is still more remarkable. Mr. L., Sixty-six years of age, who has spent a great part of his life in the West Indies, and whose sight, when he was young, enabled him to see both Near and Distant objects with great precision, began, at the age of forty, to experience a difficulty in reading and writing. He immediately procured convex Spectacles of the first number sold by Opticians, which glasses are usually ground to a focus of forty-six * or forty-eight inches, and by the aid of these he continued to read and write with ease (distinguishing perfectly in the usual way all distant objects without them,) until he was fifty. At this time he first began to perceive an indistinctness in the appearance of things at a distance; and, on trying with different glasses, he discovered that, by looking through a double-concave glass of the sixth number, (which is ground to a radius of eight inches

* Read thirty-six. — W. K.

on one side and eleven inches on the other,) he was enabled to see distant objects distinctly. He has continued to use glasses of this description, for the purpose of seeing distant objects, from that time to the present; but is obliged to remove them whenever he reads, and still to employ the first number of a convex glass. — In this instance a presbyopic was changed to a myopic sight, without any known efficient circumstance to produce it. p. 47.

“ In addition to these cases, I beg leave to add the information I have received from an eminent Mathematical Instrument-maker, about fifty years of age, who has long made use of convex glasses to assist his sight in reading. He tells me, that when he has been employed many hours together, for several successive days, in looking through a double microscope that magnifies twenty-eight times, (in order to enable him to mark the degrees on a small brass plate,) he has afterwards been able, repeatedly, for a few weeks, to read without his glasses; but then the amendment gradually ceases, and he is

soon obliged to return to the use of the same glasses that he had worn before.”

No. IX.

AN APPENDIX TO MR. WARE'S PAPER ON
VISION. BY SIR CHARLES BLAGDEN, F.R.S.

In Vol. 103 of Phil. Trans. p. 110.

“ MR. WARE states in his Paper, that Near-sightedness comes on most frequently at an early age; that it is more common in the higher than the lower ranks of life; and that particularly at the universities, and various colleges, a large proportion of the students make use of concave glasses. All this is exactly true, and to be accounted for by one single circumstance, namely, the habit of looking at *near* objects. Children born with eyes which are capable of adjusting themselves to the most distant objects, gradually lose that power soon after they begin to read

and write; those who are most addicted to study become Near-sighted more rapidly; and, if no means are used to counteract the habit, their eyes at length lose irrecoverably the faculty of being brought to the adjustment for parallel rays. Of this I am myself an example, and as I recollect distinctly the progress, it may not be useless to record it here.

“ When I first learnt to read, at the usual age of four or five years, I could see most distinctly, across a wide church, the contents of a table on which the Lord’s Prayer and the Belief were painted in suitably large letters. In a few years, that is about the ninth or tenth of my age, being much addicted to books, I could no longer read what was painted on this table; but the degree of Near-sightedness was then so small, that I found a watch-glass, though as a meniscus it made the rays diverge very little, sufficient to enable me to read the table as before. In a year or two more, the watch-glass would no longer serve my purpose; but being dissuaded from the use of a common concave

glass, as likely to injure my sight, I suffered the inconvenience of a small degree of myopy, till I was more than thirty years of age. That inconvenience, however, gradually though slowly increasing all the time, at length became so grievous, that at two or three-and-thirty I determined to try a concave glass: and then found that the numbers 2 and 3 were to me in the relation so well described by Mr. WARE; that is, I could see distant objects tolerably well with the former number, but still more accurately with the latter. After contenting myself a little time with No. 2, I laid it wholly aside for No. 3, and, in the course of a few more years, came to No. 5, at which point my eye has now been stationary between fifteen and twenty years. An earlier use of concave glasses would probably have made me more Near-sighted, or would have brought on my present degree of myopy at an earlier period of life. If my friends had persuaded me to read and write with the book or paper always as far from my eye as I could see; or if I had occasionally intermitted study, and taken

to field sports, or any employment which would have obliged me to look much at distant objects, it is very probable that I might not have been Near-sighted at all. Possibly the persons who become Near-sighted, by having constantly to adjust their eyes to near objects, may not usually change to be Long-sighted by Age." p. 111.

No. X.

FROM DR. HERSCHEL'S PAPER ON THE POWER
OF PENETRATING INTO SPACE BY
TELESCOPES.

In Vol. XC. of the Phil. Trans. p. 49.

“THE APERTURE OF THE PUPIL OF THE EYE in different persons differs considerably. Its changes are not easily to be ascertained; but we shall not be much out in stating its variations to be chiefly between 1 and 2 tenths of an inch. Perhaps this may be

supposed under-rated, for the powers of vision in a room completely darkened will exert themselves in a very extraordinary manner. In some experiments on light, made at Bath, in the year 1780, I have often remarked that, after staying some time in a room fitted up for these experiments, where, on entering, I could not perceive any one object, I was no longer at a loss, in half an hour's time, to find every thing I wanted. It is, however, probable that the opening of the Iris is not the only cause of seeing better after remaining long in the dark, but that the tranquillity of the retina, which is not disturbed by foreign objects of vision, may render it fit to receive impressions such as otherwise would have been too faint to be perceived. This seems to be supported by telescopic vision, for it has often happened to me in a fine winter's evening, when at midnight, and in the absence of the Moon, I have taken sweeps of the Heavens, of four, five, or six hours' duration, that the sensibility of the Eye, in consequence of the exclusion of light from surrounding objects, by means of

a *Black Hood* which I wear upon those occasions, has been very great; and it is evident that the opening of the Iris would have been of no service in these cases, on account of the diameter of the optic pencil, which, in the 20 feet telescope, at the time of sweeping, was *no more* than the 12th of an inch.

“ The effect of this increased sensibility was such, that if a star of the 3d magnitude came towards the field of view, I found it necessary to withdraw the eye before its entrance, in order not to injure the delicacy of vision, acquired by long continuance in the dark. The transit of large stars, unless where none of the 6th or 7th magnitude could be had, have generally been declined in my sweeps, even with the 20 feet Telescope. And I remember, that after a considerable sweep with the 40 feet instrument, the appearance of *Sirius* announced itself at a great distance, like the dawn of morning, and came on by degrees, increasing in brightness, till this brilliant star at last entered the field of the telescope, with all the splendour of the rising Sun, and forced me to take the

eye from that beautiful sight. Such striking effects are a sufficient proof of the great sensibility of the Eye, acquired by keeping it from the Light. p. 54.

“ On taking notice, in the beginning of sweeps, of the times that passed, I found that the eye, coming from the light, required near 20 seconds before it would be sufficiently reposed to admit a view of very delicate objects in the telescope; and that the observation of a transit of a star of the 2d or 3d magnitude would disorder the eye again, so as to require the same time for the re-establishment of its tranquillity.

“ The difficulty of ascertaining *the greatest opening of the Eye* arises from the impossibility of measuring it at the time of its extreme dilatation, which can only happen when every thing is completely dark.”

No. XI.

SNOW SPECTACLES.

THESE appear as if formed of half the Marrow-bone of a Leg of Mutton, and are worn by our untutored fellow creatures, to guard their Eyes from the glare of light from the Snow. See page 91.

The following are the dimensions of a pair which were lent to me, and correspond very nearly with those mentioned at page 110.

Length of Front $4\frac{6}{10}$ ths.

Breadth across it $1\frac{2}{10}$ ths.

Distance between the Eye slits $1\frac{3}{10}$ ths.

The Eye slits in length $1\frac{3}{10}$ ths.

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The part which answers to the knuckle $\frac{4}{10}$ ths.

They are fixed on the head by skin Straps about an Inch broad, which also serve to defend the Eyes from *side* light.

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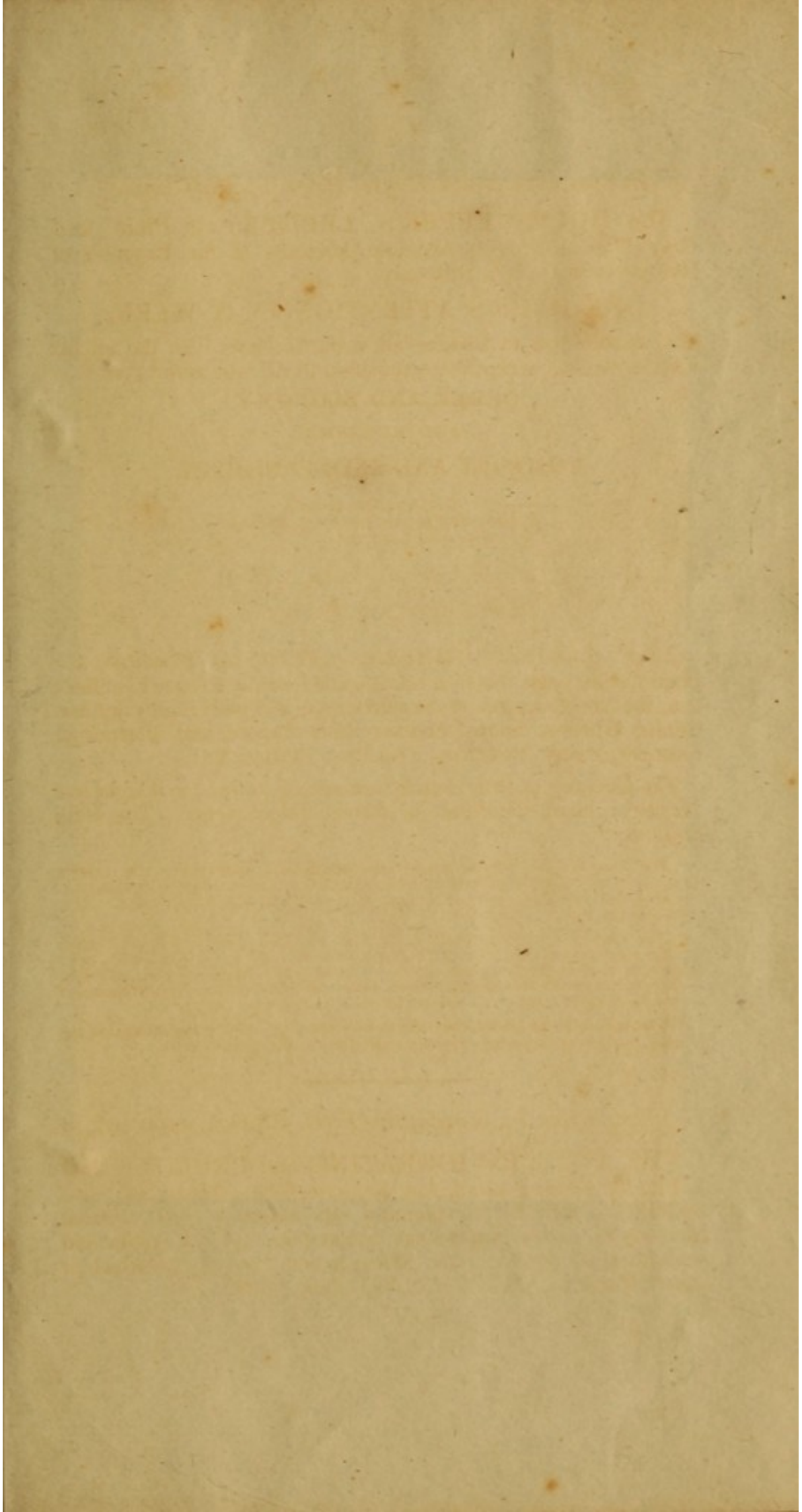
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