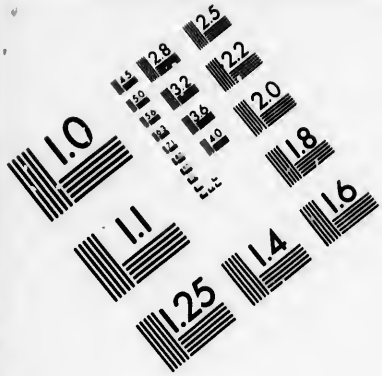
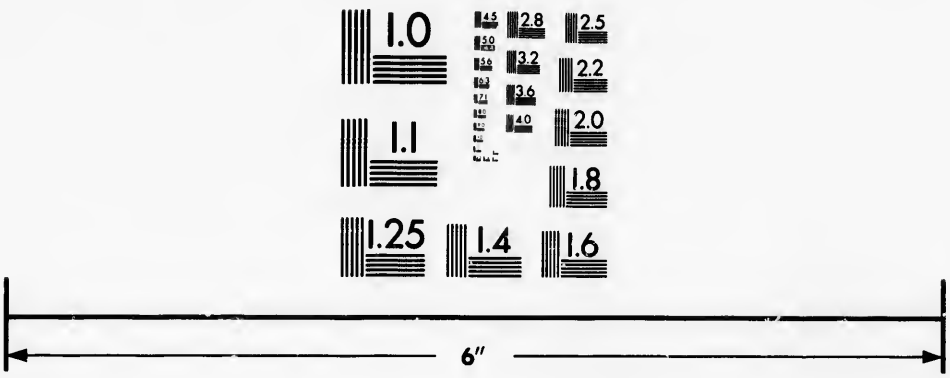
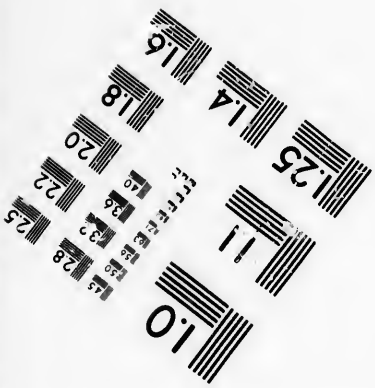
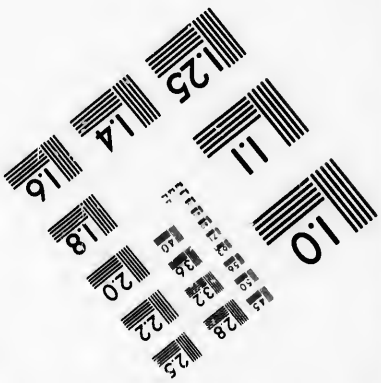


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Technicel and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographicelly unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

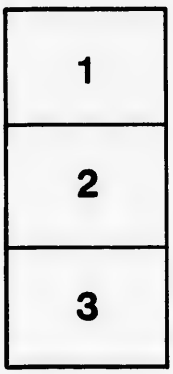
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

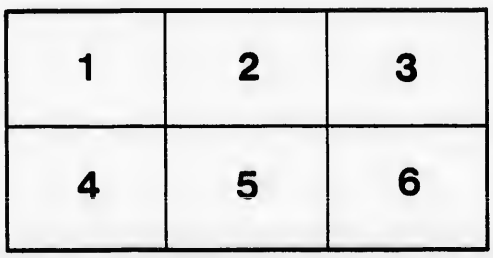
- [x] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured meps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [x] Bound with other material/ Relié avec d'autres documents
- [ ] Tight binding may cause shadows or distortion along interior mergin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certeines peges blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments:/ Commentaires supplémentaires:

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [x] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [ ] Includes supplementary material/ Comprend du matériel supplémentaire
- [ ] Only edition available/ Seule édition disponible
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
						✓					





45

With Emmetropia Possible in both Eyes, What Portion of the Ametropia Shall we Correct?

By CASEY A. WOOD, C.M., M.D., Chicago, Ill.

Professor of Ophthalmology in the Post Graduate Medical School, Chicago; Ophthalmic Surgeon to Cook County Hospital, to the Alexian Hospital and to the Emergency Hospital, Chicago.

Reprinted from
The Refractionist,
Boston, Mass.
1894.

47

With Emmetropia Possible in both Eyes, What Portion of the Ametropia Shall we Correct?

By CASEY A. WOOD, C.M., M.D., Chicago, Ill.

Professor of Ophthalmology in the Post Graduate Medical School, Chicago; Ophthalmic Surgeon to Cook County Hospital, to the Alexian Hospital and to the Emergency Hospital, Chicago.

Reprinted from
The Refractionist,
Boston, Mass.
1901.

WITH EMMETROPIA POSSIBLE IN BOTH EYES WHAT PORTION OF THE AMETROPIA SHALL WE CORRECT?

By CASEY A. WOOD, C.M., M.D., Chicago, Ill.

Professor of Ophthalmology in the Post Graduate Medical School, Chicago, Ophthalmic Surgeon to Cook County Hospital, to the Alexian Hospital and to the Emergency Hospital, Chicago.

FOR many years past the greatest diversity of opinion has obtained as regards the amount of the refractive error to be corrected in a given case. Some oculists order, in the higher degrees of ametropia, a full correction for reading and a partial one for near work, while some are for ordering in every instance a full correction of the error in both eyes, while others never order more than the manifest amount. Some neutralize one-half of the total myopia. Some have a sort of graduated scale with reference to both myopia and hyperopia. Some regard the correction of astigmatism as an uncertain experiment, and still others follow rules for the correction of the various kinds of ametropia as complicated and apparently as difficult of application as the system of the gambler who aspires "to break the bank" at Monte Carlo.

I am acquainted with some ophthalmologists, for whose judgment generally I have the greatest respect, who set themselves to overcome the patient's hyperopia and hyperopic astigmatism in much the same way that siege was formerly laid to a medieval fortress. A preliminary survey of the outworks is made when the amount of the manifest error is calculated. This consumes a good deal of time and patience and is not always satisfactory since observation parties are not allowed to approach very close to the inner fortifications, and are in the nature of things liable to be deceived by a number of

circumstances. Next a cycloplegic is used (which, to carry out the simile, means that plans of the fortifications are cunningly obtained) and the true state of things is unmasked. Then the enemy is driven within his first line of defence by ordering, just as soon as the effects of the cycloplegia have worn off, as large a percentage of the total hyperopia as he will accept. Finally after the siege has lasted two or three months an assault is made by land and sea and sometimes the works capitulate; sometimes the patient's total error is found to equal his manifest, often it falls short of it. In any event he is ordered only what is manifest.

Surely we ought to be able to accomplish the end in view by a method less complicated, less expensive and less wasteful of time than this. Personally, I have earnestly sought for some definite rules, founded upon well known laws of physiological optics, whereby one could readily determine how much, if any, of the total ametropia should be corrected in a given case. In common with other ophthalmologists I have waited for satisfactory answers to certain questions—queries which every practical man is asking himself to-day.

Why do some myopes gratefully accept a full correction while others having the same kind and amount of error, refuse to wear the prescribed glasses? How is it that certain patients obstinately reject a full correction of their hyperopia? On the other hand, why do some having apparently the same refractive condition find their troubles promptly relieved by the same prescription?

What are we to do with patients who refuse all corrections and why do they act in this unseemly manner? Have we any means of deciding beforehand whether a patient will accept a full correction of his refractive error? If uncomfortable at first, will he eventually obtain relief? If so, how long will the struggle continue?

What amount and kind of work will the ametrope be able to do? Shall he give up book-keeping and take to raising vegetables in a market garden? Had the scholar better return to school at once, or should he wait until next term—next year? Will he be able to enter college in the autumn? Will he ever be able to do hours of continued near work at night? These are a few of the numerous and important questions, the answers to which, in every case, we should be able after a few examinations to supply with considerable accuracy.

The key to these problems is furnished, to my mind, by the following proposition and by what may be termed a corollary to it:

A condition of ametropia converted by means of glasses into a state of absolute emmetropia is the most effective for all kinds of eye work, as long as every portion of the visual apparatus as well as the general health are in a normal condition.

Advocates of some particular system of dealing with refractive errors, in which partial corrections play an important role, speak of "making the patient comfortable" as if that were the chief end of their work. It seems to me that we should aim rather to provide our patients with glasses, if they need them at all, that will give most aid and satisfaction *in the long run*, even at the expense of a little present discomfort.

If this first proposition be admitted, it naturally follows that when the full correction of a refractive error has been given and the patient continues to complain of asthenopia or reflex symptoms of ocular origin, we may with almost absolute certainty, assume that the trouble lies chiefly or entirely without the dioptric system.

Bearing these two theorems in mind, let us consider some of the conditions present in persons whose ametropic eyes (although potentially emmetropic) refuse to accept a total or it may be, even a partial correction of their errors.

The condition of the ciliary muscle. It is alleged with much plausibility and show of authority, that the ciliary muscle is almost entirely responsible for the refusal of the eyes to adapt themselves to the new order of things brought about by the total correction of myopia, hyperopia and astigmatism.

The classic pictures of Iwanoff (Handbuch der ges. Augenh. 1 p. 271 *et. seq.*) have long been the comfort and refuge of those who teach the partial correction dogma. They, as everybody knows, show, first of all, the annular, radiating and meridional fibres of the ciliary muscle, as seen in the emmetropic eye.

Secondly, a hypertrophied wedge of circular fibres is pictured, said to be characteristic of hyperopia. The muscle in myopia is depicted as having its circular fibres altogether or almost entirely wanting, while its meridional layer is unusually well developed. This argument from the anatomical standpoint would be unanswerable if all cases of well marked hyperopia or myopia rejected a complete correction, but the fact is that a large percentage of patients exhibiting these errors almost immediately accept a full correction of them, are grateful for it and do not require to return for additional examinations of their eyes and changes in their glasses.

Possibly the third or radiating group of ciliary fibres gives to the atrophied set all the assistance needed to carry on the work of focal adjustment under the new conditions until other parts of the muscle are properly developed through exercise. In any event I am firmly convinced from observation of and experience with such cases, that while weakness of accommodative effort is occasionally a serious bar to fully correcting certain refractive errors, its importance has been much over-rated. The ciliary muscle usually adapts itself very readily to displacements, both of the accustomed near and far points, provided other parts of the eye are in their normal state.

Landolt, speaking of the relative amplitude of accommodation and convergence in ametropia, remarks that in myopia the amount of the accommodation remains lower than that of convergence, while hyperopia calls for more convergence, and yet there often exists such a latitude in the relation between the two functions, that binocular vision is realized and maintained with comfort, provided always that innervation and the muscular power are normal.

Heterophoria.—This is probably the most common obstacle to the speedy realization of comfortable emmetropia, and a full correction of any considerable refractive error should never be attempted without first estimating the relative strength of the extrinsic ocular muscles.

Where, for example, a patient does not accept a full correction of his myopia or hyperopia, the fault is much more likely to reside in weak externi or interni than in any condition whatever of his ciliary muscle. It seems to me that in dealing with the eye muscles we are prone to rely for our information regarding their functions more upon empirical results obtained by the use of phorometers and other instruments rather than upon calculations deduced from a study of physiological optics. Surely it is more satisfactory and more scientific to have an every-day acquaintance with the relations of the meter-angle of Nagel to the amplitude of accommodation than to possess many measurers of heterophoria.

The fact that both convex and concave glasses exert a direct influence upon convergence-efforts led Norton and Savage to lay down certain rules of conduct for dealing with refractive errors in the presence of muscular anomalies. I quote from the latter writer some observations on this subject, based on a study of the relationship between convergence and accommodation.

We have in these studies an attempt to explain why, in a large

number of cases of ametropia, the production of absolute emmetropia is abhorred by certain eyes and gratefully received by others. "The ciliary strain necessary for the correction of 1 D. to 3 D. hypermetropia is more kindly borne by the nervous system in many cases of exophoria, than would be the pseudo-exophoria which the correcting lenses would engender. Thus there is a reason for making no corrections at all, or only a partial correction of hypermetropia, in certain exophoric cases.

"Who has not seen one of many hypermetropes wearing comfortably concave lenses who could not bear the use of convex lenses? Such cases have always been exophoric. At first—probably from one to several hours—a mydriatic, in hypermetropic eyes, will increase the esophoria, will lessen an exophoria or convert it into orthophoria or even into an esophoria. All tests for lateral heterophoria are wholly unreliable within the first few hours after eyes have been brought under the influence of a mydriatic. Esophoria depending on hypermetropia solely is wholly relieved by advancing years, as well as by glasses that fully correct the focal error. It is also relieved after the first few hours by the use of a mydriatic, and this relief continues with the continued use of the drug.

"*Deductions.* Give a full correction of hypermetropia when associated with esophoria. (2) Give no correction or only a partial correction of hypermetropia when associated with exophoria. (3) Give a full correction of myopia when associated with exophoria, and when there is orthophoria. (4) Give only a partial correction or none at all of myopia, when associated with esophoria. (5) A full correction of hypermetropia cures a pseudo-esophoria in esophoric cases, and creates a pseudo-exophoria in exophoric cases. (6) A full correction of myopia cures a pseudo-exophoria in exophoric eyes and creates a pseudo-esophoria in esophoric eyes. (7) In hypermetropia associated with internal strabismus, fully correcting lenses aided by mydriatics remove all pseudo-esophoria and thus make it possible for the guiding sensation to resume control of the converging centers in such a way as to restrain the true esophoria, and thus cure the strabismus. (8) In myopia associated with exotropia, fully correcting lenses with myotics, will remove pseudo-exophoria and thus make it possible for the guiding sensation to restrain the true exophoria and thereby cure an external squint. (9) Any test for lateral heterophoria within the first few hours after beginning a mydriatic is wholly unreliable, even with lenses on."

In another place the same author attempts to formulate a working rule for the correction of oblique astigmatism. I have little experience of its operations, but I can easily believe that in the total correction of this form of error, the condition of the oblique muscles is an important factor.

"Steele's rule for placing the axes of correcting cylinders in oblique astigmatism would be perfection itself if the oblique muscles were always harmonious.

"This rule is, in those cases in which the axes of the proper *convex* cylinders for the two eyes diverge, place the cylinders at those points which will give the axes the greatest divergence permitted by the tests; and in those cases in which the axes converge, place them at the points which will give them the greatest convergence permitted by the tests. By substituting *least for greatest* and *vice versa*, the same rule applies to *concave* cylinders.

"'There is no rule without exceptions,' applies to the Steele rule, but the exceptions in this instance should have only a temporary application. That the reason for these exceptions may be clearly understood, it may be stated that in any form of uncorrected oblique astigmatism (hypermetropic, myopic or mixed) if the meridians of greatest curvature diverge above there is consequent strain on the superior oblique muscles; if these meridians converge above there is then, necessarily, strain on the interior oblique muscles. If in any of these cases the strain is on the superior oblique muscles (meridians of greatest curvature diverging above) and these muscles are insufficient (cyclophoria superior) Steele's rule holds good, but if in this condition the interior obliques should be insufficient (cyclophoria interior) the rule should be reversed temporarily. Again when the meridians of greatest curvature converge above and there is cyclophoria superior, Steele's rule for placing the axes of the cylinders must be reversed for the time, whereas if there is cyclophoria inferior the rule should be followed."

In all the above cases, where a partial correction is advised, that course of action is counselled in view of the insufficiency of certain muscles, but as Savage points out, *the proper thing to do under the circumstances, is to first cure the heterophoria (which may itself be one cause of the asthenopia) and then give a full correction of the refractive error.* Failing that, we shall at least have a reason for deviating from the better practice.

Age. A very slight acquaintance with the work of the ophthal-

mologist is sufficient to teach us that it is sometimes difficult to persuade the middle aged hyperope or myope to accept a total correction of his refractive error, a difficulty not frequently encountered in dealing with younger patients. *The habit of years* is not to be overcome in a day, whether one deals with the ciliary muscle or with other organs. Doubtless, also, the new and unaccustomed innervation-impulses required to regulate the changed relations between accommodation and convergence growing out of a full correction, are generated with about as much cerebral effort as are modifications in the contour of the lens controlled by those undeveloped ciliary fibres, whose contraction we may suppose to be necessary for effective vision. In practice, however, the eyes and the nervous system, other circumstances being favorable, shortly adapt themselves to the improved state of things in the great majority of cases.

Anisometropia. Even where with glasses vision is normal in either eye, the patient may not obtain binocular vision for near or distant work, because he has acquired the habit of using one eye to the exclusion of the other, and may promptly refuse a full or indeed any correction that makes more distinct the dulled image of the second eye. There are no problems in ophthalmology that requires more patience, more experience, and better judgment for their successful solution than those presented by the refractive anomalies of anisometropes and far too little is said about them in works on refraction. This is not the place to discuss any of them except to say that, *ceteris paribus*, as good results are obtainable by fully correcting the error in both eyes, as by any other single method of procedure. Where relief is not obtained by this method or where annoying symptoms are engendered by it we must not hastily jump to the conclusion that the retraction of one eye only should receive attention, or that a partial correction should be given on one or on both sides. It may easily happen that the trouble is traceable to parts of the visual apparatus not concerned in direct vision. This should be remedied, if possible, so that both eyes may receive the benefits that accrue to the emmetropic state.

Diseases of the fundus. The question in refraction sometimes is *not* what percentage of the total error we shall neutralize but whether we shall order any glasses at all. There are cases in which the condition of the coats of the eyes is such—even where the patient has centrally a full acuity of vision in both eyes—that one cannot conscientiously be a party to any considerable use of them by ordering

56

any sort of glass. The presence of choroiditis, a beginning optic nerve atrophy, a hyperaemia of the discs, a history of glaucomatous attacks, and a dozen other circumstances indicates the need of rest from work combined with other treatment, after or during which, the refractive error may be corrected when it is urgently called for. In such cases the oculist will, as a rule, probably find it wise to correct only the manifest error.

Occupation. While it is stating a very elementary law in ophthalmology, to say that the kind and amount of work should influence the selection of the lenses to be worn by the patient, it is also true that other factors are of paramount importance, and should not be lost sight of.

What difference does it make to a myopic engraver of 5 D. whether he is ordered a full correction, a half correction or no correction at all if he wishes to do his work at, say, 20 cm., and cannot command therewith the necessary number of meter angles of convergence? Or if he has, or can easily induce a choroidal congestion or suffers from acute dyspepsia? What about the typewriter who does her work with a poor illumination or who is so anemic that she cannot walk up a flight of stairs without having an attack of temporary heart failure?

Field of binocular fixation. Even when there are, as there should always be, normal amplitude of accommodation and a sufficiency of convergence for objects held in front of the eye, some part of the field of binocular fixation may be contracted, and this contraction should influence the prescribing of glasses in patients like compositors, book-keepers, car-checkers and others who require to use their muscles in various quarters of the field, and at widely varying distances from the eye. Of course the condition and relative strength of all the extrinsic muscles should be examined that weak points may be guarded. The oblique muscles in such cases are often at fault and would be wise to follow Savage's rules for correcting retractive errors when cyclophoria is present.

Reflex Ocular Symptoms. Most observers, whatever their views regarding the correction of retractive anomalies when the troubles complained of are purely optical (blurring of print, temporary disappearance of words, etc.) seem inclined to favor a full correction of the error (usually astigmatism and hyperopia) in the headaches, eye pains and neuralgia that result from them. In the same way chronic blepharitis, conjunctivitis and other reflex local and general diseases

due to eye strain, demand not only fully correcting lenses but also the removal of any obstacle that renders emmetropia difficult.

Defective innervation of the eye muscles. Transitory and partial pareses. General diseases. These causes of muscular asthenopia are sometimes mistaken for true heterophoria, and are, in my experience, more common than is generally supposed. After doses of certain drugs, during convalescence from acute diseases, during attacks of indigestion and in affections that lower the muscular tone generally, there may be a transient insufficiency of the extrinsic ocular muscles as well as a decrease in the ciliary power. Transitory pareses following diphtheria, syphillis, excess of venery, etc., are often to be met with. Here the question is not one of glasses of any strength, but rather a building up of the system and treatment of the disease that originally brought on the muscular trouble. Apart from these considerations one finds an "irritable" condition of other parts of the ocular apparatus dependant upon a state of ill health not easy to define or to account for. For example, the ophthalmologist has no more embarassing symptom to deal with, whatever its origin, than insomnia. Patients suffering from sleeplessness are not grateful for glasses prescribed in accordance with anybody's rules, and one must approach such cases cautiously, and not promise too much, even when the refractive error is of high degree or the asthenopic symptoms well marked.

"Demandare e non udire
Aspettare e non venire
Stare in letto e non dormire
Sono tre cose da morire"

runs the Italian jingle, and the physician who sees many such cases will probably re-echo the sentiment.

One should not be led into prescribing glasses for minor errors of refraction or into treating slight degrees of heterophoria in the presence of any of the above mentioned diseases, or other well recognized sources of ocular irritation such as, for example, hypertrophic rhinitis, neurasthenia, dental disease, true neuralgia of the face and head, disease of the lids, sclera or lachrymal apparatus. If glasses must be prescribed it is perhaps better to give a manifest correction of the hyperopia, and a partial correction of myopia, pointing out to the patient that treatment of the accompanying disease is imperative before proper glasses can be prescribed.

The oculist who intelligently orders a full correction in cases proper for it, requires in the very nature of things to make himself ac-

58

quainted, not only with the condition and functions of the parts concerned in the visual act, but also of all portions of the organism. In so far as he does this he distinguishes himself from the optician or jeweler "who also sells glasses." Even his method of examination (*quoad* the state of the refraction) must be more precise and more carefully applied than when he decides to order a partial correction of the error. In this particular, it seems to me, he should always examine every patient with the oblique illumination and, through the dilated pupil, with the ophthalmoscope; he should always use a cycloplegic sufficiently strong to develop the total ametropia (homatropine and cocaine discs are effective in the great majority of cases where atropine is not especially indicated or cannot be employed), he should make himself perfect in the exercise of some objective method, skiascopy for example, of determining the amount of the refractive error and, last of all, he should employ every device possible to elicit reliable information from the patient during the subjective examination.

And when the prescription for the glasses is handed over there should be a distinct understanding between patient and prescriber as to the conditions under which they are to be worn, temporarily, for near work, for use on the street, whenever it may be. Such an understanding, arrived at in the manner indicated, will assist in removing the impression, not altogether confined to the laity, that glasses for a dollar and a quarter are about as good as those obtained on an oculist's prescription.

103 East Adams Street