DEPARTMENT OF THE INTERIOR
BUREAU OF EDUCATION

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# THE EYESIGHT OF SCHOOL CHILDREN

## DEFECTIVE VISION AS RELATED TO SCHOOL ENVIRONMENT, AND METHODS OF PREVENTION AND CORRECTION

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DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
*Washington, D. C., April 1, 1919.*

SIR: In the Second Report of the Provost Marshal General on the Operation of the Selective Service System it is shown that 10 per cent of all the rejections of drafted men were on account of eye defects. This does not include a large number of men with eye defects of a minor character or with eye defects corrected by glasses who were classed in the limited service group. Furthermore, it does not include those men having eye defects, corrected or uncorrected, who were definitely rejected for other defects before their eyes were reached in the order of examination. The figures, however, are sufficiently large to demonstrate that visual defect is responsible for a substantial impairment of man power needed in time of war, no less than for the pursuits of peace.

This is merely a confirmation in a dramatic way of the facts that have been revealed by examination of the eyes of millions of school children in all parts of the civilized world during the past generation. A conservative interpretation of the data revealed by these examinations would be that approximately 20 per cent of all children in the schools are in need of corrective treatment for eye defects. Also, the fact has been demonstrated that there is a progressive increase of eye defects with grade progress in the schools. It is clear, therefore, that the care and protection of the eyesight of school children is a school duty and a school problem. It is incumbent upon the schools, not only to discover defects and disabilities that impede growth and interfere with school progress, but also to make the conditions of school life and school practice such as will conserve and promote the physical and mental fitness of the children.

The following manuscript on the Eyesight of School Children has been prepared by Mr. J. H. Berkowitz. In this he sets forth the nature and extent of defective vision in school children; the preventable causes of defect and deterioration under control of the school; the effective means that have been taken to improve such conditions and the methods and facilities for remedying the defects.

I transmit herewith this manuscript and recommend that it be published as a bulletin of the Bureau of Education.

Respectfully submitted.

P. P. CLAXTON,
*Commissioner.*

The SECRETARY OF THE INTERIOR.

# THE EYESIGHT OF SCHOOL CHILDREN.

## I. INTRODUCTION.

### THE SUBJECT OF DEFECTIVE VISION.

Competent authorities seem to agree as to the causes of eye strain in school children other than congenital defects. Standard works on diseases of the eye are practically unanimous in declaring that myopia results from the protracted and unhygienic use of the eyes in near work.

Most of the factors tending to cause eye strain exist in the schools. Among them are improper illumination; glare from windows, from glazed paper, and from improperly arranged artificial illumination; improper seating; poor printing and improper type.

### OBJECTS OF THE STUDY.

This bulletin represents the results of a comprehensive survey having for its objects the ascertaining of the following:

(*a*) The nature and extent of defective vision in school children as disclosed by medical inspection.

(*b*) The preventable causes within the schools and factors intimately connected with school life to which may be attributed eye strain and the general deterioration of visual capacity, as established by the investigations of different authorities.

(*c*) Efforts made to correct conditions inimical to eyesight in the schools and prophylactic measures adopted.

(*d*) Clinical facilities for the correction of refractive errors and available sources for supplying needy children with eye glasses.

(*e*) Necessary improvements in facilities and methods in these various fields.

This is not intended, however, as a medical treatise on eyesight. The references to the anatomy and physiology of the eye and technical phraseology have been reduced to a minimum. The chief considerations were the environmental influences which tend to produce functional disturbances of the eye and thereby to impair the physical fitness of the child for school work and later for industrial or professional work.

Though the scope of the survey has been wide, every phase of the problem has been considered with reference to this principle. The result must be something of practical usefulness to the teacher, the

principal, the school nurse, school official, and health officer; to those who must cooperate in the removal of obstacles and in providing conditions favorable to the health and happiness of school children.

## SCOPE AND METHOD.

### 1. EXTENT OF INVESTIGATIONS.

Originally, this survey was mainly an investigation of conditions in New York City, made for the Bureau of Welfare of School Children, Department of Social Welfare, New York Association for Improving the Condition of the Poor. Recommendations bearing chiefly on the system of school medical inspection and based on these investigations were placed before the city authorities with gratifying results. Subsequently, at the suggestion of the United States Commissioner of Education, the investigations were extended in order to make the report national in scope. These later investigations have necessarily been limited. Use has been made of available data on conditions in England and Wales, thus affording an opportunity for comparing work here and abroad and at the same time obtaining many constructive suggestions for American communities.

Certain phases of these surveys were correlated in the work of the author with the committee on schoolhouse planning and construction of the National Education Association, and with reference to rural school conditions, the committee on health problems in education, representing jointly the National Education Association and the American Medical Association. Some of the facts and conclusions here given are the results of those activities.

### 2. THE NATURE OF INVESTIGATIONS.

(*a*) Intensive surveys were made in a large number of classrooms for the purpose of obtaining authentic data on conditions unfavorable to eyesight. The subjects thus studied included classroom lighting, both natural and artificial, structure and arrangement of desks and seats, position and condition of blackboards, and the observance of at least elementary rules of classroom hygiene.

(*b*) An inquiry was made into the work, methods, and facilities of municipal and privately maintained eye clinics and dispensaries in New York City with special reference to the refraction work. Information was obtained on the prices charged for eyeglasses by clinics which make a practice of selling directly to patients and by opticians who work in connection with dispensaries; also, the available sources for supplying glasses free to needy children applying at the dispensaries.

(*c*) A survey was made of the rooms set aside for the use of medical inspectors in a number of schools of different types and periods of erection, for the purpose of determining their fitness for vision tests.

(*d*) A limited inquiry was made into the follow-up work of securing the necessary attention for children requiring treatment for physical defects.

(*e*) An inquiry by means of a questionnaire and correspondence covering 50 cities in the United States for the purpose of obtaining more general data on the principal questions studied intensively in New York City. From the following cities complete data were obtained:

California:
- Los Angeles.
- Oakland.
- San Francisco.

Connecticut:
- Bridgeport.
- Hartford.
- Meriden.

Florida:
- Jacksonville.

Illinois:
- Chicago.

Indiana:
- Indianapolis.

Kentucky:
- Louisville.

Maryland:
- Baltimore.

Massachusetts:
- Boston.
- Newton.

Michigan:
- Detroit.

Minnesota:
- Minneapolis.
- St. Paul.

Missouri:
- St. Louis.

New Hampshire:
- Manchester.

New Jersey:
- Atlantic City.
- Camden.
- Hoboken.
- Newark.
- Orange.
- Trenton.

New York:
- Buffalo.
- Binghamton.
- Jamestown.
- Newburgh.
- New York.
- Poughkeepsie.
- Rochester.
- Syracuse.

New York—Continued.
- Troy.
- Utica.

Ohio:
- Cincinnati.
- Columbus.
- Dayton.
- Toledo.

Pennsylvania:
- Harrisburg.
- Philadelphia.
- Pittsburgh.

Rhode Island:
- Newport.
- Providence.

Vermont:
- Burlington.

Washington:
- Seattle.

Wisconsin:
- Madison.
- Milwaukee.

### 3. RESEARCH OF LITERATURE.

Standard works on conditions of the eye, on school hygiene, and the proceedings of various meetings and conferences in which these subjects were discussed have been consulted. Other sources used were the reports of investigations made by different agencies devoted to conservation of vision, school reports, special studies, and reports on school architecture and illumination. All of these are included in the appended bibliography.[1]

[1] While not all the works listed in the bibliography are everywhere available, the standard works on school hygiene will no doubt be found in most public libraries and the libraries of educational institutions. For those school workers who may wish to obtain a working knowledge of the structure and functions of the eye, the nature of the various visual defects, the methods and the technique of eye examination and the different types of lenses for the correction of defective eyesight, the following concise and handy publications are especially recommended: (*a*) Defective Eyesight: The Principles of its Relief by Glasses, by D. B. St. John Roosa, New York, Macmillan Co., 1899. (*b*) The series of pamphlets on Conservation of Vision, published by the American Medical Association, Chicago, Ill. [These pamphlets are brief, low priced, and easily obtained, and therefore should commend themselves to school-teachers and school nurses.] (*c*) Medical Notes for School Teachers, by C. W. Hutt, London; Edward Arnold, 41 and 43 Maddox Street, Bond Street W., 1917 (E. B. Treat & Co., 241 West Twenty-third Street, New York).

#### 4. CONSULTATIONS.

Throughout these investigations consultations resulting in valuable aid were had with the following:

Dr. Leonard P. Ayres, of the Russell Sage Foundation; Dr. Ward A. Holden and Dr. William A. Carhart, oculists; Dr. S. Josephine Baker, director of the bureau of child hygiene, department of health, New York City; Mr. C. B. J. Snyder, superintendent of school buildings, department of education, New York City; Dr. C. Ward Crampton (now of Battle Creek, Mich.), director of physical training; Dr. I. H. Goldberger, assistant director of educational hygiene, department of education. Miss C. C. Van Blaroom, secretary of the New York State and National Committees for Prevention of Blindness, and subsequently secretary of the Illinois Society for the Prevention of Blindness, laid the final draft of the survey before a group of oculists who were interested in the movement for the conservation of vision in Chicago. Valuable cooperation in the study of follow-up methods in schools and of model forms of procedure was rendered by Mr. George F. Ungar, now deceased.

Upon the completion of the report on New York City it was submitted to the criticism of a committee of oculists, consisting of Dr. W. B. Marple (since deceased), surgeon, New York Eye and Ear Infirmary; Dr. Edgar S. Thompson, surgeon, Manhattan Eye, Ear, and Throat Hospital; Dr. Ward A. Holden, professor of clinical ophthalmology, College of Physicians and Surgeons, chairman of the committee. This committee reported that it "finds no errors of statement in the survey, approves the recommendations offered, and advises the approval of the recommendations by the bureau of welfare of school children and the presentation of the survey to the commissioner of health for his guidance."

## PRIOR INVESTIGATIONS.

Within recent years a number of efforts have been made to ascertain the status of vision among school children and what the factors of school hygiene are that are responsible for eye troubles. These studies and their results while presented by different groups have offered practically a unanimity of conclusions and recommendations for the removal of the conditions in school life inimical to the well-being of pupils. While the list given below includes the more important national and local committees, it should be stated here that the work of the committee on the influence of school books upon eyesight of the British Association for the Advancement of Science in formulating standards for the printing and make-up of school books has been of the greatest importance.

Investigations in this field have been made by the following organizations in this country:

Subcommittee on Myopia in School Children of the Public Health Committee of the New York Academy of Medicine.

Subcommittee on Hygiene of the Eye of the Special Committee on Hygiene of the Department of Education, New York City.

Committee on Children's Welfare of the Association of Women Principals (New York City).

The New York State Committee for the Prevention of Blindness.

Committee on Conservation of Vision of the American Medical Association.

Committee on the Standardization of School Books, etc., American School Hygiene Association.

Committee on Safeguarding the Eyes of School Children of the Illuminating Engineering Society.

Committee on Myopia in School Children of the Advisory Council of the New York City Health Department.

## II. THE PROBLEM OF DEFECTIVE VISION.

The intimate relationship between defects of eyesight in school children and school life has been emphasized by many writers. Some of the earliest investigations disclosed facts which have been confirmed by the results of various later investigators. Perhaps the first to take up the problem and apply to it an intensive method of study, was Dr. Jäger, who in 1861 pointed out to the German authorities that myopia is a progressive defect in school children and that school conditions tend to aggravate it. The studies of Dr. Cohn, of Breslau, and Dr. Gärtner, of Tübingen, made soon after Jäger's, pointed in the same direction. The earliest American studies were made by Dr. Risley, of Philadelphia, and Drs. Loring and Derby, of New York. There have been other studies both here and abroad, but the works of the specialists above referred to have become classics on the subject and references to them are found wherever the eyesight of school children is considered.

### THE CAUSES AND CHARACTER OF VISUAL DEFECTS IN SCHOOL CHILDREN.

Refractive errors usually found in school children are hypermetropia, myopia, and compound myopic astigmatism. By far, the commonest condition in the early years is hypermetropia. Myopic conditions are seldom found in school entrants but develop with the advance in school grade so that myopia preponderates among the children in the higher grades or classes.

For convenience of lay readers, the three terms generally used in describing these refractive errors should here be defined. The following, indicating briefly the commonest symptoms with the avoidance of technical terms, are taken from Dr. Hutt's little book, already referred to:

In cases of hypermetropia (long sight), the condition in which the eyeballs are too short from before backwards, the child can often see distant objects well, but has

difficulty in reading, sewing, etc., after using the eyes continually for some time. The type become blurred, and the letters run together; the eyeballs ache, and headache is felt, usually over the eyebrows.

These symptoms constitute eye strain, and are chiefly due to overaction of the ciliary muscle, a small muscle situated inside the eyeball; by its action the position and shape of the lens are altered so as to allow objects at different distances to be focussed on the retina at the back of the eye. This power of altering the focus of the eye is called "accommodation."

In high degrees of hypermetropia the child holds the book close to the eye.

In cases of myopia (short sight), the condition in which the eyeballs are too long from before backwards, the children can not see the blackboard when seated at the back of the class, or tell the time by the clock when placed at the other side of the room; they hold books near their eyes and stoop over their work; after working by artificial light the eyes become tired.

In cases of astigmatism the eyeball is curved unequally in different directions. Both hypermetropic and myopic astigmatism occur.

With hypermetropic astigmatism, the commoner form, eye strain is more often associated than with any other abnormality of the shape of the eye.

Children with myopic astigmatism chiefly complain of inability to see distant objects.

Perhaps the most emphatic dictum on the subject has come from the British Association for the Advancement of Science, which in 1911 designated a committee for the study of the influence of school books upon eyesight. A subcommittee of oculists made the study of the physiological and pathological phases of the problem, the results of which were given in the report of the committee issued two years later. This oculist subcommittee makes the following statement in its report:

Myopia, or short sight, commonly depends on undue elongation of the eyeball. It is never, or hardly ever, present at birth. It is rare at five years of age. It usually begins during school life, and increases more or less from year to year during the period of growth. It sometimes continues to increase after growth is completed. It is not necessarily, or always, associated with over-use of the eyes, either in school or elsewhere, for we see it arise after illness, we meet with it in illiterates, and we know that the predisposition to it is strongly hereditary. But it is everywhere most frequent among the most studious, and there is a mass of evidence to show that it depends very largely, both in its origin and in its progress, on overuse of the eyes in near work.

Dr. F. Park Lewis, in a paper on Sight Saving and Brain Building, delivered before the Fourth International Congress on School Hygiene, at Buffalo, 1913, stated:

It is an accepted fact, recognized by ophthalmologists everywhere that changes occur in the eyes of children during the period of their school life, of which the most prominent symptom is a steadily progressive development of nearsight. As definitely formulated by the late Prof. Dufour:

(1) In all schools the number of short-sighted pupils increases from class to class.

(2) The average degree of short-sightedness increases from class to class.

(3) The number of short-sighted pupils increases with the increase in the school demands.

This condition is not dependent upon constitutional weakness. It frequently appears in those who enjoy most rugged health. Neither is it due to bad sanitary

conditions. It is not found more commonly among the poor than among the children of the rich, nor more frequently among the unclean and poorly nourished than among those whose every want is most abundantly supplied.

It is not, as has been assumed, merely an abnormal phase of development which is fortuitous in its manifestations, nor will a given proportion of all school children of necessity become near-sighted under any circumstances. It is not due in any large degree in its inception at least, to conditions external to the child, because among these living and working at the same tasks and with like environment some will acquire nearsight while others will escape.

It is, on the other hand, a logical sequence of condition which may be recognized and controlled. Its beginnings are, primarily at least, due to congenital astigmatism and the consequent strain upon the accommodation of the eye in the effort to see. Its development is still further encouraged by the hours of constant daily application in reading and writing at that period in life when the tissues are plastic and easily molded.

Dr. S. D. Risley makes the following observations on good vision as a factor of school progress:

The signal importance of good and comfortable vision as a factor in the educational progress of a child is not always appreciated by either parent or teacher. Until within comparatively recent years the child, having reached the conventionally accepted school age, was entered at school without inquiry as to the fitness of the eyes to withstand the exacting and steadily increasing demands of the educational process. Formerly this neglect was due to ignorance of any need for such inquiry. Children are not prone to complain of their discomforts.

If the strain of near work in the schoolroom resulted in a periodically blurred page, smarting and burning eyes or pain in the eyes or head, how was the child to know that this was not the common experience of his fellows? Therefore, why should he complain? This had always been his experience in the schoolroom and was therefore accepted as a part of the enforced confinement and other disagreeable features of his school life. Any assigned task which can be performed only at the expense of physical discomfort or actual pain is either neglected or imperfectly executed. In the schoolroom this means illy prepared lessons and bad marks. In a word, his school progress is hampered. He suffers, in addition to the pain produced by his work the mortification of falling behind his class, loses courage, and is unhappy. The baneful influence of such an experience over the development of character in the growing boy or girl is obvious.

The chief medical officer of England also says that—

the great majority of children enter the schools with normal vision, but owing in large measure to the defective conditions under which instruction is given, that number is seriously diminished in the course of a few years. School medical officers frequently refer to two of the causes, that of imperfect lighting of the schoolroom and the near distance work of the children in reading, sewing, and handwork.

**The report of Dr. Hamer, medical officer for London, by differentiating between boys and girls and between "intermediate" and "leavers," clearly indicates a marked increase in defective vision during the children's school life. The higher percentage of defects among girls indicates the damaging effects of close work, such as sewing, to which they are subjected more than the boys.**

| | Intermediate. | | Leavers. | | Total. | Urgent and special. | |
|---|---|---|---|---|---|---|---|
| | Boys. | Girls. | Boys. | Girls. | | Boys. | Girls. |
| Number examined | 42,965 | 42,811 | 43,301 | 43,682 | 172,759 | 18,134 | 21,241 |
| Vision test, 6/12 or worse, right or left eye: | | | | | | | |
| Number | 8,394 | 8,741 | 9,317 | 10,105 | 36,557 | 1,104 | 1,457 |
| Per cent | 20.2 | 21.0 | 21.6 | 23.3 | 21.5 | | |
| Cases noted as requiring treatment: | | | | | | | |
| Number | 5,057 | 5,253 | 6,406 | 6,818 | 23,534 | 950 | 1,199 |
| Per cent | 12.2 | 12.6 | 14.8 | 15.7 | 13.9 | | |

Dr. Hamer comments as follows on these figures:

A high percentage of children inspected failed to reach the normal acuity of vision; 20.2 per cent of the boys and 21 per cent of the girls in the intermediate age group and 21.6 per cent of the boys and 23.3 per cent of the girls in the leaver group are returned as having relatively severe and uncorrected visual defect. On the other hand, the percentages reaching normal visual acuity increased from 40.6 in boys and 36 in girls at the intermediate age to 54.4 in boys and 48.4 in girls at the leaver group. Attention must again be drawn to the constant excess of visual defects amongst girls which never fails to be brought out in the results of medical inspection and appears to constitute a conclusive demonstration that close application to fine work is a potent means of producing defect in childhood.

## DEFECTIVE VISION AND SCHOOL PROGRESS.

What possible relation is there between defective vision and school progress? Does it cause retardation? Although in general terms students of the school health problem agree that physical defects of various kinds are responsible for a certain amount of retardation, available statistics do not always bear this out quite convincingly. The passing references to this phase of the question in the quotations given in the first part of this monograph are logical, but unsupported by any statistics or illustrative cases. The data necessary to establish this relation between physical defects and school progress in such a way as to remove any doubts will have to be much more extensive than at present recorded and the matter will have to be handled in all its complex ramifications. However, some suggestive and at the same time curious facts have been brought out by the investigations of Dr. Walter S. Cornell, chief medical officer of the public schools of Philadelphia;[1] by Dr. S. W. Newmayer, also of Philadelphia; James E. Bryant, school superintendent, Camden, N. J.; and Dr. Leonard P. Ayres, of the Russell Sage Foundation, New York.[2] On the whole, the results of these investigators bear out two facts:

(a) It is indisputable that children suffering from physical defects generally constitute a larger percentage of those retarded or below-grade groups than the children who are physically normal.

[1] Health and Medical Inspection of School Children, by Walter S. Cornell, M. D.

[2] Laggards in Our Schools. A Study of Retardation and Elimination in City School Systems, by Gulick and Ayres. New York, Survey Associates, 1913.

(*b*) Defective vision does not appear to as great an extent as other physical defects in the retarded children; but, on the contrary, in some groups a larger percentage of defective vision exists in the bright than in the dull children.

Among 10,130 school children examined for vision in Camden of whom 8,110 were normal-age children, that is, within their proper school grades, and 2,020 retarded children, 27.1 per cent of the first and 28.9 per cent of the latter had defective vision. The difference between these percentages may not, however, be sufficient to sustain the proposition that defective vision is a cause of retardation. Curiously enough, the same proportion of vision defects in the two groups of normal and retarded, or bright and dull, children was found in the examination of 3,587 school children in the investigations made in the Philadelphia schools by Dr. Newmayer. There the percentage of defective vision among the bright children was 10 per cent while among the dull children it was 12 per cent. The classification used by Dr. Newmayer was "exempt" and "nonexempt." The terms signify those children who were so proficient in their school work that they were "exempt" from examination and advanced to higher grades, and those whose work was unsatisfactory and therefore "nonexempt."

In a more detailed examination of the physical and mental records of 3,304 children in New York City schools, Dr. Ayres established three different groups, i. e., dull, normal, and bright. The data on these children were tabulated by grades and defects found among the children of each grade. Taking all defects together, it was found that the percentage of children suffering from some sort of defect (in many cases more than one defect) was 75 per cent among the dull, 73 per cent among the normal, and 68 per cent among the bright. Defective vision in these three groups existed as follows: Among the dull, 24 per cent; the normal, 25 per cent; the bright, 29 per cent. The result arrived at in this investigation, it will be noted, sustains the view of the British oculists' committee, that myopia "is everywhere most frequent among the most studious." Dr. Ayres's comment is:

> A computation of the individual ages of the dull and bright pupils in the groups here studied shows that the dull ones are older than the bright ones. Nevertheless they have better eyesight. The explanation may be that we are here dealing with extreme cases. The pupils here designated as bright are very young, indeed, for their grades and in all probability include a number who have injured their eyes through undue use and strain.

**Authorities already quoted in this study have established the fact that defective vision is progressive, and is therefore found to a large extent among the older children in the schools.**

In order to establish conclusively the character of increase in defective vision from class to class and its effect upon scholarship, it is necessary to have the continuous records—physical and class work—of a large number of individual cases, e. g., 5,000 or 10,000 pupils entering the first grade, these pupils to be examined and recorded periodically to determine what changes take place.

Such a study would well be worth the effort. It involves, in addition to the main problem under consideration, the question of economy in school time and expenditures (the added cost of educating "repeaters"), and the result should determine, among other things, whether or not uncorrected defective vision is one of the causes for children leaving school before graduation.

## EXTENT OF DEFECTIVE VISION AMONG SCHOOL CHILDREN.

For convenience and speaking generally of the extent of defective vision among school children, it may be said that 25 per cent would be an accurate representation. This would mean, of course, speaking in averages, since there are striking differences in the percentages reported by examiners in different localities. These differences do not always represent the differences in local conditions, but more often the variations in methods of testing, degree of efficiency, and adequate organization of the work of medical inspection in the schools. Thus the average percentage of children with defective vision found among those examined by the medical inspectors of New York City schools from 1909 to 1915 was 10.5 per cent, while the figures for Boston show a minimum of 12.85 per cent for the year of 1916 and a maximum of 31.50 per cent for 1907, the average for 10 years being 18.06 per cent. On the other hand, the report of the medical officer for London shows a minimum of 20.2 per cent. As against this, we have the report of 64 school areas in England and Wales, showing an average of only 10.5 per cent. All of these figures deserve careful analysis.

*Extent of defective vision among school children in New York City, 1909–1918.* [1]

| Year. | Children examined. | Number of cases of defective vision. | Per cent. |
|---|---|---|---|
| 1909 | 231,081 | 30,408 | 13.2 |
| 1910 | 266,426 | 29,634 | 11.1 |
| 1911 | 230,243 | 24,514 | 10.6 |
| 1912 | 287,469 | 21,078 | 7.3 |
| 1913 | 330,179 | 27,629 | 8.4 |
| 1914 | 308,595 | 27,534 | 8.9 |
| 1915 | 176,540 | 25,531 | 14.4 |
| 1916 | 276,611 | 27,760 | .10 |
| 1917 | 328,190 | 33,361 | +.10 |
| 1918 (6 months) | 175,253 | 17,888 | +.09 |

[1] Reports of Division of Child Hygiene, Department of Health, New York City.

*Vision tests made and percentage of defectives found in Boston public schools, 1907–1916.*

| Year. | Pupils tested for vision. | Pupils with defective vision. | Per cent of defective vision. |
|---|---|---|---|
| 1907 | 83,909 | 26,435 | 31.50 |
| 1908 | 82,255 | 19,723 | 23.97 |
| 1909 | 82,954 | 18,838 | 22.70 |
| 1910 | 84,058 | 17,303 | 20.58 |
| 1911 | 84,747 | 12,845 | 15.15 |
| 1912 | 83,075 | 12,488 | 15.03 |
| 1913 | 87,493 | 12,581 | 14.37 |
| 1914 | 84,508 | 11,020 | 12.36 |
| 1915 | 91,326 | 11,039 | 12.08 |
| 1916 | 92,552 | 11,899 | 12.86 |

Dr. William M. Carhart, oculist in the New York City school clinics, has compiled some striking data on the respective percentages of the several types of refractive errors found in 1,000 school children from 5 to 18 years of age. An interesting table, based on the same cases, presents the percentage for each type of defect found in three age groups. These children were from village schools, coming from a population largely American born and are, therefore, valuable as an index of conditions among the native element, whereas the statistics on the large cities represent conditions among mixed racial and national stocks.

*Percentages of refractive error in 1,000 school children, ages 5–18 years.*

| | Percentage. |
|---|---|
| Emmetropia | 13.9 |
| Hypermetropia | 36.2 |
| Compound hypermetropic astigmatism | 44.0 |
| Myopia | 1.4 |
| Compound myopic astigmatism | 3.5 |
| Mixed astigmatism | 1.0 |

*Percentages by ages of same 1,000 children.*

| | 5 to 8 years. | 9 to 12 years. | 13 to 18 years. |
|---|---|---|---|
| Emmetropia | 10.00 | 16.43 | 14.33 |
| Hypermetropia | 53.48 | 37.27 | 22.87 |
| Compound hypermetropic astigmatism | 33.48 | 40.05 | 58.55 |
| Myopia | .87 | 1.85 | 1.17 |
| Compound myopic astigmatism | 1.74 | 3.01 | 5.26 |
| Mixed astigmatism | .43 | 1.39 | .88 |

In the second table, it will be noticed, as Dr. Carhart points out, that the—

**immature hypermetropic eye decreases rapidly in percentage as the child develops, being 53.48 per cent at 5 to 8 years of age and only 22.81 per cent at 13 to 18 years. The stress and strain of school life, causing an increased distortion of the eyeball through irregular yielding of its structure, is shown in the increase of astigmatism, hypermetropic, mixed, and myopic in nearly equal degree; and myopia itself without**

astigmatism is found more prevalent in the middle years of school life for the same reasons, although children with much myopia and consequent excessively impaired vision, by dropping out of school in the grammar grades, cause the percentage of high-school myopia to be less than in the middle years of school life. The increase of emmetropia demonstrates the physiological lengthening of the eyeball as the child matures and is again greatest in the middle sections of the table * * *.

The comparison of these two sets of statistics quite clearly demonstrates that many of these refractive errors are increased in degree where present and when absent can be caused directly by the stress and strain of the use of the eyes in school.

The following table summarizes the findings of English school medical officers for 1916 respecting vision and squint in 64 areas. The areas were taken at haphazard and include 12 counties, 14 county boroughs, 29 municipal boroughs, and 9 urban districts:

| Areas. | Number of children examined. | Code groups. | | "Specials." | |
|---|---|---|---|---|---|
| | | Number referred for treatment. | Number requiring to be kept under observation but not referred for treatment. | Number referred for treatment. | Number requiring to be kept under observation but not referred for treatment. |
| Counties | 84,051 | 5,383 | 1,708 | 1,354 | 643 |
| County boroughs | 69,384 | 4,048 | 1,208 | 1,785 | 173 |
| Municipal boroughs | 41,140 | 2,872 | 1,163 | 224 | 7 |
| Urban districts | 18,271 | 1,175 | 290 | 283 | 34 |
| Total | 212,846 | 13,478 | 4,367 | 3,646 | 857 |

These figures yield a total percentage of 10.5 of children who are suffering from defective vision or squint which needs supervision or treatment. This percentage figure does not include children whose vision is defective, but which was at the time of examination corrected by glasses, now after nearly 10 years a very large number.

### RURAL CONDITIONS.

No real purpose will be served by drawing comparisons between the health conditions of country children and city children. It surely will not do to base such comparisons upon the available statistics. Until a well-formed method of examination and recording of physical defects is applied in a considerable number of school districts, both rural and urban, it would be futile to expect the results of examinations made by physicians, nurses, and teachers to prove that defective vision besides other physical defects is more prevalent among rural school children than among city children or the opposite. Suffice it to say that the reports on rural children all indicate a very high percentage of defective vision. It is also a matter of common knowledge that the country school, "the little red schoolhouse," built upon the principle that what was good enough for the father is good enough for

the son, is notoriously lacking in the essentials of hygienic construction and equipment. There are not many rural school districts in the United States where the application of the fundamental principles of conservation of vision may be found. It is, therefore, not at all surprising to find a very high percentage of defective vision reported from rural sections.[1]

In Pennsylvania, where rural school and medical inspections have been made extensively during several years past, 17.9 per cent defective vision has been found among 469,199 rural school children examined. It is also interesting to note that the number of children with defects in both eyes was twice as large as the total of children with either right eye or left eye defects.[2]

Of 1,625 pupils examined in the schools of Orange County, Va., 26.6 per cent were found with defective vision, of whom 5.1 per cent were very serious.

Of 742 children in the rural schools of Bannock County, Idaho, 29.9 per cent had defective vision. The school nurse of Grand Forks County, N. Dak., reports 25 per cent defective vision among 824 pupils examined.

Attention is directed to the outstanding fact in the foregoing figures that the smaller the number of children examined, the larger the percentage of defects reported, leading to the inference that stricter and more careful tests were applied where fewer children were concerned. This is further illustrated, if not proved, by the report of the North Dakota nurse, above quoted, on one typical rural school in which 8 out of 22 pupils, or over 30 per cent had defective vision. A similar illustration is furnished by the report on a rural school made to the Indiana State board of health. In this instance 7 out of 27 pupils, or approximately 25 per cent, had defective vision.

Although conditions in these individual schools do not prove the general rule, they are by no means isolated cases. Judging from the reports of health officers and rural-school agents in different parts of the United States, they probably are fairly typical.

## III. ENVIRONMENTAL CONDITIONS UNFAVORABLE TO EYESIGHT.

The environmental conditions and influences which are unfavorable to the eyesight of school children may be divided into those within the school and those outside of school. Such detrimental factors as poor lighting and unhealthful working conditions are found

[1] According to the second report of the Provost Marshal General (1919) the rejections for eye defects were: City, 10.9 per cent; country, 9 per cent, p. 419.

[2] Report of the State Commissioner of Health on Fourth Class Districts, Pennsylvania, School Year, 1914-15.

in the home as well as in the school. A dangerous factor has come into prominence during recent years which relates to the child's eyesight both in conjunction with the school work and his home influence. This is the cinematograph or the "movies." The factors within the schoolroom, which may have an unfavorable effect on eyesight if proper standards are not maintained, may be summarized as follows: Natural and artificial light, interior colors, desks and seats, blackboards, books, maps and other paraphernalia, and classroom procedure.

## CLASSROOM LIGHTING.

In the field of prevention of eye strain equal importance attaches to the work of the school architect, the school hygienist, the teacher, and the oculist. The primary requirements for proper light conditions in the classroom apply to planning and construction of schools. The subject of natural and artificial illumination for schools has been treated within recent years more or less intensively by representatives, both individual and in group, of the forementioned professions. Fundamentally, there is almost perfect agreement upon the factors relating to light which are inimical to the eyesight of school children. References to these conditions are found in the works of the specialists and the official reports already quoted.

Broadly speaking, the principal elements to be considered with relation to light are: (*a*) Natural light, dimensions of classroom, orientation of windows, proportion of window area to floor area of classroom, proportion of height of windows from floor to width of classroom, window shades, proximity of windows to walls of adjoining buildings. (*b*) Artificial lighting, whether by means of gas or electricity, while heretofore provided mainly to meet the emergency of cloudy days, is now much more needed because of the wider use made of the schools at night. Of the three systems of artificial lighting now generally employed, direct, semi-indirect and indirect, the semi-indirect is considered the most satisfactory for schoolroom lighting. By this system the source of light is diffused through an opaque glass bowl to the working plane and some of it is reflected either by a reflector or by the ceiling.

*Requirements.*—Without going into details as to the individual elements bearing on school lighting above enumerated, this having been done repeatedly in a large number of recent publications, it may be well to state briefly the major requirements for classroom lighting. Details of construction, such questions as orientation, which must necessarily be modified to meet geographic conditions, are omitted. The four cardinal requirements are:

(1) The ratio of glass area to floor area depends somewhat upon climatic condition. In northern zones, where there is a good deal of

cloudy weather, the glass area should be not less than one-fourth of the floor area. In southern zones, especially in the southwest of the United States, the ratio may be reduced to one-fifth and in some

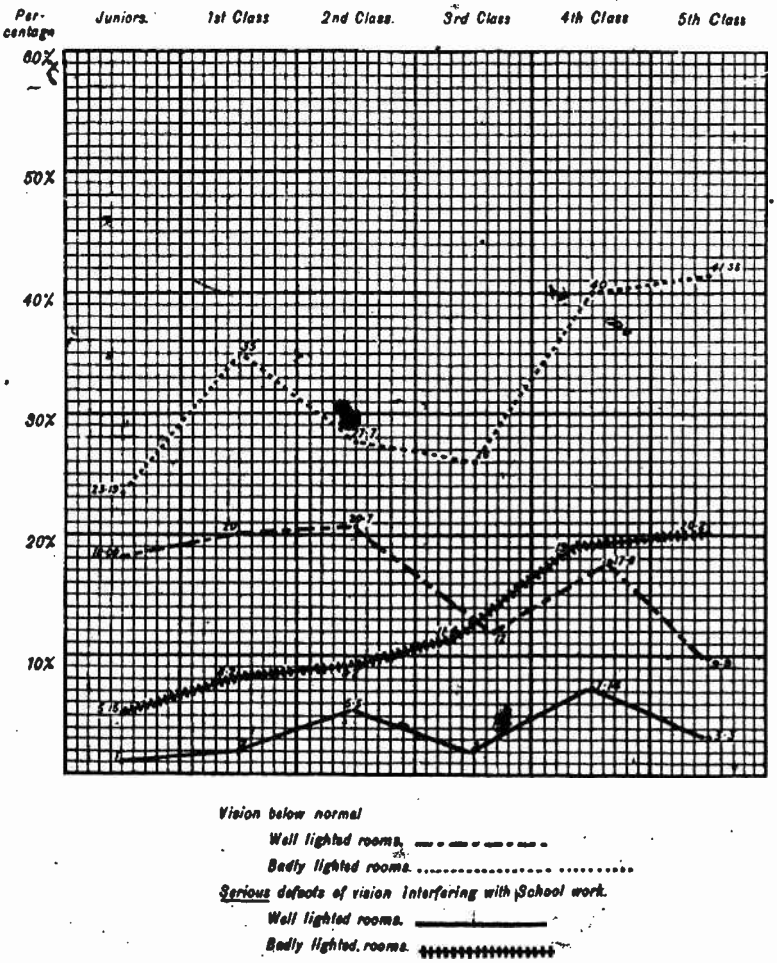



FIG. 1.—VISION AND CLASSROOM LIGHTING.

Graph prepared by Dr. Gertrude Halley, chief medical inspector, South Australia, indicating relative extent of defective vision in well and badly lighted rooms, respectively.

cases even to one-sixth. However, it is much easier to exclude excessive light than it is to increase a deficiency of light.

(2) Windows should be placed on one side of the classroom so that the light will fall upon the writing surface of the desk from the left side of the pupil. There are probably some conditions under which overhead lighting and bilateral lighting are both practicable

and preferable, but this method of unilateral lighting is generally accepted as the best practical solution of this problem.

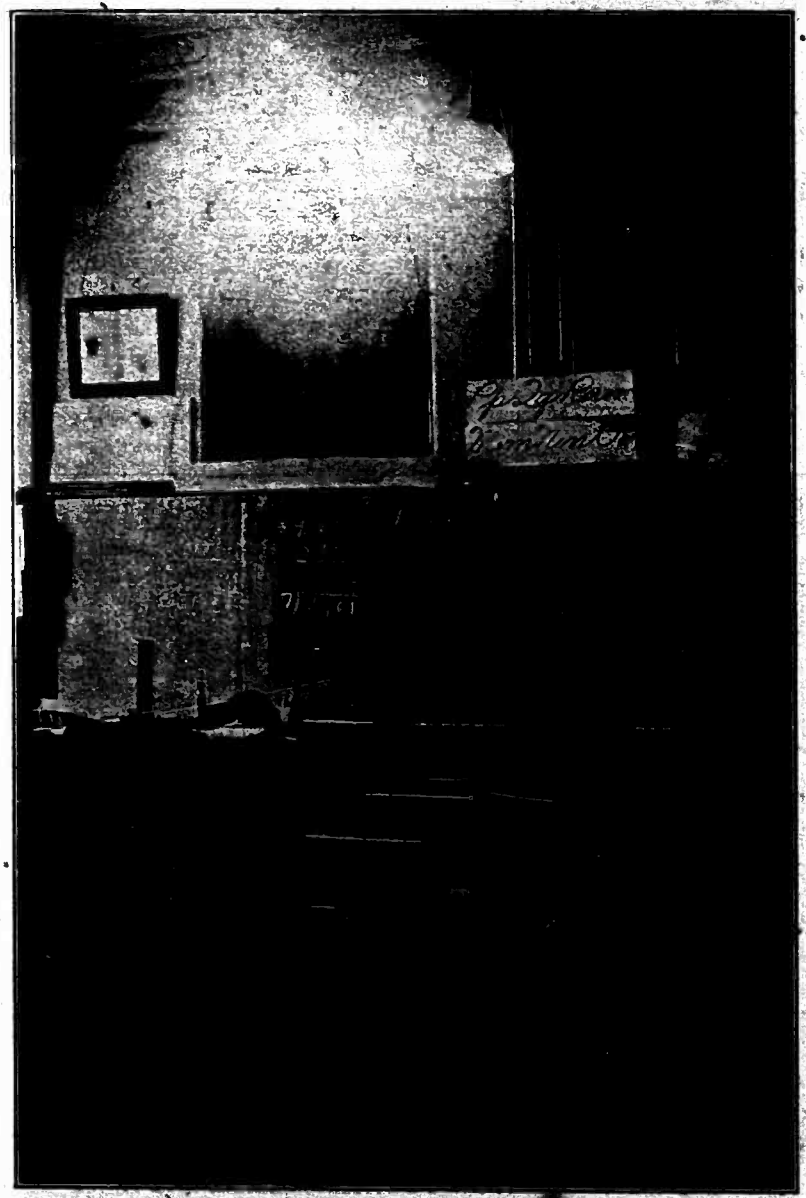
(3) There should be uniform light distribution, both natural and artificial; that is to say, all parts of the classroom should be equally well lighted, so that desks farthest away from the windows should receive adequate light.

(4) Glare from any source or cause must be avoided. It is well established that too great a brightness on working surfaces is as ruinous to the eyes as insufficient brightness. Excessive light produces glare. Given a classroom with lighting of the proper intensity, it becomes necessary to guard against glare which might be caused by polished surfaces. Desk tops, glossy blackboards, pictures, particularly those framed under glass, charts and maps hung about the classroom, all are glare-producing surfaces and require proper adjustment and utilization with reference to the sources of light.

*Interior colors.*—The colors of classroom walls, ceilings, woodwork and wood trimmings, and furniture play an important part in the lighting problem. Dark tints absorb light, and glossy surfaces, such as are produced by ordinary oil paints on walls and varnishes on woodwork, produce glare, and have an injurious effect. Classrooms with an unusually good exposure and very bright light should be finished with slightly darker tints than classrooms having ordinarily good light. On the other hand, classrooms located on inside parts of the building and not too well supplied with light should be finished in the lightest possible tints obtainable without resulting in glare. Combinations of tan, green, and gray are now generally favored. Various tones of these colors may be used and nonlight-absorbing tint obtained. Whichever color is used, the best practice is to employ two or three tones, e. g., lower part of walls to height of 3 or 4 feet, in a dark tan; the upper part of the wall to within 2 or 3 feet of the ceiling, light tan; the rest of the wall, together with the ceiling, in a faint shade of cream color. A similar gradation of tints may be worked out with green, except as regards the ceiling, which should, under all conditions, be very pale cream, and only in rooms where the lighting is not quite adequate ought it to be white. A combination of dull green and a pale mixture of green and gray may also be used satisfactorily, with the lighter shade, of course, on the upper portion of the walls.

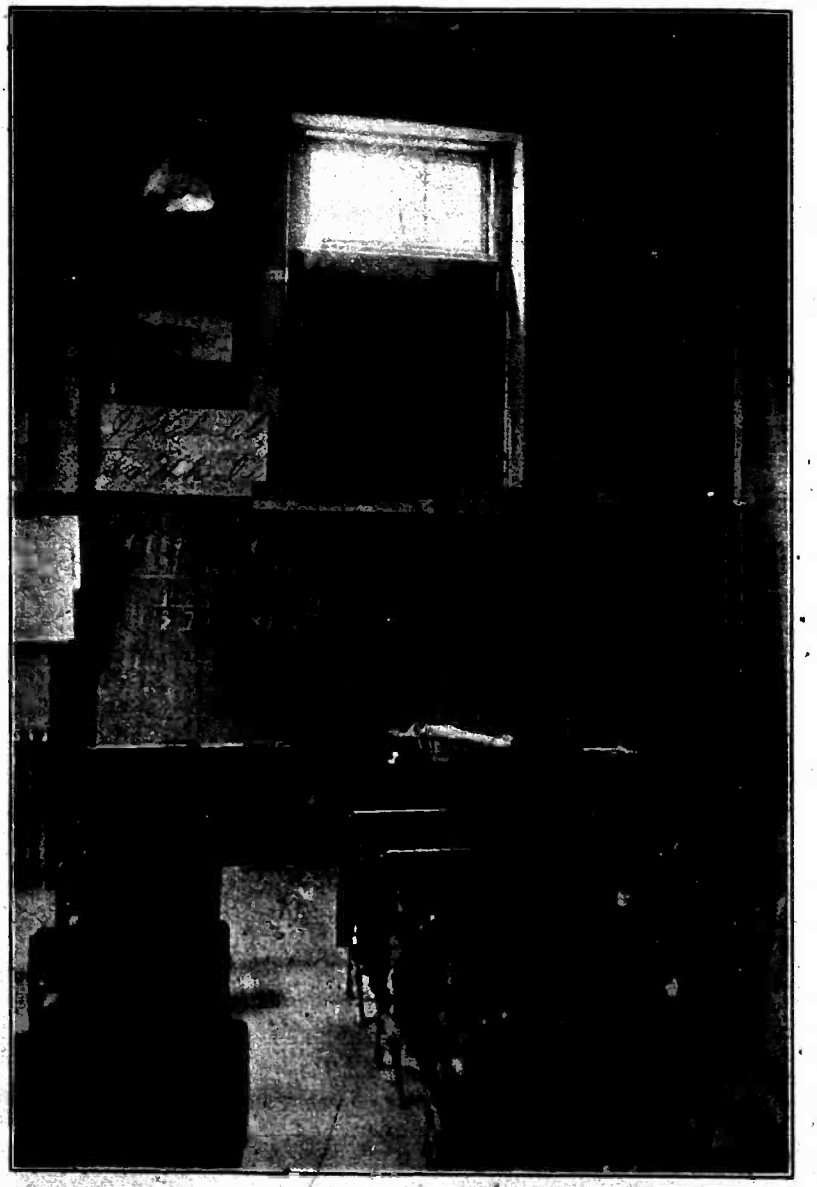
Woodwork and furniture having glossy surfaces, produced generally by being varnished, are a distracting element. Such surfaces cause reflections and will minimize the value of the best lighting system. All woodwork should, therefore, be finished to a dull surface regardless of the color.

*Window shades.*—Window shades play a highly important part in the adjustment of light in classrooms. The primary function of a



ONE CAUSE OF DEFECTIVE VISION IN SCHOOL CHILDREN.

Faulty classroom arrangements in which children face a window. Incalculable harm is thus produced by the intense glare of sunlight.

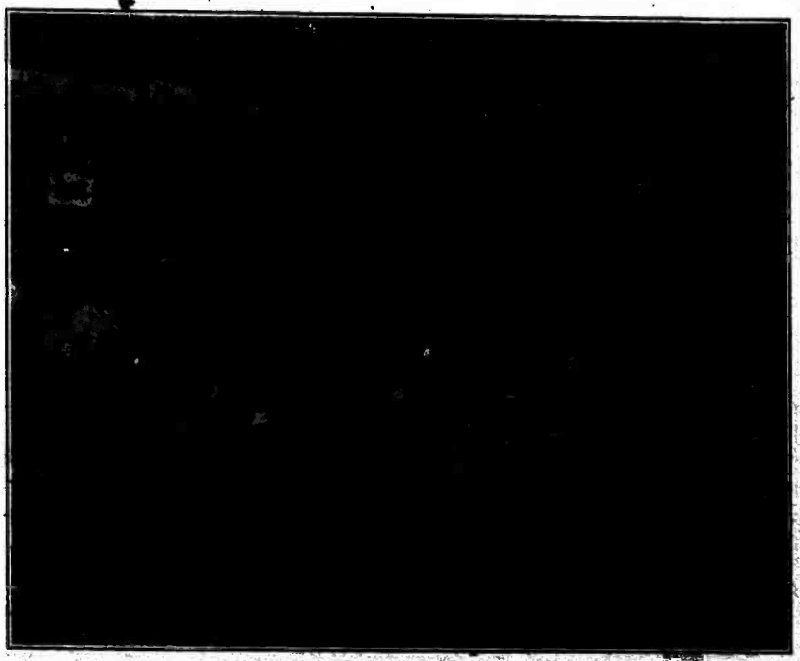


A CAUSE OF DEFECTIVE VISION.

Showing the same room with the sunlight only slightly obscured.

A. THE SCHOOL'S CONSIDERATE NEIGHBOR.

In congested sections of large cities where schools are huddled close with tall buildings, a white painted wall is an aid to the lighting of classrooms facing it. Note the difference between the two buildings.

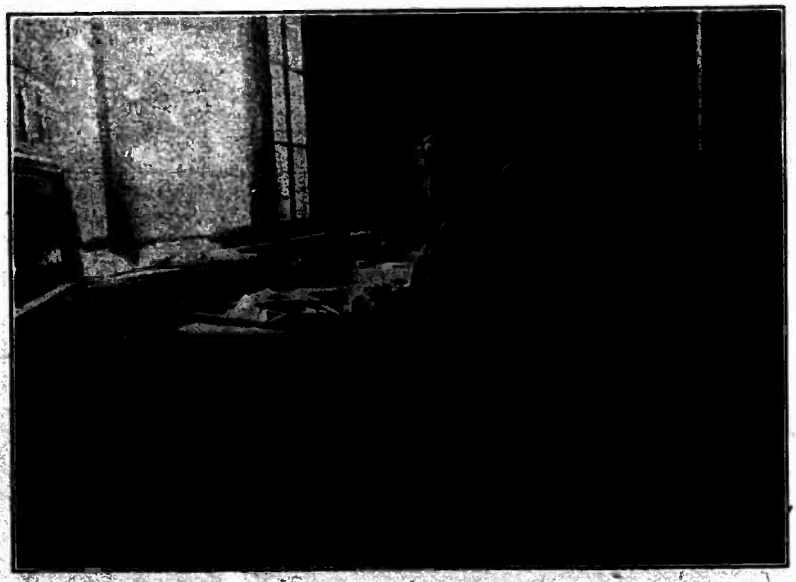


B. A ONE-ROOM SCHOOL.

The garish design of the wall paper and the blackboard placed between two windows indicate a lack of familiarity with the elements of school hygiene, although intelligent management is indicated by the lunch service and the well-framed pictures.

A. STRONG GLARE CAUSES EYESTRAIN.

Classroom windows should be fitted with proper shades which can be easily adjusted to shut out excessive and direct light.



B. MAKING FOR INDUSTRIAL UNFITNESS.

Permitting children to do their work while facing a window is criminal neglect.

window shade when drawn is to exclude excessive light and glare. The utmost care, selection of color, and judicious use of window shades is necessary. Torn or cracked shades are a menace in that when pulled down sharp rays of light penetrate into the room with much more intensity than when diffused through the unobstructed window. To be of the fullest service, it is necessary for a window shade to comply with these two major requirements:

(1) The color should be of a light buff tint or even white (depending on orientation of windows on which they are hung), so that they will permit sufficient light to penetrate into the room on a bright day without admitting glare.

(2) The shade should be so adjusted and fitted to the window as to permit its being drawn either up or down to such a position as to cover no more of the window area than is necessary for shutting out excessive light. The only entirely satisfactory device is the adjustable fixture whereby any desired part of the window can be covered.

*Artificial light.*—In the large cities the problem of artificial lighting has received and continues to receive earnest attention on the part of school architects, illuminating engineers, and school authorities in general. All the most improved systems of artificial lighting are of comparatively recent origin and experiments for further improvements are in progress. Although great strides have been made in working out certain standard requirements for artificial illumination, there are many details upon which the best known experts in the field disagree. It would be futile, therefore, to recommend here any set of standards. It may be said, however, that the semi-indirect system of lighting should be introduced into every school. School authorities should never fail to consult, or insist that the school architect consult with an illuminating engineer. Following is the table of minimum artificial light intensity, prepared by the Illuminating Engineering Society.[1]

*Desirable and minimum illumination.*

| | Artificial lighting—Foot-candles (lumens per square foot) [2] at the work. | |
|---|---|---|
| | Minimum. | Ordinary practice. |
| Storage space | 0.25 | 0.5– 1.0 |
| Stairways, corridors | 0.5 | 1.0– 2.5 |
| Gymnasiums | 1.0 | 2.0– 5.0 |
| Rough shop work | 1.25 | 2.0– 4.0 |
| Auditoriums, assembly rooms | 1.5 | 2.5– 4.0 |
| Class rooms, study rooms, libraries, laboratories, blackboards | 3.0 | 3.5– 6.0 |
| Fine shopwork | 3.5 | 4.0– 8.0 |
| Sewing, drafting rooms | 5.0 | 6.0–12.0 |

[1] Code of Lighting School Buildings, p. 5, Illuminating Engineering Society, 29 West Thirty-ninth Street, New York City.

[2] Intensity of illumination is only one of the factors on which good seeing depends; equally important is distribution of the light.

Exception may be taken to some parts of this table by students of the problem, but it is sufficiently in agreement with the views of most American and English authorities to serve as a guide.

Improved lighting, conforming to the best-known standards, may now be found in all large cities, particularly in buildings of recent erection. In many small towns, too, the best known standards of light provision have been observed in the construction of new schoolhouses. To discuss any special features of this work in any number of cities would require too much space. It may be sufficient, therefore, for the present purpose to refer briefly to some experiments made in New York City where the problem had to be solved for a larger number of schools than in any other city and where new school buildings are built every year. For the most part the lighting fixtures in the New York schools, excepting in those of the latest construction, consist of five overhead clusters in each classroom, each cluster having four 50-watt incandescent lamps, placed at a height of about 7 feet from the floor; each cluster is fitted on a combination fixture having two brackets for gas lighting. When this system of lighting was found to be inadequate, the Department of Education carried out a number of experiments for the purpose of improving classroom lighting. The result was the adoption of a standard arrangement which is installed in all new and remodeled buildings. The conclusions are best summarized by the report of the chief of the electrical bureau of the Department of Education:

> From our tests we arrived at the conclusion that nine units placed in symmetrical location were best for our purpose. Fixtures, consisting of a stem supporting deep bowl, dense opal reflector with depolished inner or reflecting surface, and 100-watt bowl, frosted, metallized filament lamp, the bottom of which comes to a point 9 feet above the floor, were so arranged that the greater amount of light came from a point a little to the left and forward of the students' desks. In that way whatever shadow was created was delivered in a direction such as to be received under the pupil's hand in writing, there being an absence of shadow forward of the pencil which would tend to confuse. The average illumination obtained at the time of the tests with new equipment was 3.20.
>
> Owing to the nature of the glassware and the bowl-frosted lamps employed, together with the height of such units above the plane of illumination, the glare factor formerly so conspicuous has been reduced almost to a minimum. As it has been stated, the average foot-candle intensity obtained from this nine-outlet arrangement when all the equipment was new and clean was 3.20. After this type of equipment had been in use about one year, the original lamps still being used, the equipment was again tested, showing a depreciation of about 42 per cent. Similar tests were conducted in other rooms similarly equipped where the depreciation ran about 20 per cent, which may be considered as more nearly what we would get in average practice.

*Maintenance.*—Maintenance should be given constant attention on the part of school officials. Electric lamps necessarily become dimmed after a certain period of use and should be replaced. Too often one will find, particularly in larger schools, a considerable propor-

tion of electric bulbs that have burned out and have not been replaced, thus reducing the normal amount of light required in the classrooms. Dusty domes, globes, and reflectors, as well as electric lamps, also reduce the amount of illumination. Frequent cleaning of every part of the lighting fixture is imperative.

Unclean windowpanes are much too common in the schools. It does not require any mechanical test to establish the fact that unclean windowpanes reduce the amount of light that should come into the classroom. Reports on school sanitary surveys made in different sections of the country show a large percentage of classrooms poorly lighted by reason of dirty windows. A shortcoming in this respect is also to be found in the by-laws of boards of education and the various rules and regulations governing janitorial service in that that they do not as a rule provide for sufficiently frequent window cleaning. The case of the rural school is only too well known. In most villages the windows are cleaned but once a year; in too many cases this work is assigned to the teacher.

The worth of prism glass as an aid in obtaining better lighting of rooms facing outside obstructions is still experimental, although this method has many ardent advocates. The question of maintenance is especially serious where prism glass is used, since the corrugated surface of such glass affords spaces for the accumulation of dust. Consequently unless such prism or ribbed glass is washed often and carefully it may tend to reduce rather than increase the amount of natural light.

*Blackboards.*—Blackboards, good or poor, if badly placed, are potent factors in the production of eyestrain. Blackboards of the most approved type, even though arranged in the most satisfactory manner, are of themselves a light-reducing element. This, of course, is unavoidable. Since at the present time the dark blackboard must be accepted as a necessary part of classroom equipment, the needful thing is to utilize it to the best advantage. It has become almost an obsession with educators that a maximum of blackboard surface must be provided in every classroom, and they place blackboards on every possible wall space where no other necessary equipment will be interfered with.

The most serious violation of eye hygiene is the placing of a blackboard beneath a window or between two windows. This error is by no means uncommon, as several of the illustrations here reproduced indicate.

Deterioration of blackboard surfaces is another common eye hygiene evil. Particularly in the case of slate blackboards it will be found that the surface becomes streaked and chipped, so that in those instances where this deterioration has progressed a good deal the writing is

difficult to read, often entirely illegible. Whatever material be used for blackboards, whether slate or otherwise, the prime requisites are that the surface be smooth, that it be dull and of a very dark gray tone bordering on black of uniform shade throughout. The extent to which these conditions are impaired in blackboards that have been used for some time may be indicated by the following summary of a survey made by the writer, covering 187 blackboards in 67 classrooms. Of these 187 blackboards, 85 were of shade so light, due mostly to the wearing off of the top finish and the absorption of chalk, that white chalk writing was barely legible from the center of the classrooms and in a large number of rooms entirely invisible from the rear. The surfaces of 72 among these 187 blackboards were variously cracked and chipped in such a manner that even, easy writing on them was impossible.

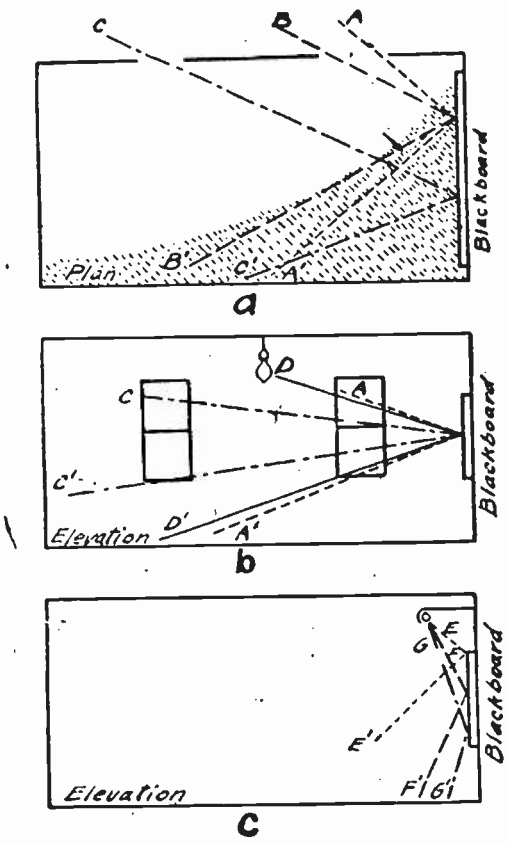
Natural slate is considered by far the best material for school blackboards. Considerable attention has been given to the use of dull glass and various artificial compositions of wood pulp and paper, and each of these materials has its advocates. Until the merits of these are definitely established by experiment, the most advisable course is to continue using slate blackboards and to do so in compliance with the well-established requirements.

Slate blackboards the surfaces of which have become worn or discolored should be refinished, and there are simple mechanical processes for doing this. A wise procedure would be to require all teachers to report at the end of the spring term on the condition of the blackboards in their rooms, so that those requiring repair and refinishing may be restored during the summer vacation.

William George Bruce, in his handbook on school architecture, summarizes this matter as follows:

> Blackboards are invariably placed on the front and right-hand wall of the classroom. They are rarely placed on the rear wall because of the absorption of light, and should never be placed to the left, between windows. The glare from windows puts this wall space into a dark shadow which is almost impenetrable. The strain on pupils working in their seats is severe—almost blinding on the sunny side of a building.
>
> There are three standard types of blackboards: 1. The board obtained by covering a concrete or ordinary wall surface with liquid slating. 2. The wood-pulp board. 3. The natural slate blackboard. Liquid slating is possibly the third best of the three types. While cheaper than wood pulp or slate, its surface must be renewed once a year, and then often can not be washed or properly cleaned. Wood pulp is satisfactory and very much cheape than slate. Slate makes the best blackboard. Both slate and pulp can be secured in a dull, dead black, but must be kept so, and should never be allowed to become gray. A new artificial slate made of ground slate and cement mounted on metal lathing is being introduced with success.
>
> The standard height of blackboard surface is 4 feet. This in primary grades is placed 2 feet 2 inches from the floor; in grammar grades and high schools 2 feet 6 inches. The top of the blackboard should never be more than six and one-half feet from the floor and not extend into dark or useless corners.

Natural slate, the ideal blackboard surface, may be obtained for blackboards in widths ranging from 24 to 48 inches. The standard widths are 36 inches, 42 inches, by 3 to 6 feet in length. The slabs can be purchased to fit close-jointed and fill wall spaces exactly. They cost about 25 cents per square foot placed on the wall.




From Code of Lighting School Buildings, by Illuminating Engineering Society.

FIG. 2.—Diagrammatic illustration of glare from blackboards. (a) Showing that occupants of seats in shaded area are subjected to daylight glare from blackboards. (b) Showing angles at which glare is experienced from daylight and from artificial light. (c) Arrangement of local artificial lighting to minimize glare.

The artificial blackboards can be obtained in greater lengths and similar widths. They should be placed preferably on a wall with expanded metal lath. Artificial blackboards cost about 16 cents per square foot.

Where it is found that blackboards affect the lighting of the room, spring roller shades of a neutral color may be drawn over the surface when not in use. Cabinets of disappearing blackboards, one upon the other, and about six in number, are desirable in science lecture rooms of high schools.

*Desks and seats.*—Proper adjustment of desks and the seating of children with due regard to their visual capacity are of equal impor-

tance with sufficient and correct illumination in the classroom. Large proportion of eye strain has been found to be due to the seating of children at their desks in such manner that they are unable to see the writing on the blackboard without undue effort or to read and write at their desks without falling into habits of bad posture.

The following quotations summarize the opinion of authorities upon the relation of school seating to visual health.

The committee on myopia in school children of the New York Academy of Medicine concluded its report (1916) on a survey of several schools thus:

> So long as desks and seats are made as difficult to adjust as possible, so long as the adjusting depends upon the good will of a janitor, so long as the adjustment can only be made for height without regard to the distance of seat from desk, the children will be subjected to conditions sure to result in spinal curvature and ocular defects. The matter is of sufficient importance to demand a careful and thoughtful study.

Says Lyster: [1]

> Faulty positions for reading are potent causes of short sight. . . . In almost all schools from the highest to the humblest, the bodies of scholars have to accommodate themselves to fixed seats and benches. The evil results of such a system appear in the form of eye and spinal trouble, as well as consumption. Not only is it most harmful in the case of young children, but the injury and inconvenience is also very pronounced in the case of youths and young men and women who attend technical and evening classes held in elementary school buildings. This aspect of the case is often ignored, and the writer well remembers one instance where, after protests had been received on behalf of such adult students, members of the local education authority denounced the "luxurious tendency" of the present race of students. Real progress must necessarily be slow in the face of gross ignorance and petty economy.

Bailey and Burrage [2] thus sum up the case against poor seating:

> There are various bad forms of desks. The desk may be too high, in which case, during writing, one shoulder is unduly raised in order to rest the arm on the desk, and a lateral twist of the arm results, which in time tends to become persistent. If the desk is too low, the scholar has to bend too far over his work. A forward stoop and round shoulders are produced. The head becomes congested from being held so low, and there is a strong tendency toward the development of nearsightedness. A flat desk is particularly bad, necessitating a cramped position and interference with free respiration. If the desk is too far from the seat, a forward stoop, with round shoulders, flat chest, and injury to the eyes are produced.

School furniture is of two types, fixed (fastened to the floor) and movable (combined desk and seat). In the great majority of regular classrooms, the fixed type still prevails. In rooms used for special classes, e. g., open window or fresh air classes, the movable type, such as the Moulthrop and the New York study chair are found. In some instances the movable type is in general use, especially in primary grades and in the high schools.

Fixed furniture is likewise of two types, adjustable and nonadjustable. By "adjustable" is meant ordinarily such construction as will

[1] School Hygiene, p. 139. [2] School Sanitation and Decoration, p. 73.

permit of adjusting the seat and desk for height only. More complicated mechanism may provide for adjusting the distance between desk and seat, for the slant of the desk top and for the chair back.

Actual conditions in schools show wide variety as to form and adjustability of seats and desks. There are single desks, both adjustable and nonadjustable; double (for two pupils) nonadjustable desks; single adjustable desks with the additional adjustability of desk top for plus or minus distance. In three New York schools, surveyed by the writer, no less than 10 different kinds or makes of desks were found. One school may have only one make of desk throughout, while another school may have as many as six different types, either all of different makes or variants of the same make.

The mechanism for adjusting desks and seats found in most schools is too cumbersome. Besides, the matter does not receive the attention it deserves from the teachers upon whom devolves the responsibility of securing proper seating for the pupils. The difficulty is greatly aggravated in those schools where classes are "shifted"—where two and often three different groups of children in turn occupy the same classroom.

Careful observations were made by the writer in four large elementary schools equipped with adjustable desks. In 58 classrooms each desk and seat was measured in relation to the pupil occupying it—a total of 2,413 desks. Liberal allowances were made, counting adversely only the most flagrant maladjustments, and yet 36.7 per cent of the units were found faulty. The defects of adjustment varied as follows:

| | Number. | Per cent. |
|---|---|---|
| Desk too high | 194 | 8.1 |
| Desk too low | 138 | 5.8 |
| Seat too high | 105 | 4.4 |
| Seat too low | 307 | 12.8 |
| Both desk and seat too high | 31 | 1.3 |
| Both desk and seat too low | 105 | 4.4 |
| Total | 880 | 36.7 |

Total number of units surveyed 2,413.

In recent years much attention has been given to the relative position of seat to desk, technically called "the distance."[1]

The custom, formerly, was to place seats and desks at "zero" distance. Out of 2,413 desks and seats surveyed by the writer 1,100 or nearly one-half were placed at "zero" distance.

| Distance. | Number of units. | Per cent. |
|---|---|---|
| Plus | 67 | 2.8 |
| Minus | 1,246 | 51.9 |
| Zero | 1,100 | 45.3 |

[1] "Distance" is "zero," "plus" or "minus"; "Zero," if the seat edge is flush with the desk edge; "plus," if the seat edge is back of a perpendicular line dropped from the desk edge; "minus," if the desk edge overhangs the seat edge.

There is still more or less disagreement as to the proper "distance," especially with respect to certain types of school work; but there is substantial agreement that for keeping the body in proper position during reading and writing, there should always be a minus distance. After much technical discussion of "distance," Kotelmann[1] says: "The *chief thing is always to have a minus distance when the pupil is reading or writing.* With a zero and still more with a plus distance the pupil bends forward to get near his books."

With fixed furniture, therefore, either nonadjustable or adjustable to height only, some practical "distance" standard must be adopted. Desks and seats can not be loosened and moved ad libitum to meet varying needs. Fixing the distance at 2 inches minus would seem to meet the primary need. This will conduce to hygienic posture of most of the pupils while reading and writing—the two school activities making the most exigent demands upon the eyes of pupils. This necessity of compromise, of course, is eliminated in case of the horizontally adjustable desk. With this, the pupil can move the desk top toward or away from himself as needed.

The Vienna school desk commission, consisting of physicians, architects, and teachers, after exhaustive study set up the following requirements for a hygienic seat and desk:

1. It must allow pupils to stand up during recitations.
2. It must have a continuous rest from sacrum to shoulder, conforming to the curvature of the spinal column.
3. When the pupils are writing, the seats must have a minus distance.
4. It should make writing and free-hand drawing possible for a reclining position; that is, while the pupil leans against the back rest.
5. The desk slope is to be as great as possible, at least 15°, but not such as to make the books slide off.
6. When the pupil is sitting, his feet should rest flat on the floor.
7. The change in distance should if possible be made by moving the desk.

Numerous attempts have been made in the United States to produce improved hygienic school furniture. The most successful efforts, however, have been in the direction of the movable, rather than the fixed type. The work of the American Posture League so far constitutes the most important contribution to the practical application of sound hygienic principles in the construction of school furniture.

The problem of good posture, however, will not be solved merely by improved furniture. Bad posture and consequent eye strain may be alleviated but will never be prevented by mechanical contrivances. The only insurance against these evils is a flexible school program that eliminates extended periods of immobility on the part of pupils. Dr. Lyster sums up the matter thus:

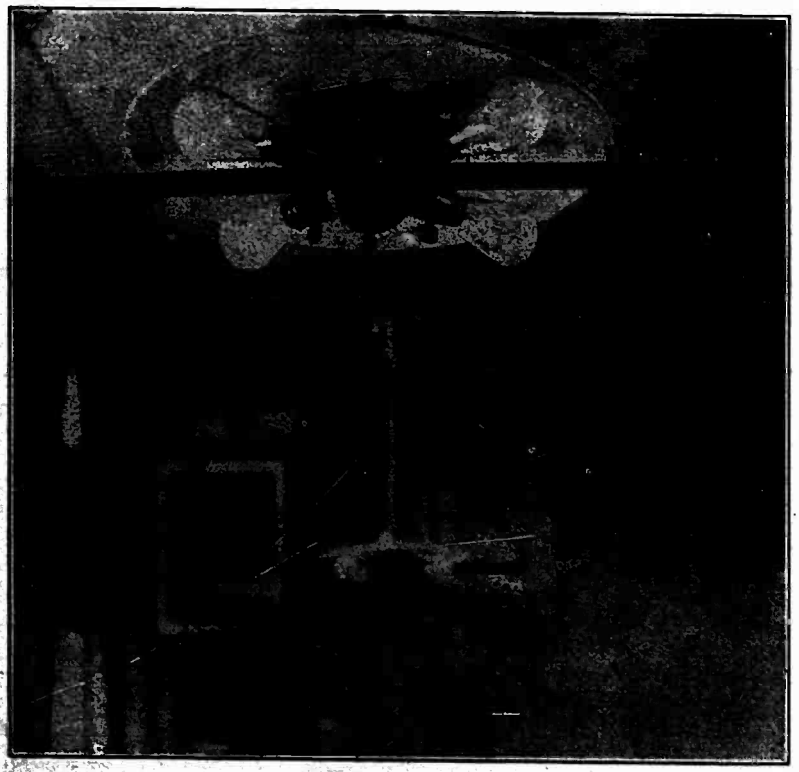
[1] School Hygiene, p. 141.

*A*. IN A RURAL SCHOOL.

A window shade that does more harm than if the window were unobstructed. If a school is too poor to replace such a shade by a new one, it might at least discard the old one when it reaches such a condition.

*B*. WORSE THAN USELESS.

Window shades are an important medium for the protection of children's eyes and should be kept in good repair.



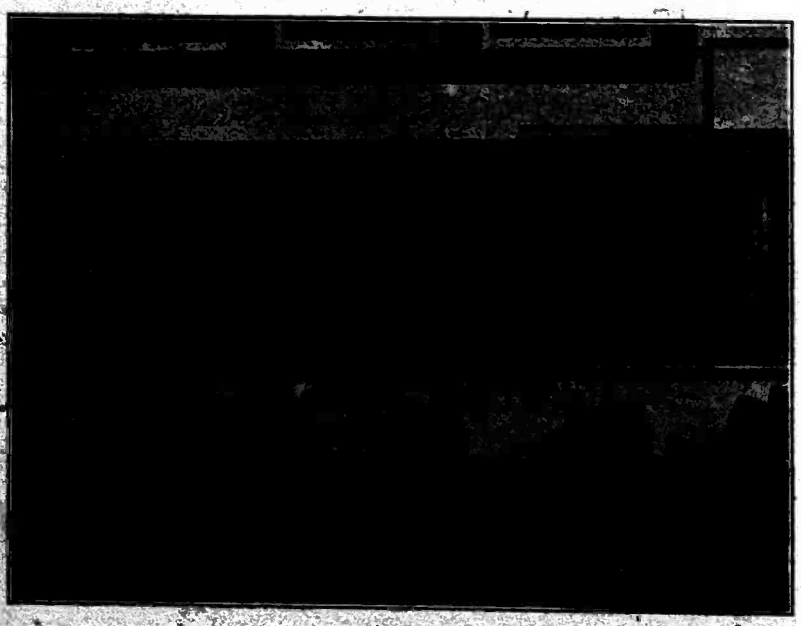
DIRECT LIGHTING.

A type of combined electric and gas lighting fixture which is being replaced by the more modern devices.

IMPROVED DIRECT LIGHTING.

A. WHERE BLACKBOARDS SHOULD NOT BE.

The worst possible place for a blackboard in a schoolroom is next to or between windows.



B. HARMFUL BLACKBOARDS.

Blackboards which are stained, streaked, or otherwise defective so as to make writing thereon difficult to read may be the cause of defective vision among school children.

For day schools an adjustable desk will no longer be a necessity when the time tables are under the control of medical men who have made a special study of hygiene as applied to child life. With three sizes of desks and seats for the ordinary standard it is possible to fit 95 per cent of ordinary children sufficiently exactly to produce no ill effects *if the children are kept seated in them for short periods only.*

*Books.*—School books, unless made to conform to the best standards already adopted and recognized as authoritative, are a constant menace to the eyesight of their users, particularly among the younger children. Poor print, fine print, poor paper, glazed paper, line too long, ill-proportioned margins, half-tone pictures—these are some of the characteristics of badly made school books. When one considers the vast amount of reading that the average child does in and out of school, the realization must come with a shock that most of the books used are not designed and printed to conform to any scientific requirements. Is it any wonder that the highest degree of myopia is found in the most studious children?

For the conservation of school children's eyesight, certain hygienic requirements to which school books should conform are now universally recognized. Perhaps the most authoritative statement of requirements is that given in the Report of the Influence of School Books upon Eyesight of the British Association for the Advancement of Science (1913).

This report, an abstract of which follows, gives a review of the present practice of detecting defective vision through medical inspection in the schools, a statement of hygienic requirements to which school books should conform, and gives also a report of the oculist subcommittee:

At the age when school life begins the visual apparatus is still immature. The orbits, the eyes themselves, and the muscles and nerves which move them, have still to increase considerably in size. The various brain structures concerned in vision have not only to grow but to become more complex. The intricate coordinating mechanism which later will enable the eyes, brain, and hand to work together with minute precision is awaiting development by training. The refraction of the eyes is not yet fixed. It is usually more or less hypermetropic, with a tendency to change in the direction of normal sight; in other words, it has not reached the ideal condition in which the eyes see distant objects without accomodative effort, but is tending toward it. In short, the whole visual apparatus is still unfinished, and is therefore more liable than at a later age to injury by overuse.

Overuse of the eyes is chiefly to be feared in such occupations as reading, writing, and sewing, not in viewing distant objects. During near work the head is usually bent forward, and the blood vessels of the eyes tend to become fuller; the focus of the eyes is shortened by a muscular effort which alters the form of the crystalline lens; the visual axes, which in distant vision are nearly parallel, are held in a position of convergence, and if the work be reading, they are also moved continuously from side to side. It is near work, therefore, that makes the greatest demand upon the eyes, and the nearer the work the greater the strain. Moreover, it is chiefly in near work that continuous mental effort is required.

Children who do too much close eye work suffer in various ways. Some simply from fatigue, showing itself by inattention, mental weariness, temporary dimness of

sight, or aching of the eyes and head. Some from congestion of the eyes, as shown by redness, watering, and frequent blinking. A certain number, in circumstances which predispose them to the disorder, develop strabismus or squint. Some others—and these cases are perhaps the most important of all—develop progressive myopia.

Myopia, or short sight, commonly depends on undue elongation of the eyeball. It is never, or hardly ever, present at birth. It is rare at 5 years of age. It usually begins during school life and increases more or less from year to year during the period of growth. It sometimes continues to increase after growth is completed. It is not necessarily or always associated with overuse of the eyes, either in school or elsewhere, for we see it arise after illness, we meet with it in illiterates, and we know that the predisposition to it is strongly hereditary. But it is everywhere most frequent among the most studious, and there is a mass of evidence to show that it depends very largely, both in its origin and in its progress, on overuse of the eyes in near work.

A moderate myopia which does not increase may be regarded as an innocent, though somewhat inconvenient, overdevelopment of the eye. A high myopia usually involves serious stretching and thinning of the coats of the eye and a liability to further trouble. A high myopia in a child is a very grave condition, for further deterioration always follows. In connection with myopia alone, to say nothing of other eye defects, the question of school work in relation to eyesight deserves more attention than it has hitherto received.

The subject has many sides. The lighting of schoolrooms, the arrangement of the desks, the design and proportion of individual desks, the attitudes of the scholars, and the amount of work required are all factors of importance, but they can not be considered here. Our present effort is directed to the standardizing of school books, a very important step in the desired direction.

Small print leads the young scholar to look too closely at his book. He is not yet familiar with the forms of the words, and his attention is not easily secured unless he has retinal images larger than those which satisfy the trained reader. To obtain these larger images, he brings the book too near to his eyes or his eyes too near the book, and this, for the reasons already given, is apt to be injurious. Hence the importance of establishing certain standards of legibility for school books, having regard to the ages of the scholars who are required to use them, and of employing only such books as reach these standards.

The importance of the matter becomes still more evident when we remember that, according to recent medical inspection, at least 10 per cent of the children in our elementary schools have serious defects of vision, and about 20 per cent errors of refraction, and see less easily and clearly, even when provided with proper glasses, than do normal-sighted children.

At what age should children begin to read from books? From the hygienic point of view the later the better, and there is reason to believe that little, if anything, is lost educationally by postponing the use of books in school until the age of 7 at earliest. Beginners may learn to read from wall charts, and in the general instruction of young children teaching by word of mouth, with the help of blackboards, large-printed wall sheets, pictures, and other objects which are easily seen at a distance is preferable from the medical standpoint, for it has the great advantage of involving no strain on the eyes.

## In 1911 a committee of the American School Hygiene Association prepared a preliminary report on the standardization of school books, which, because of its brevity, may be quoted in full:

There is at the present time a fairly good consensus in regard to the norms for the printing of textbooks for children. In general, the type should be clear. It should be sufficiently wide and there should be no hair-line serifs, and especially the upper

part of the letters should be free from fantastic features of any kind. The following represent what may be considered reasonable minima:

(*a*) The paper should be unglazed, free from shine, and opaque.

(*b*) The eye moves by a succession of movements and stops, and a long backward sweep to beginning of the next line.

Fatigue is markedly increased by the difficulty of the backward movement and of locating the beginning of the next line if the line is too long. The maximum of safety is 90 mm., and 60 mm. to 80 mm. is better.

(*c*) The margin should be sufficient so that the eye in the backward movement does not swing off the paper, and the inner margin should be wide enough so that the inner end of the line is not obscured by the curvature of the paper.

(*d*) The size of the type should be as follows:

1. Adult's standard: (1) The height of the small letters should be 1.5 mm.; (2) the width of the vertical stroke should be 0.25 mm.; (3) the space within the letters should be 0.5 mm.; (4) the space between the letters should be 0.50 to 0.75 mm.; (5) the space between the words should be 2 mm.; (6) the leading should be 2.5 mm.

2. The standards for children are as follows:

A. First grade: (1) The height of the small letters should be at least 2.6 mm., with the other dimensions in proportion; (2) the width of the vertical stroke should be from 0.4 mm. to 0.5 mm.; (3) the space within the letters should be from 0.8 mm. to 0.9 mm.; (4) the space between the letters should be about 1 mm.; (5) the space between the words should be about 3 mm.; (6) the leading should be from 4 mm. to 4.5 mm.

B. For the second and third years the standard may be reduced slightly, but the letters should not be less than 2 mm. in height, and the leading should be 4 mm.

C. For the fourth year height and leading should not be less than 1.6 mm. and 3 mm., respectively. It would be better to retain the standard of the fourth year through the sixth year.[1]

A special committee on hygiene of the eye appointed by the New York City board of education in 1915 recommended that the city superintendent of schools have all textbooks in use in the schools examined as to paper and type. In pursuance of this the bureau of educational hygiene of the board formulated in 17 brief paragraphs the requirements for school books. These were adopted as tentative, with the proviso that "any book which does not meet these standards is to receive special consideration, and before rejection an inquiry will be made as to whether the contractor will meet the standards, or whether the book is so valuable that it can not be replaced by another." These standards were worked out on the basis of the recommendations made by the British association, the committee of the American School Hygiene Association, and the Association for the Prevention of Blindness.

1. Binding—Books should open flat, otherwise muscular fatigue results, and the rapid changes in reading distance cause eye fatigue. A serious defect in books for first grade should disqualify.
2. Paper—Without gloss, white, or with a very slight cream tone, hard finish, smooth, though not glazed surface, opaque. Print marks should not show through. Disqualify all reading books with blue-tone paper, high gloss, or high degree of irregularity due to print marks. Consider against the book all of the minor grades of these defects.

3. Margin—Fore edge not less than one-half, back edge not less than three-eighths, of an inch.

4. Illustrations—Line blocks of good size are preferred. Many pictures with small details, maps with very small names, should disqualify if possible. Highly glazed paper necessary to exhibit photographic detail is permissible for older children.

5. Length of line—If possible disqualify more than 100 mm. 4 inches; minimum standard, 3 inches. Short lines inserted between illustration and margin should disqualify if frequent.

6. Number of lines (leading)—A vertical space of not more than 4 inches should not contain more than—

| Age. | Number of lines. |
|---|---|
| Under 7 years | 10 |
| Seven to 9 years | 20 |
| Nine to 12 years | 22 |
| Above 12 years | 24 |

7. Space between words—Under 7 years at least 3 mm; adult, at least 2 mm.

8. Space between letters—Under 7 years, 0.75 mm.; above 9 years, more than 0.50 mm.

9. Height of small letters—Under 7 years, 2.6 mm.; 7 to 9 years, 2 mm.; 9 to 12 years, 1.6 mm.; adult standard, 1.5 mm.

10. Width of vertical stroke—Under 7 years, not less than 0.4 mm.; adult standard, not less than 0.2 mm.

11. Space within letter—Under 7 years, at least 0.8 mm. Seven to 9 years 0.7 mm.; 9 to 12 years, 0.6 mm.; adult, 0.5 mm.

12. Character of type—Clean cut, well-defined. As little difference as possible between hair-strokes and thick strokes. The typewriter gives an ideal type. Long serifs should be avoided.

13. Ink—Black. When thoroughly dry it should not smear. Smeared pages and uneven lines should disqualify.

14. Atlases—Minimum height of type 1.2 mm.

15. German type—It is preferable to use Roman.

16. Music—Staff should not be less than 1.75 mm. apart.

17. Library books and books for evening work—These books should pass the 9 to 12 year standard if possible.

*Motion pictures.*—There have been occasional references, though very cursory ones, by American schoolmen, to the influence of motion pictures upon children's eyesight. Now that the motion picture is rapidly coming into use as an educational medium in schools, it is well to consider the ocular problem involved. In the large cities where cheap "movie" theaters abound, and parental laxity permits children of tenderest ages to frequent the "picture shows" oftener and later at night than they should, the effects of this form of eye exertion can be seen in many children in almost every school. Observant teachers have pointed out to the writer numerous children whose strained eyes and nervous condition were attributable to their devotion to the "silent drama."

The chief medical officer of England, Sir George Newman, in his 1916 report, states that "in recent years school medical officers have

reported on the possible effects of cinematograph displays upon the eyes of children" and quotes at length from a paper in the British Medical Journal for February 17, 1917, by Mr. Bishop Harman who "is responsible for special ophthalmic reports in connection with the school medical service in London." The material is of sufficient interest and value to be reprinted here:

The following observations refer only to the direct effects of the cinematograph display upon the eyes, and ignore indirect effects that may be held to arise from undue excitement, confinement within a place the atmosphere of which may be injurious, and the fatigue caused by the late hours at which children attend exhibitions.

In general, it may be said that the effects on the eyes of children do not differ from those experienced by adults. There are few, if any, adults who do not experience some annoyance, very many of the more sensitive or impressionable feel considerable strain; children may be taken to be in the same class as the more impressionable of adults, owing to their lesser power of resistance and readier experience of fatigue.

The unpleasant effects associated with the cinematograph exhibition, so far as they affect the eyes, are due to the following conditions: (1) Glare; (2) flicker; (3) rapidity of motion; (4) concentration of attention; (5) duration of exhibition.

Some of these conditions are peculiar to the cinematograph, others are found in the same or some degree in other optical exhibitions. But none of them are natural, and the more they depart from the conditions of natural phenomena the greater is the adverse influence on the eyes.

Mr. Harman discusses the five conditions referred to above and sums up as follows:

It will be asked: What evidence is there that children's eyes suffer from the picture shows? The evidence is of such a nature that it can not be presented by figures and percentages. It is difficult to answer the question whether permanent defect arises out of attendance at the shows. But there is a recent observation which I am inclined to think has some bearing on the point.

The examination of the case of papers of a large number of school children, who have been referred to eye clinics on account of failure to pass the standard vision tests at the schools, shows that there is an increasing number of children who, on examination at the clinic, are found to have nothing the matter with them. At the school they did not pass the test; at the first examination at the clinic they did not pass the test; but when their eyes were examined nothing amiss was to be found; their eyes, objectively, were normal, or so nearly normal as to be quite capable of passing the standard test; at a later subjective examination they did pass the test satisfactorily. Several causes may be at work to account for these occurrences. The children may fail to appreciate what is wanted of them at the first test, but against this is to be observed that the occurrences are not confined to the small children. The children may be "making game" of the matter to get a half holiday at the hospital; possible this is so in a few cases. But by far the most likely cause is a condition of fatigue in the children, so that at the time of the test they were incapable of putting out sufficient energy, either ocular or mental, to read the standard types. Everyone is familiar with the fact that in a state of fatigue ordinary feats, easily accomplished in health, can not be accomplished. In some cases I have ascertained that children of this sort were in the habit of going to picture shows, and it is possible the increasing attendance at these shows may be associated with the increase in the number of those children who fail at the vision tests without objective cause. If the normal-eyed children suffer, it is certain

that the result will be more serious in those with defective eyes, and possibly lead to permanent aggravation of those defects.

The best protection for the child will be secured by the following provisions: (1) The reasonable illumination of all parts of the hall not directly beside the screen. (2) The improvement of the movement of the film so as to reduce flicker, and the withdrawal of films immediately they are damaged. (3) An improvement in taking the picture so as to bring the rate of motion of the objects depicted more nearly to the natural. (4) The increase in the number of intervals in the show, and the interposition of exhibitions other than that of the optical lantern. (5) The limitation of shows for children to one hour, and the prohibition of "repeats." (6) The reservation of the children's seats to the "optimum" position in the hall.

With such provisions, indulgence in a show once a week should do no harm to the eyes of a normal child.

## IV. EDUCATIONAL HYGIENE AND PROPHYLAXIS.

It has been often remarked that compulsory education with archaic methods, and under generally prevailing schoolroom conditions, involves compulsory disease. The unfavorable environmental conditions already discussed with reference to eyesight are not the only means by which eye strain is forced upon the child in the school.

Classroom or instructional procedure is to a greater extent responsible for the abuses to which a child's physical faculties are subjected. Indeed, by the judicious adjustment of classroom procedure it is possible to minimize the evils that lurk in harmful environment and bad equipment. Classroom procedure should be formulated on the principle that instruction shall not only seek to impart knowledge but to conserve power. Educational procedure must be welded (not merely "correlated") with educational hygiene.

Some writers think that there is altogether too much reading and writing in the schools. Sewing by small children is condemned by many. Certainly, as one English hygienist has said, small print, small writing, and fine stitches should be regarded as unnecessary torture for children. American, English, and German authorities agree, for instance, that maps, map reading, and map drawing, contribute much to this torture. The bewildering masses of detail—cities, towns and villages, rivers, districts, mountains, etc.—dots, dashes, curves, and other items labeled in many variations of small print, the colored—all these in their silent assaults upon the optic nerves may be likened to the bombardment of the ear by a battery of mixed calibre. But the youngster has not been warned against the dangers of these silent eye-wrecking elements; he is not aware of their persistent effects and so plods along until the "aches" and "burnings" appear and then the Snellen types reveal the harm that has been wrought.

How must school procedure be modified in order that it may help, not hinder, the child's physical development? A few simple recom-

mendations were worked out by the committee of the American School Hygiene Association, following the ideas of eminent American and European writers.[1] Their recommendations are:

1. The instruction should be divided so that the eyes are not used for near work too long continuously. (A) Diminution of power of focusing for small objects increases rapidly the longer the eyes are used. (B) In the first year the time should not be longer than 15 minutes, increasing to one hour in later adolescent years.
2. There should be a frequent change of tension by looking at distant objects.
3. There should be frequent recesses in the lower grades, to relieve the general nervous tension.
4. Proper position should be insisted upon in reading, writing, drawing, etc. (A) The head should be erect, and if bending forward is necessary, it should be from the trunk. (B) In reading the book should be held at a distance of at least 12 inches as nearly as possible.
5. The handwriting should be large. The small letters should not be less than 5 mm. high for beginners, and 2.5 mm. in adolescent years.
6. There should be a preponderance of oral and blackboard instruction in the early years.
7. The home work should be very limited.

A tentative syllabus of hygiene in use in the public elementary schools of New York City aims "to counteract and eliminate the health depressing influences of school life." The instruction seeks not alone to inculcate health habits in the children but also to cultivate classroom health practices in teachers. The hygiene of the eye and eyesight conservation are covered by the following passages:

GRADE IB.

Seventh and Eighth week: Eyes; care of eyes; cleanliness and infection; bathing corners every morning; danger of dirty towels and wash rags. Individual towels. Sore eyes and lids; avoid rubbing; use of separate handkerchief or cloth for infected eye; avoid danger of infecting healthy eye. Secure attention.

GRADE 4B.

Fifth and sixth week: Care of the eyes. Bathing corners every morning. Protection from infection. Danger of dirty towels and wash rags and handkerchiefs. The individual towel. Danger of rubbing eyes. Removal of foreign bodies from eyes. Use of boracic acid solution. Care of sore eyes and lids. Use of separate handkerchief or cloth for infected eye. Protection of healthy eye. Need of expert attention. Poor sight, eye strain and headaches. Necessity of examination and glasses. How to study. Proper lighting for reading, working.

GRADE 7A.

Seventh and eighth week: The eye. The function of eyelids, lashes, and tears. The importance of sight and methods of safeguarding it. The necessity of eyeglasses for defective vision. Color blindness and its importance in certain types of occupation.

[1] References: Shaw, School Hygiene, Chapter IX; Hope and Brown, School Hygiene; Huey, Psychology and Pedagogy of Reading; Schwender, Die wichtigsten Ergebnisse der experimentellen Untersuchungen über das Lesen.

### THE HYGIENE OF THE CLASSROOM.

1. Seating. The teacher should seat the pupils at the beginning of the term with regard to the following points:

(*a*) Height. Not later than two weeks after the beginning of the term, seats should be adjusted by the janitor so that the pupil can sit with hips well back, the thighs resting on the seat and the feet flat upon the floor. The desk and seat should be adjusted so that the proper writing position can be taken—i. e., hips back, body straight, inclined forward (never flexed or twisted), forearms resting on the desk near the edge. The eyes should not then be nearer than 10 inches nor more than 16 inches from the writing.

(*b*) Defects in vision and hearing. These defects should be discovered early so that afflicted children may be placed at a proper distance from the blackboard and teacher's desk. To this end they may consult the reverse side of the pupils class record card.

2. Light. Light should fall from the left and from behind. Shades should be so adjusted that the sunshine shall not fall upon the book or work. There should not be two consecutive periods of close eye work. The eyes should never be closer than 10 inches to the work, 14 inches is preferable, and should be raised occasionally from the work. Books should be held at a right angle to the line of vision, and off the desk though the hands may rest upon it.

In connection with classroom hygiene a special effort has been made in New York City to secure the most favorable hygienic conditions possible for the protection of children's eyesight in poorly lighted classrooms. A set of instructions to teachers, prepared in cooperation by the director of physical training (having charge of educational hygiene) and the superintendent of school buildings and approved by the board of superintendents, has been issued in the following form:

1. Artificial illumination should be used whenever necessary. No rule can be laid down to guide the teacher in this matter. She must use her own discretion and judge when artificial light is necessary. It must be used at once if pupils exhibit any difficulty in reading.

2. Teachers should be alert to report to the principal if the windows, walls, or prismatic glass reflectors are not clean.

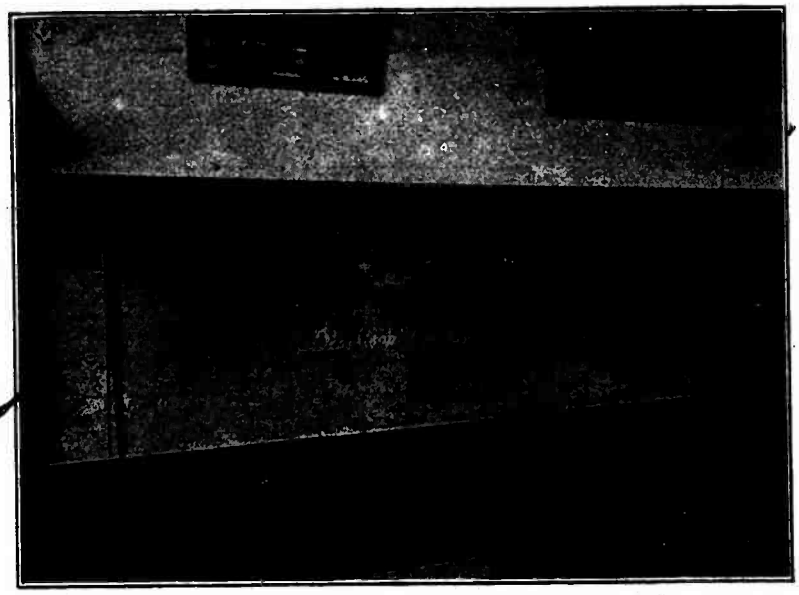
3. Dark colored pictures should not be hung on the walls and dark colored charts should be displayed only when necessary, for these diminish the light in the classroom.

4. Teachers should refrain from placing curtains, or any other obstruction in the window.

5. Window shades should be kept rolled up as much as possible. Attention should be paid to the proper regulations of the shades, protecting the children's eyes from insufficient or excessive light.

6. To favor the maintenance of the proper reading and working distance, pupils should be seated, in so far as possible, at desks according to their size. Janitors are under the by-laws required to make adjustment of furniture upon instruction from the principal. Children having defective vision should be seated as near as possible to the front of the room.

7. The eyes should be raised occasionally from the work, and there should not be two consecutive periods of close eye work.



*A.* HARMFUL BLACKBOARDS.

Sharp contrast between long-used, discolored blackboard and the specimen of natural slate.

*B.* IMPROPER SEATING.

These girls are seated without regard to proper posture and adequate light, both essential conditions for the conservation of vision.

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DESK DISTORTION.

A classroom perspective. Desks that slope to either right or left induce poor posture, with its attendant evil of eyestrain.

*A*. BAD READING POSITIONS.

Efficient class management and instruction in hygiene are needed to overcome unhealthful habits in pupils.

*B*. POORLY ADJUSTED DESKS.

A much too common cause of eyestrain. Most of the children in this group are seated at desks which are too high for them.

A. KINDERGARTEN MANAGEMENT

At the tender kindergarten age children's eyes need rigorous guarding. Instead, by the practice of seating the groups in circles and squares they are either forced to face the light or throw their own shadows upon the objects they handle, often brilliantly colored papers and wooden blocks.

B. WHY NOT IN ROWS?

A suggested arrangement to replace the square. Lateral light is secured for all children. The right or left direction of light is immaterial, as the children neither read nor write.

Another detail of preventive instruction to children which should be emulated in other communities is the placing in school books of such suggestions to children as have been recommended by the child welfare committee of the Women Principals' Association of New York. These are printed upon gummed slips and furnished to school principals to be pasted on the inside of book covers. A copy is herewith given.

**READ THIS FREQUENTLY.**

1. Take care of your sight; upon it depends much of your safety and success in life.
2. Always hold your head up when you read.
3. Hold your book fourteen inches from your face.
4. Be sure that the light is clear and good.
5. Never read in the twilight; in a moving car; or in a reclining position.
6. Never read with the sun shining directly on the book.
7. Never face the light in reading.
8. Let the light come from behind you or over your left shoulder.
9. Avoid books or papers printed indistinctly or in small type.
10. Rest your eyes frequently by looking away from the book.
11. Cleanse your eyes night and morning with pure water.
12. Never rub your eyes with your hands or an unclean towel, handkerchief, or cloth.

Valuable suggestions to children.

(To be inserted in every book used by pupils.)

## GRAPHIC METHODS FOR EDUCATIONAL HYGIENE.

In recent years, a number of organizations interested in public health and particularly school hygiene have adopted the illustrated chart as a means of propaganda. Many valuable, instructive charts have been issued at low prices to make them available to school superintendents, health workers, settlements, etc.

During 1915 and 1916, the writer prepared for the Committee on Health Problems in Education of the National Council of the National Education Association, a series of charts on health conditions of school children generally and with particular emphasis on the conditions and needs of rural schools. Two of these charts dealing with the subject of conservation of vision are here reproduced. It is the writer's belief that by placing within easy reach of school workers such graphic illustrations of the problem and its solution, a better understanding of school hygiene and the health needs of children will be brought about.

One of these, entitled "Defective Eyes Severely Handicap the Child's School Progress," gives a vivid illustration of the proportion of children with defective vision in their classroom and also of the relief brought to such children by the fitting of glasses.

Another chart, entitled "Save the Eyes," illustrates conditions in schools both favorable and unfavorable to the conservation of vision. A modern rural schoolhouse is shown, plainly indicating a window area which perhaps exceeds the required proportion of one to four as to floor area. A country schoolroom in which a warped and cracked wooden blackboard is placed between two windows is also shown. In this same illustration it will be seen that the windows are to the right of the pupils and that not only must they experience the strain on the eyes due to direct light and glare but also the discomfort of turning sideways to look at the blackboard.

In another of these charts, bearing the title "Eye Tests are Efficiency Tests," a typical case of corrected vision is shown. A graphic presentation is also given of the results found in two different surveys, one covering 1,262 rural schools in 18 States and the other covering 347 schools in Iowa, 89 of which were rural. In the first instance, the reports show that in 76.7 per cent of the schools surveyed the children did not have their eyes tested by doctor, nurse, or teacher, while in the Iowa survey in 66 per cent of the schools inspected, the eyes were not tested in physical examinations of the children.

## [redacted]. DETECTION OF DEFECTS.

In the campaign to relieve school children of physical handicaps the first step is detection of the defects. In this the joint labors of teachers, medical inspectors, and nurses are necessary. Undoubtedly, preliminary examination can be made by the teacher and a complete record of the visual capacity of all children in the school thus may be had each term, but this examination must be supplemented by the services of physician and nurse.

It is generally maintained by writers on the subject of the conservation of vision of school children, that the observation of eyesight should be continuous and that tests of its accuracy be frequent. Under the system of medical inspection by physicians, who visit the school at long intervals and have other important work to do, continuous observation and frequent examination of eyes are impossible. It follows, therefore, that if the need be conceded for such continuous supervision of the well-being of school children in so far as it relates to eyesight, this should be in charge of the teachers. Dr. Frank Allport, chairman of the committee on conservation of vision of the American Medical Association, states that he is firmly convinced that tests and examinations of this preliminary kind should be made by school teachers. He proposes that "each teacher should examine all the children in her own room and should report results of such examinations to the principals," such reports to be signed by the examining teacher. He characterizes this plan as "simple and

uncomplicated," and "requiring no medical education on the part of the examiners."

"Every teacher," Dr. Allport continues, "should annually and systematically examine the eyes, ears, nose, and throat of each child in her room. The school board should set aside one day in the early fall for this work. As there are only about 40 children in each room and as it does not take more than five or six minutes to examine a child it will be seen that a room full of children may easily be examined in one day." To indicate the importance of such tests, Dr. Allport makes the following statement:

> It must not be supposed that eye tests among school children are merely for the purpose of correcting ocular defects by glasses. Such instances are, of course, extremely frequent, and many children are retarded in their school work by nearsightedness or by other defects, such as hypermetropia, astigmatism, muscular weakness, etc., which prevent easy and comfortable eye service, and which are usually followed by laziness, neglect of work, discouragement, truancy, and school abandonment. But there are many other ocular conditions which the school tests will disclose, such as the various forms of sore and red eyes, iritis, ulcers, cataracts, cross-eyes, and tear-duct diseases. Thousands of children already owe their emancipation from such diseases to the ocular examinations made in schools. I have no hesitation in saying that every board of health and board of education in this country is commi[illegible] a moral and social crime if it does not insist upon the annual systematic exa[illegible]nation of school children's eyes, ears, noses, and throats.

Dr. Hiram Woods, on the other hand, after a discussion of the causes and effects of eye strain, comes to the conclusion that "examinations of eyes at the beginning of school life should be thorough and should be made by one who knows how to use the ophthalmoscope."[1]

A certain amount of necessary instruction is requisite to qualify teachers to recognize symptoms indicating ocular disturbances, and for the more or less technical procedure in testing acuity of vision. It may be sufficient to issue printed instructions to teachers, as is being done in several States and cities where the work is placed in their charge, but it is undoubtedly much more advisable to include preparation for this work in the training for the teaching profession. Under the medical-inspection law of New York, the commissioner of education is required to "provide for pupils in the normal schools, city training schools and training schools, instructions and practice in the best methods of testing the eyesight and hearing of children." A similar provision is to be found in the Maryland law of 1914, section 10 of which reads: "And be it indicated that the State board of education shall provide for pupils in the normal schools suitable instruction and practice for testing the sight and hearing of school children."

[1] Eyestrain, by Hiram Woods, M. D., professor of diseases of the eye and ear, University of Maryland, Baltimore, Md. Conservation of Vision Series issued by the Council on Health and Public Instruction of the American Medical Association, Chicago.

## PROCEDURE AND APPARATUS.

There are several varieties of test charts both for literates and illiterates, but the one most used for testing the acuteness of vision is the Snellen chart. Reference to the summary of State laws (see Appendix VIII) will show that the Snellen test chart is often specifically designated to be used in testing eyesight of school children.

The following statement of procedure for vision tests was prepared by the writer and approved by a committee of oculists representing three of the leading eye infirmaries in New York City and recommended by them to the New York City health authorities:

1. The vision of every child entering the first term at school should be tested. Two kinds of tests can be made in these cases: (1) Shadow test, and (2) illiterates' chart test.

The shadow test is one requiring the knowledge and training of an oculist and can therefore be made by medical inspectors after a little special training.

The chart tests can be made by teachers using any of the standard methods. (See Appendix VII.)

2. Since the preliminary vision test made in the school is merely to determine in a general way whether a child's vision is normal or defective, the defectives to be reported to the parents as requiring the attention of an oculist, the teacher's test would probably be sufficient. If the teacher finds the vision apparently normal, but the child backward or showing any evidence of eyestrain, the child should be referred to the medical inspector for the shadow test. By assigning this work to teachers it would be possible to accomplish two important things—

(*a*) Examine all the children every year. This is practicable, as the maximum number of pupils per teacher is 50.

(*b*) Allow more time to the medical inspectors for general physical examinations. At the present time only about one-third of the enrolled pupils in New York are examined for physical defects, owing to the large number of pupils per doctor employed. The time necessary for making a vision test is usually sufficient for a general medical examination. By relieving the doctors of the work of testing vision, it will be possible to increase considerably the number of physical examinations.

3. Children wearing eyeglasses should have their vision tested at the beginning of each term by the teacher, and if the vision be found subnormal, the child should be reported for examination by an oculist.

4. Instructions should be issued to medical inspectors with reference to the proper use of test charts. These instructions should include the following:

(*a*) Whenever possible the test chart should be placed so as to receive a lateral light. Otherwise it should be placed on a wall opposite the source of light so that the pupils under examination shall have their backs to the light when reading from the chart.

(*b*) Care should be taken to have the eye which is not being tested properly shielded so as not to impair the value of the examination. The use of a black patch "blinder" is recommended.

(*c*) The test chart should never be exposed when not in actual use. Children awaiting examination should not be permitted to see the chart.

(*d*) Wherever artificial lighting is provided in the medical inspectors' room it should be used for testing vision on dark days, particularly in rooms which do not afford sufficient natural light at all times.

## OBSERVATION AND RECORDING.

The new syllabus of hygiene for New York City schools, providing for cooperation between the health and education departments and tentatively adopted, contains the following provision:

> During the first week in October, the teacher should make a simple test of the pupil's vision and hearing. During the first week in March, pupils registering since October should also be tested. But at all times teachers should keep their children under careful classroom observation, in order to discover evident physical disabilities. Every effort should be made to cooperate with the doctor and nurse to correct the defect found.

Despite the fact that they have more or less knowledge of physiology and hygiene, teachers should not be expected to recognize evidence of physical disturbances which may only be recognized by one having special instruction for this purpose. Hence a limited number of simple suggestions for the guidance of teachers is advisable rather than any complex sets of rules. The following "hints," prepared by Dr. J. T. C. Nash, of Norfolk, and recommended for general use by the Chief Medical Officer of the Board of Education for England and Wales meet the requirements:

> Defective eyesight may be suspected when a child (1) in a back row can not read what is written on the blackboard; (2) can not tell the time by the clock at a little distance; (3) fails to keep to the lines when writing; (4) misses out small words when reading; (5) habitually holds a book nearer to the eyes than 12 inches when reading (6) complains that the letters run into one another; (7) squints, even if only occasionally; (8) complains of tiredness of the eyes or of frontal headache after reading or sewing.

For the manner of recording the acuteness of vision tested by the Snellen chart, guidance will be found in the regulations adopted by the various boards of health and of education, a specimen of which will be found in the appendix giving the Indiana rules. Among them will be found several items already stated in the foregoing.

The undesirability of exposing the test charts in the classroom or any other place where children congregate, thereby enabling them to memorize the letters and thus vitiate any after tests made of their vision, has already been pointed out. The possibilities for such exposure are many and it not infrequently happens that the test charts are left hanging upon the wall when not in use. An interesting innovation has been devised by J. M. McCallie, of Trenton, N. J., consisting of a set of six cards about five and one-half inches square, on each of which are given four test letters of different sizes than as they appear on the Snellen charts. On the reverse of each card are printed the same letters in corresponding positions with the distance at which each should be read by the normal eye. By shuffling these cards and displaying one at a time to the child being

tested, changing their order as often as desired, it is possible to conduct a test in the classroom in the presence of other children without at the same time enabling them to memorize the letters.

Objective tests for illiterate children by means of picture-test cards are not altogether reliable and there is no chart for this purpose which is so universally indorsed and used as the Snellen chart for literates. J. M. McCallie has designed a set of illiterate test cards for the use of teachers in the same manner as the literates' cards are to be used; that is, by shuffling them so that only one item in the test is exposed at a time. Specimens of the McCallie literates' and illiterates' test cards, together with other types of test charts, will be found in Appendix VIII.

For the purpose of recording the results of physical examinations and eye tests, whether made by teachers, medical inspectors, or nurses, a simple, clear form of record card must be provided. Several American and English specimen cards will be found in Appendix VI.

## MEDICAL ROOMS.

In several of the largest cities in the United States special rooms are provided for the medical inspector and school nurse. All new school buildings in New York are now planned to contain such a room; and the dimensions and equipment which make them fit for vision tests as well as for other health work are now practically standardized. Although the testing of vision may be more and more left in the hands of the teachers as time goes on, it is nevertheless necessary so to construct medical inspection rooms that it shall be possible for the physician to make thorough visual examinations. To serve this purpose such a room should conform at least to the following major requirements:

(*a*) A distance of 20 feet, obtainable either in the room proper or by inclusion of the adjoining anteroom.

(*b*) A small waiting-room separated by a partition from the doctor's office.

(*c*) Overhead electric light on the wall best suited for hanging up test charts.

(*d*) Interior finish to be in white or, in part, a nonlight-absorbing buff tint.[1]

## SPECIAL CLASSES FOR THE SEMIBLIND.

Several years ago a physician interested in public-health work caused no little excitement in New York City by declaring that hundreds of children were annually condemned to lifelong blindness by being placed in classes for the blind, whereas had their eyes been carefully examined it would have been found that they possessed

[1] See U. S. Bureau of Education, Bulletin, 1919, No. 2.

enough visual capacity to enable them to use their precious sense of sight if properly cared for and instructed under special conditions. Whether this was so or not at that particular time and place is immaterial now, but the same assertion, except as to the number of children involved, might justly be made concerning many American cities.

That this problem of the child with seriously defective vision or semiblindness was not totally unknown to the school authorities in the metropolis was shown by the 1910 report of the inspector of classes for the blind, of which there were six at that time, by differentiating between the totally blind "and the child with sight so defective that it is impossible or inadvisable for him to carry on the regular work of the school without special assistance." [1] Again, in 1913, the attention of the superintendent of schools was called to the "border-line cases" and special classes for them recommended.[2]

> In the public schools there frequently appear cases of doubtful eligibility on account of defect of eyesight. There are cases where ordinary print can be read with more or less difficulty by placing the book or paper near the eyes, or in favorable positions as to light, but where reading on account of such conditions must be slow and more or less uncertain. Again there are cases where there is such sensitiveness of the eyes that, while ordinary reading is possible, it is attended with the danger of more or less serious injury to the eyes if maintained for any length of time. In both these cases education in the public schools can be carried on only under special conditions. In short, there arise border-line cases which are often puzzling and an incorrect decision as to which may be unfortunate to the individual in question.

One can easily imagine the pitiful plight of such children being compelled to receive instruction by the use of books for the blind, straining themselves in an effort to utilize their little remaining sight to master a method for reading and writing designed solely for those totally blind. Yet one reads in the report of a progressive western city that as late as 1917 "those children who are blind *or nearly so* have been selected and from this class a school has been established where the Braille system of reading and writing is taught." [3]

It was not until the beginning of the twentieth century that this problem of the semiblind or partially sighted child began to engage the attention of medical and educational authorities in England and Germany, the "classes for myopes" established by the London County council, being undoubtedly the first of their kind.

Boston was the pioneer American city in making special provision for children threatened with blindness. Classes for semiblind children were opened in 1913 as a result of the joint efforts of the Massachusetts Commission for the Blind, the local school authorities, and

[1] Twelfth Annual Report of the City Superintendent of Schools to the Board of Education of the City of New York for the year ending July 31, 1910, p. 117.

[2] Fifteenth Annual Report of the City Superintendent of Schools. Reports on Defective Children to the Board of Education, Dec. 10, 1913, p. 30.

[3] Health Supervision in Los Angeles City Schools, Publication No. 1, Board of Education, Los Angeles, Calif., June, 1917.

a group of Boston eye specialists. The initiative for this action is credited to Edward E. Allen, director of the Perkins Institute for the Blind, who was impressed with the tragedy of semiblind girls and boys applying at the institute. Two classes were therefore established for such children, located in one school in Roxbury. The first enrollment consisted of 22 children and there has been but slight variation in this number from year to year. These children are assembled from all parts of the city, the carfare for most of them being furnished by the schools. This group of children and the method of instruction provided for them is as follows:

> The pupils, with one exception, have better than one-tenth normal vision. An experienced oculist has oversight of the work, and two teachers, who have been trained at the Perkins Institute, give the instruction, which includes the ordinary curriculum of the course of study and especially adapted manual work. The few textbooks used in the school are especially prepared in large type. Most of the matter, however, has been copied in large script by the teachers, and much of the work is taught orally. Most of the written work is done on a blackboard, although large pencils and specially ruled paper are used to some extent.[1]

Jersey City and Newark, N. J., were quick to follow the example of Boston, Newark in 1913 providing two special teachers for its class of 10 children with seriously defective eyesight.

Detroit, Mich., acted upon the recommendation of its superintendent of schools made in 1915.

In New York City, two special classes for the partially blind were in operation in 1916, for which the following regulations were adopted:

> The blackboards are used for their written lessons until they have learned to write in a bold, double-sized script, when large-sized paper may be used for writing. The special teachers read many of their lessons for them and assist them with their home-work, for these children must not read or study by poor artificial light. Charts are provided to cover every subject in the child's course emphasizing the important points. Notebooks and spelling-books are printed in large type for purposes of study. At present all written work is done under the supervision of the special teacher and oral lessons are recited to the regular grade teacher with the other children.[2]

Cleveland, Ohio, holds an enviable record among American cities for the thoroughness with which this problem has been studied and the remedy applied. The first class was opened in 1913 at the Waverly School, R. B. Irwin supplying the children with the regular school texts in 36-point bold-face type. These children are under close observation by the medical inspection department. Under direction of Mr. Irwin, Cincinnati opened conservation of vision classes in 1914, the work so organized and related to the work of seeing children that these partially blind, "as well as the totally blind under the same director, are making in most cases the same rate of school progress as the seeing children."

[1] Eighteenth Annual Report of the City Superintendent of Schools, Reports on Special Classes, presented to the board of education Mar. 28, 1917, p. 38.

[2] Boston Public Schools, Annual Report of the Superintendent, December, 1915, p. 70.

Standards for admission to the Cincinnati conservation of vision classes, proposed by a local committee of oculists, were adopted in May, 1915. General rules for the guidance of teachers and nurses were published and a course of lectures given by Dr. King to teachers and normal school girls. These rules are reproduced in full in Appendix IV.

## VI. CORRECTIONAL PROCEDURE.

### FOLLOW-UP.

The detection of physical defects is but the first step in correctional procedure. A notice sent to parents advising them that the examination of their child indicates defective vision and that an oculist should be consulted does not always produce the desired effect. Such notice is often received with indifference, sometimes with resentment. Most parents have to be "jogged up." This matter of securing parental action is the best test of cooperation between teacher and physician or nurse.

In the cities where this follow-up work is largely done by nurses it has been found that without it a very large proportion of defective children would suffer neglect. New York City school nurses, for instance, make an average of four visits to homes of children in need of treatment—well-to-do and poor alike—before the needful thing is done. These follow-up calls vary from 2 to 10 in many cases. At the end of one year nurses reported 45,000 cases as "unfinished" out of 222,072 needing treatment of various kinds. One reason why the number remained so large at the end of the year was because too much time was consumed in the repetition of visits.[1]

Teachers can render very effective service by communicating either directly or through the principal with the parents whom the nurses have had no opportunity to see. In New York a teacher has before her the physical record card of every child in her class. No teacher should let up on a case until every defect entered by the school doctor has been reported as treated. A reminder to the child or a brief note to the parent will sometimes suffice. If not, a request that the parent call to see the principal regarding the child's work at school may be effective. It must be made clear to parents, who are not as yet abreast of the times, that the child's health is as much the school's business as are his "studies." When the teacher prods a parent on the child's need of eyeglasses and medical or dental treatment, as well as on his failure in his studies, the relation of defect to school work becomes more apparent to the parent.

[1] See also School Nurses, Teachers and Parents: Need of Their Cooperation in Following Up Cases for Treatment, by J. H. Berkowitz. The Modern Hospital Magazine, June 1916. Reprinted in New York Times, July 14, 1916.

## OBJECTION TO EYEGLASSES.

Much time is necessarily lost on cases among the foreign-born population as well as among some uninformed natives who view the authorities' interest in their children with fear and suspicion and have strong prejudices and superstitions regarding medical, surgical, and dental treatment. It is sometimes as hard to convince a mother that a row of decaying teeth, stumps, and inflamed gums are a disfigurement to her young daughter as it is to overcome the mother's objection to eyeglasses as an impairment of a girl's appearance. Further difficulty is experienced with some children in having them wear the glasses after they are obtained. This is not an uncommon complaint of school health workers, as the following from an English report illustrates:

> For various reasons the children do not want to wear glasses, and the parents do not bother about it. Some parents seem to think that if they themselves provide the glasses it is no business of the medical inspector or the teacher whether the child wears the glasses or not. In about a dozen cases where there was persistent neglect in this respect the matter was reported to the school board. Children are not taught to take care of their glasses after they have been provided, and when they are broken it is quite common to take no steps to have them repaired or replaced. One finds children frequently with their spectacle frames made up mostly with string and lemonade wire. The result is that the glasses sit on the face at all sorts of angles, and may be doing next to nothing in helping the child to see.[1]

Curiously, at about the same time, another English health officer was pointing out "the fact that many employers hesitate to engage workers who have to wear spectacles explains the reluctance of some parents to provide glasses, even when recommended by school medical officers."

With this we have a suggestion of a different line of follow-up endeavor, the attention of manufacturers having been drawn to "spectacles as an aid to efficiency," the health officer making this comment:

> Employers can help by considering the fact that a large number of people have defective sight and that if they wear spectacles the employer gets better work done and they are safer as regards accidents—i. e., an employer who, on going through his work, finds few people wearing spectacles, ought not to feel that it means efficiency or safety but rather that he has his fair proportion of badly defective vision cases not wearing spectacles who will be inefficient workers, and more likely to meet with accidents.[2]

## VALUE OF FOLLOW-UP WORK.

The value of such follow-up work may be judged in a number of ways, and among the tests for it would be—

1. The promptness with which the child is examined for refractive errors, either by a private ophthalmologist or at a clinic, after being

[1] The Medical Officer (London), No. 424, Sept. 9, 1916, p. 345.
[2] Dr. J. Percival Brown, in The Medical Officer (London), No. 423, Sept. 2, 1916, p. 331.

reported as having defective vision by either teacher or medical inspector.

2. The promptness with which eyeglasses are obtained when prescribed.

3. The testing of eyeglasses as to their accuracy, wherever obtained.

4. Endeavors to insure the wearing of the eyeglasses by the children.

In cases in which the refractions are done and glasses prescribed at school clinics, there is some assurance that the children will be required to return for an examination of the eyeglasses. When children fail to report for this purpose, the clerk of the clinic should be required to inform the school nurse of the fact. At most dispensaries little, if any, effort is made to follow up cases. Failure to follow up cases is a particularly serious matter where eyeglasses are sold by dispensaries and there is no checking up or subsequent testing of glasses.

The experience of the Boston Dispensary in this respect is of interest. This institution is known for its efficient social-service department, and the reports of the dispensary attest the wisdom of maintaining such department. A study was made of the records of all new patients for three months in 1910 and the corresponding three months in 1912, covering in all 564 cases—263 in 1910 and 301 in 1912. It was found that in 1910, when no effective follow-up work was done, 66⅔ per cent of the glasses prescribed by the oculist were not called for, while in 1912 only 8 per cent of the glasses prescribed were not called for.

Another direction in which the efforts of the school nurse and teacher should be applied is in warning against the opticians and optometrists who improperly style themselves "doctor," "eyesight specialist," and by other similar titles. More often than not these are men without any medical training, who merely hold a State license for optometry. In a large number of cases the parents of children, upon being notified of an ocular defect, and advised to "see the doctor," have recourse to either optician or optometrist instead of consulting a duly licensed physician practicing ophthalmology.

As an illustration of practical results obtained through follow-up efforts, we may take the following record of disposition made in vision cases in New York City schools from 1909 to 1918.

During 1914, 15,348 children were reported as having obtained glasses. In addition to these, 3,451 were reported by certificates from physicians as under treatment for defective vision. Investigations by the school nurses, however, proved that in these cases nothing more was done than to prescribe some eye lotion or eye drops.

*Character of treatment obtained for defective vision.*

| | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| Glasses | 8,218 | 9,929 | 11,304 | 10,658 | 12,285 | 15,348 | 16,475 | 14,108 | 13,451 | 9,085 |
| Medical | 14,122 | 5,598 | 5,329 | 2,572 | 2,670 | 3,451 | 2,843 | 1,419 | 3,954 | 1,977 |

[1] 6 months.

It should be noted in the foregoing figures that there is a steady and considerable yearly increase in the number of children obtaining glasses and a corresponding decrease in the number of medically treated cases reported, even during the years when the service was seriously drawn upon by the war emergency. These are largely the results of follow-up work. Considering that the staff of nurses is inadequate to the city's needs (one nurse for 4,500 pupils), this is a record of substantial achievement.

Systematic cooperation on the part of the school doctor, nurse, principal, and teacher would insure the proper disposition of all cases, whether treated by family physician or clinic.

## SCHOOL CLINICS.

Few cities in the United States, and those only among the very largest, have special clinics for correcting refractive errors in school children. The operation of such clinics as part of the educational system is often opposed as too paternalistic. Even in some cities, where the school health work is otherwise effective, the correctional or curative work is left to hospitals and dispensaries maintained by private funds.

The English authorities, on the other hand, have long since recognized the necessity and propriety (as public policy) of including clinics for school children in the educational system. There are now, according to the chief medical officer of the board of education, no less than 168 local education authorities of English cities and boroughs maintaining clinics in which eye-refraction work is done. These employ 181 ophthalmologists. London proper has 19 centers in which this type of work is conducted. In addition to these special school clinics, there are 48 hospitals in that many boroughs which are cooperating with the education authorities in providing treatment for eye cases.

Of American cities, it might be said that the outstanding ones in this respect are New York, Cleveland, Milwaukee, and Rochester, N. Y. There are other cities in which clinical services are provided for school children in various types of institutions, but the cities named maintain clinics within school buildings and as part of the school system. The clinic in Cleveland is managed by the depart-

ment of medical inspection of the board of education. The procedure is as follows:[1]

This clinic is open every afternoon during the school year. * * * During the routine physical examinations of children by the doctors in the different schools, the vision is tested and, if found defective, the parents are advised of it by note. The nurse then follows up the case and if she finds that the parents are unable to pay for an examination by an oculist, she takes the child to the school clinic, after having obtained the written consent of the parent. There the child is given a thorough and accuraet examination, the eyes being first dilated with homatropin and the error of refraction determined by means of the retinoscope. The proper glasses are ordered for the child and in a few days he is brought back to the clinic and the frames carefully adjusted. The nurse then keeps in touch with the case, seeing to it that the child wears the glasses, that the frames are straight, and that the symptoms of which the child complained are relieved.

NEW YORK CITY.

There are six eye clinics in public schools for the exclusive use of school children. Although located in school buildings, these clinics are conducted by the health department, under whose jurisdiction school medical inspection is maintained in the city of New York. These clinics were established in 1912. In addition to the making of refractions and fitting of glasses, treatments are also given for contagious eye dieases. While the number of cases treated at these school clinics annually is very large, it represents only a portion of the total number of such cases in the city. A survey of the clinical facilities in Greater New York for this work showed that there are altogether 40 institutions at which eye refractions are made. This number includes the 6 school clinics, 2 municipal hospitals, and 32 public dispensaries conducted independently or in connection with privately supported hospitals. These clinics are distributed by boroughs as follows:

| Borough. | Health department. | Municipal hospitals. | Dispensaries. | Total by borough. |
|---|---|---|---|---|
| Manhattan | 2 | 1 | 24 | 27 |
| Bronx | 1 | 1 | 2 | 4 |
| Brooklyn | 2 | | 4 | 7 |
| Queens | 1 | | 1 | 1 |
| Richmond | | | 1 | 1 |
| Total for city | 6 | 2 | 32 | 40 |

These school clinics are in locations where the need is greatest, as determined by the economic character of the neighborhood and the lack of other clinical facilities in the vicinity. They have done an enormous amount of work efficiently and reliably, and this work steadily increases from year to year as shown by the following table:

[1] Cleveland Education Survey: Health Work in the Public Schools, by Leonard P. Ayres and May Ayres, Cleveland, Ohio, Survey Committee of the Cleveland Foundation.

*Clinical statistics.*

| Refraction service. | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 (6 months). |
|---|---|---|---|---|---|---|---|
| Cases brought forward | | 2,016 | 3,675 | 2,969 | 7,356 | 5,295 | 6,844 |
| New cases received | 4,845 | 8,365 | 9,625 | 11,212 | 9,132 | 11,397 | 4,819 |
| Total registered | 4,845 | 10,381 | 13,301 | 14,181 | 16,488 | 26,984 | 13,060 |
| Cases discharged | 2,829 | 6,705 | 10,332 | 6,825 | 5,581 | 8,143 | 3,694 |
| Cases pending | 2,016 | 3,675 | 2,969 | 7,356 | 10,907 | 8,549 | 6,794 |
| Cases discharged: | | | | | | | |
| Normal | 506 | 1,474 | 106 | | | | |
| Cured | 1,908 | 4,204 | 5,017 | 5,819 | 4,634 | 7,182 | 3,352 |
| Dropped | 415 | 1,027 | 5,209 | 1,006 | 947 | 1,066 | 350 |
| Refractions performed | 8,780 | 20,528 | 24,722 | 26,452 | 20,922 | 26,732 | 12,204 |
| Treatments | 4,907 | 11,023 | 11,067 | 9,713 | 12,379 | 18,323 | 11,790 |

The report of the bureau of child hygiene[1] for 1915 stated: "The department clinics are not sufficient to meet the pressing need and should be extended." Another statement appears in this report based upon the reports of school nurses, that "It has been impossible to obtain sufficient facilities from the dispensaries of the city." The survey made by the writer fully confirms these statements.

## METHODS AND ROUTINE.

New York having been the pioneer American city in establishing school eye clinics, the methods followed in them represent the result of several years' application of the knowledge and experience of competent oculists. A detailed account, therefore, of the procedure in these clinics may be of value to other communities should they establish such clinics.

The examinations are made by ophthalmologists, and for this reason these clinics, like the private special eye infirmaries, should be preferred, and probably are, by school nurses and principals when directing the attention of indigent parents to the need of having their children's refractive errors corrected. No glasses are sold at these clinics nor is any particular optician recommended to the children receiving prescriptions. Precautions are, of course, taken to the end that the clinic privileges are not abused and also that they are fully utilized for the children's benefit.

All children referred to the clinic are required to present a card signed by the school nurse indicating that she has investigated the social and economic status of the family and that they are entitled to free treatment. Where no adult member of the family is available, the school nurse accompanies the child to the clinic after obtaining written consent of the parent to have the child treated at the clinic.

Each child, on admission at the registrar's office, is given two history cards, one for refraction and one for contagious disease.

[1] The Bureau of Child Hygiene of the Department of Health, of the City of New York, third edition, January, 1915.

The child is then sent to the clinic physician (oculist) who makes his diagnosis of the eye condition. If there is no eye disease present on examination, the contagious disease history card is terminated at once and the diagnosis marked "normal." The examination of vision for glasses is then entered on the refraction history card. If, however, eye disease is found, the refraction history card is marked "refraction pending," the order being to treat and cure any eye disease before glasses are prescribed.

The only exception to this ruling has been in some cases of mild, noncontagious eye disease where evident refractive error demanded immediate correction for effective use of vision in school, in which cases refraction, examination, and treatment of the eye disease have proceeded simultaneously.

All cases of eye disease are treated until terminated either as cured, improved, unimproved, or transferred to another hospital or clinic. Operative cases are referred to the nearest special hospital. When cured or terminated otherwise on contagious disease history card, all cases are then refracted for refraction history card.

The procedure for refraction requires mydriasis for all new cases. Strabismus cases, either convergent or divergent, receive a vial of atropine sulphate solution with instructions to instill one drop in each eye three times a day for two days before returning to the clinic.

In order to prevent cases of atropine poisoning from careless use of atropine solutions, the children and parents, besides being instructed how to use the drops, are supplied with a card of printed instructions. These instructions are also printed on the label of the vial containing the drops:

POISON.

1% Sol. of Atropine Sulphate.

Directions.

One drop by the dropper in each eye three times a day.

Start drops on ....., continue for two days, and return to clinic on ....., at 2 p. m.

All other cases have homatropine and cocaine instilled at the clinic by the clinic nurse at the first visit. For such cases one drop of 2 per cent solution of homatropine is instilled in each eye for three times at intervals of five minutes followed at the same interval by one drop of 1 per cent cocaine solution. After a wait of approximately 20 minutes the child is ready for refraction tests.

The vision of each eye is tested and compared with vision of each eye previous to mydriasis. In the dark room the eye is examined

with the ophthalmoscope, direct and indirect methods, and by retinoscopy. The astigmatic error is measured with the Javal ophthalmometer. The refractive condition is then corrected with trial lenses and test types, all findings being noted on the history cards. The child is then told to return for final tests in approximately four days, when, without mydriasis, all the above methods of examination are repeated and compared with the findings under mydriasis. If satisfactory glasses are then prescribed or case terminated as normal, unimproved, or transferred elsewhere, e. g., for operation for strabismus.

All children with glasses ordered are directed to return to have their lenses tested for accuracy in grinding and adjustment of frames before history cards are terminated as cured.

## CLINICAL FORMS.

One result of the clinical survey which is here summarized has been the adoption in the New York City school eye clinics of an improved form of case history card, based upon recommendations contained in the report on the survey.

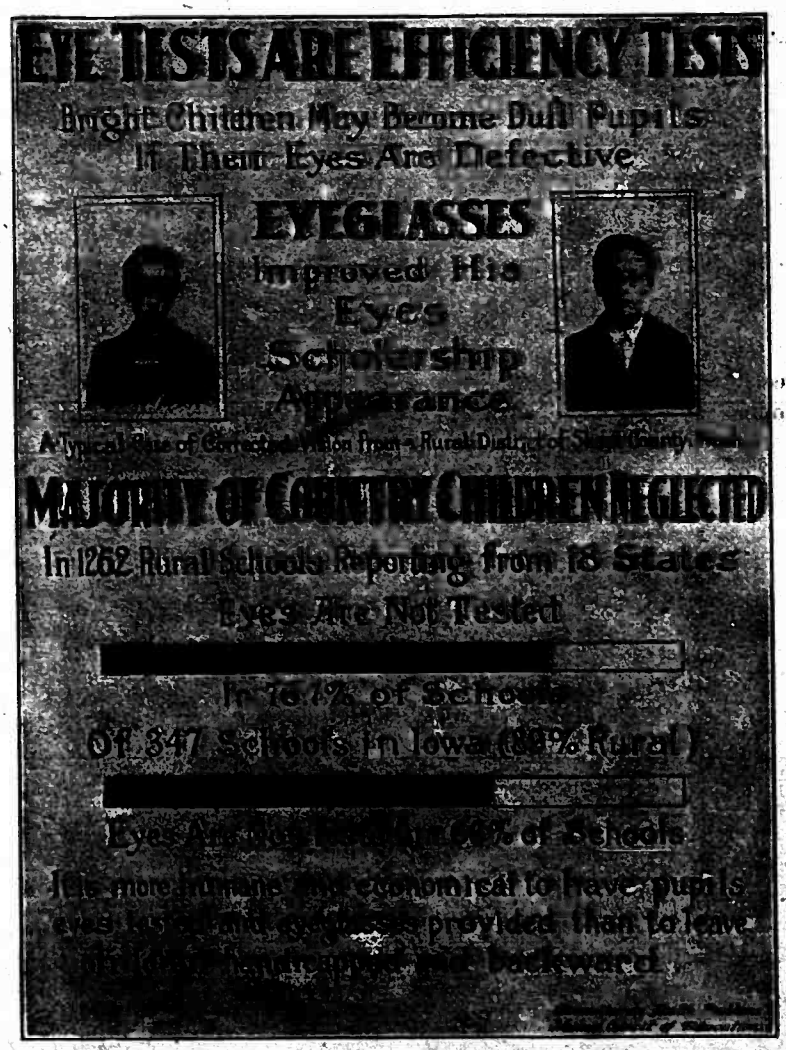
The record blanks must be clear, comprehensive, and practical. They are vital instruments for the efficient administration of clinics and medical inspection. They are discussed more fully in Appendix VI, in which also will be found specimens used in several American and English cities.

## THE PROVISION OF EYEGLASSES.

The fitting of eyeglasses by opticians generally involves much petty exploitation. As yet no considerable scheme has been attempted in any American city for supplying eyeglasses to dependent children, either free or at cost. This problem has been successfully attacked in England, where education authorities, through cooperation with local reputable optical firms, furnish eyeglasses which are purchased at wholesale rates, the cost being borne either entirely or in part by the school committee. School committees or county councils have legal authority to provide school children with eyeglasses as well as any form of medical treatment needed, and then demand a contribution from the parents toward the cost should they be unable to pay the entire cost.[1] In either case, the authorities may take steps against the parent to collect the debt by legal process. The provision for this is found in the act of 1909, as follows:

SECTION 1. Where any local education authority provides for the medical treatment of children attending any public elementary school under section 13 of the education (administrative provisions) act, 1907, there shall be charged to the parent of every child in respect of any treatment provided for that child such an amount

[1] See London County Council. Education Committee. Handbook containing general information with reference to children's care. Education Offices, Victoria Embankment, London.




THE CASE OF THE COUNTRY CHILD.

An illustration of an individual case which ought to represent the rule instead of the exception.

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not exceeding the cost of treatment as may be determined by the local education authority, and in the event of payment not being made by the parent, it shall be the duty of the authority, unless they are satisfied that the parent is unable by reason of circumstances other than his own default to pay the amount, to require the payment of that amount from that parent, and any such amount may be recovered summarily as a civil debt.

The general rule in American cities is as follows: When, upon investigation by a school nurse or teacher, a pupil is found to have defective vision, and he can not afford to purchase necessary eyeglasses, the case is reported to some local charity. In several localities there are, however, special funds maintained in schools to which voluntary contributions are made, or obtained by the teachers and nurses. With these funds eyeglasses are provided for the most needy cases just as other forms of assistance are sometimes given.

The following is a table of expenditures by the English education authorities during four years for spectacles furnished to school children:

| Expenditure. | 1912–13 | 1913–14 | 1914–15 | 1915–16 |
|---|---|---|---|---|
| Provision of spectacles | £1,670 | £2,155 | £3,681 | £4,023 |

The number of education "areas" (districts) in which spectacles were provided free or at cost reached 189 in the year 1916.

## THE COST OF EYEGLASSES.

There seems to be no good reason for the striking variation in the retail price of eyeglasses. In Philadelphia, where in a limited way glasses are obtained for children at wholesale cost, the average price paid for the simpler forms of lenses fitted with plain steel frames is 98 cents a pair. In New York a group of 40 children attending a school in one section of the city were questioned as to the price paid for eyeglasses and the average cost per pair was $1.46; in another part of the city the average cost in a group of 44 children was $2.28. The prices charged at the city dispensaries and infirmaries also display striking differences, the average "minimum" price for glasses computed from figures obtained in 10 infirmaries being $1.40 a pair. Figures secured in other cities also show considerable differences. The average "reduced" prices paid for school children's glasses in several cities are as follows:

| | |
|---|---|
| Camden, N. J. | $1.00 |
| Harrisburg, Pa. | 2.00 |
| St. Louis, Mo. | 3.00 |
| Providence, R. I. | $1.25–3.00 |
| St. Paul, Minn. | 1.75–2.50 |
| Cincinnati, Ohio | 1.25–2.40 |
| Rochester, N. Y. | 3.00–4.00 |
| Minneapolis, Minn. | 2.50–5.00 |
| Chicago, Ill. | 2.00–5.00 |

Compare with the foregoing figures of opticians and dispensaries catering to the poor the following estimates of a leading New York optical firm doing business in the most fashionable part of Fifth Avenue:

*Eyeglass or spectacle complete.*

| | Spherical. | Cylindrical. | Compounds. |
|---|---|---|---|
| Gold, silver, or aluminum | $1.50 | $2.00 | $2.50 |
| Gold filled | 2.25 | 2.75 | 3.25 |
| *Lenses only.* | | | |
| Flat lenses (per pair) | 1.00 | 1.50 | 2.00 |
| Toric lenses | 2.00 | 3.00 | 3.50 |
| Paster bifocals | 1.75 | 2.75 | 3.25 |
| Pasters only | .75 | 1.25 | 1.25 |

In the absence of any definite system of efficient supply of glasses to needy children, much at least can be done in regulating the traffic of opticians. Undoubtedly many opticians can be found both honest and reliable who would undertake to fit the children with the proper glasses, charging a reasonable minimum price in consideration of receiving the bulk of the business in their respective school districts. Such arrangements could be managed easily either by the school nurses or school principals. Wherever there are school clinics, the children examined and treated there may properly be referred to an optician with whom such arrangement has been made. This practice prevails among clinics and dispensaries generally, but the relation between opticians and dispensary oculists is often such that the latter share in the profits of the optician, thus precluding the possibility of lowest possible prices. Assuming ethical conduct on the part of the public employee, whether the oculist, nurse, or school principal, there is no good reason why the indigent child should not obtain the full benefit of a reduced cost of eyeglasses obtained from an optician, working in cooperation with the school and health officers.

## COMPULSORY TREATMENT.

There is sharp division between English and American opinion generally on the wisdom and soundness of policy in the legal compulsion of parents to provide for their children such curative treatment as may be necessary for the correction of discovered physical defects. The English authorities are not only well armed with specific laws for this purpose, but they already have in their favor a number of judicial decisions. The record of legal prosecutions and compulsion, even punishment of recalcitrant parents and guardians, already contains precedents regarding almost every kind of children's physical deficiency requiring surgical, medical, or nursing service.

In a number of our States it is possible at the present time to proceed against recalcitrant parents and guardians in such cases

under certain provisions of the compulsory education law, sanitary codes, or domestic-relation laws affecting the relations between parents, guardians, and children; but direct provisions of this character are only to be found in the laws of Colorado, New Jersey, and New York.

The law of Colorado, passed in 1909, contains the following:

> If the parent or guardian of such child shall fail, neglect, or refuse to have such examination made and treatment begun within a reasonable time after such notice has been given, the said principal or superintendent shall notify the State bureau of child and animal protection of the fact: *Providing, however,* That whenever it shall be made to appear to the said principal or superintendent, upon the written statement of the parent or guardian of said child, that such parent or guardian has not the necessary funds wherewith to pay the expenses of such examination and treatment, the said principal or superintendent shall cause such examination and treatment to be made by the county physician of the district wherein said child resides; and it shall be the duty of such county physician to make such examination and treatment, and if he be unable to properly treat such child he shall forthwith report such fact to the county commissioners of the county with his recommendation.

The New Jersey law, adopted in the same year as the one in Colorado, contains the following provision:

> If the cause for exclusion is such that it can be remedied, and the parent, guardian, or other person having control of the child excluded as aforesaid shall fail or neglect within a reasonable time to have the cause for such exclusion removed, such parent, guardian, or other person shall be proceeded against, and, upon conviction, be punishable as a disorderly person.

In the State of New York it is possible to take action against neglectful parents both under the penal law and the educational law. The penal law provides that a person who willfully omits, without legal excuse, to perform a duty by law imposed upon him to furnish food, clothing, shelter, or medical attendance to a minor is guilty of a misdemeanor. At the same time, the State education law provides that every child of the statutory age, who is in proper physical and mental condition, shall attend school. Under such law, it is possible to take action against recalcitrant parents. No doubt such action could be taken in a number of States having compulsory education laws. It should be pointed out, however, that resort to such legal action is almost futile, if no penalties are provided.

So far there is on record only one report of a prosecution and conviction in a case of this character. The State superintendent of public instruction of Colorado, in her report for 1909–10, page 16, says:

> Out of 41,546 cases of defectiveness reported to the State superintendent of public instruction as having been discovered, and presumably reported to the parents of the children, 221 cases were reported by teachers to the State bureau of child and animal protection for failure of parents to have the medical examination, indicated by the teachers' examination, made.

The report goes on to say that—

> With one exception the parents in all these cases were induced by letter or by the visit of our officer to do whatever the children's condition required. In the one case where it was necessary to bring the parents into court the child's throat was nearly closed by enlarged tonsils and his health seriously affected. At the trial the father was sentenced to 30 days' imprisonment.

It is obvious that failure to correct visual defect could be prosecuted on the same grounds.

### AMERICAN OPINION.

Before proceeding with the account of the situation in England, it may be well to quote here the opinions of American workers in the field of school health. Dr. Jacob Sobel, chief for the Borough of Manhattan, division of child hygiene, New York City health department, has given particular attention to the attitude of the parents, especially in the foreign quarters of the metropolis, toward the exercise of official compulsion in the removal of physical defects. Referring to conditions in New York, Dr. Sobel, says:

> So serious at one time did this question of parental cooperation become that it was suggested that legislation be enacted to compel parents to have these physical defects remedied. It is questionable whether any such compulsory law will be enacted in our day, any that will stand the test of the courts, and I admire the courage of those who advocate the idea. With Kerley I prefer to say, "I do not believe in compulsion or in attempt at legislating righteousness into people. I do believe in education sufficient so that each individual may with reason and intelligence direct his life and habits." The easier way, that of education, I believe to be along the line of least resistance; "accomplishing mighty feats by gentle suasion" will prove, in the long run, not only more effectual but more lasting.[1]

These sentiments are admirable for the consideration shown human sensibilities, but from the point of view of results there remains something to be desired. It is pertinent to mention that Dr. Sobel, in the paper above quoted, gave the statistics (1909–1912, inclusive) of cases of defective vision found and the number of these cases for which glasses were procured. The percentage of cases in which glasses were procured was disconcertingly low; 1909, 27 per cent; 1910, 33 per cent; 1911, 46 per cent; 1912, 50.5 per cent.

On the other hand, the constant increase in the percentage of cases for which glasses were procured is distinctly encouraging. It was shown in a prior section (p. 44) that the nursing force is insufficient for adequate follow-up work, that clinical facilities are inadequate, and that the problem of furnishing glasses economically is only partly solved. In view of these facts, it is evident that the possibilities of "accomplishing mighty feats by gentle suasion" have not been fully exploited. The fact that in the Colorado case, cited above, only 1 parent out of 221 was recalcitrant is likewise encouraging.

[1] Prejudices and Superstitions Met with in Medical School Inspection. By Jacob Sobel, M. D. New York Medical Journal, November 23, 1912.

It is true, however, that legal compulsion is a necessary last resort in some cases. The account given below, by Dr. J. M. Hurty, State health officer of Indiana, of conditions found in one rural county and of the parental attitude, is doubtless typical of the experiences of the health workers. Even in case of such serious diseases as tuberculosis and trachoma Dr. Hurty found the legal means at his disposal inadequate.

> In the rural schools of one county, 49 cases of trachoma were discovered. The parents were kindly informed by letter and urged not to neglect treatment. Two weeks after, it was found that only one child was under treatment, and he was a ward of the county court. Finally, it was necessary to compel most of the parents to save the eyesight of their children. One mother, when asked why she did not take her child to the doctor, said, with a nasal drawl: "Oh, you doctors, you's just got another scheme to git our money." Another mother replied to the same question: "I had them sore eyes when I went to school and I got well. I ain't skeered." * * *
>
> And does this not make plain that finally medical inspection and also care of children by parents must be made compulsory, just as was found necessary in the matter of education? [1]

## PROSECUTIONS BY ENGLISH EDUCATION AUTHORITIES.

In the reports of school medical officers for England and Wales there appear about as large a proportion of cases unattended for physical defects after notification to parents as may be found in the reports of most American cities. This clearly points to the backwardness of parents due variously to indifference, ignorance, and dogged opposition to such governmental "paternalism." The English authorities, however, are not unwilling to avail themselves of all the legal possibilities for forcing action. Sometimes prosecutions are brought directly by the education authorities under any one of the several acts which specifically apply and give them the power to institute proceedings, or they report such cases of parental delinquency to such organizations as the Society for the Prevention of Cruelty to Children. Most of the prosecutions are for sending children to school in unclean condition, "verminous" mostly, but there have been prosecutions and convictions since the children's act of 1908 went into effect, for failure to provide the necessary medical or surgical attention for practically every kind of physical defect reported by the medical inspectors. It should be noted that the school authorities in England were not without this power to proceed in such cases for they had the prevention of cruelty to children act of 1904, the pertinent sections of which were incorporated in the children's act of 1908.

The first case [2] reported at that time was one in Eccles where the local education authority prosecuted a parent for neglecting his child

[1] Public Health Bulletin of the Michigan State Board of Health, p. 287. Lansing, Mich., September, 1913.

[2] All citations here given on English prosecutions are based on the annual reports of the Chief Medical Officer of the Board of Education for England and Wales, 1909–1914, inclusive, and the results of the prosecutions quoted in abstract.

by failing to provide her with spectacles. The evidence showed that several notices had been sent to the parent without avail and that the education of the child was being retarded by her defective eyesight. The parent was fined 20 shillings and costs with the alternative of imprisonment for a month. Similar prosecutions for failure to provide spectacles were successfully carried out in 1910 at Bridgewater and at Weymouth. In the latter place five parents were prosecuted with such salutary effect on the rest of the community, according to the local medical officer, "that since these prosecutions there have been no cases of parents refusing to provide spectacles for their children." An unusually obstinate parent having been encountered at Hull, the fine imposed was £1 11s., with the alternative of 24 days' imprisonment. In a similar case, in Northamptonshire, the parent was fined £3. The school medical officer in the latter area made this comment: "I purpose now to use this case as a lever for recalcitrant parents in bad cases where the child's school progress is being definitely interfered with from the defective vision and the suffering entailed on the child by the eyestrain."

It appears from the records that in all these cases the courts lend the fullest cooperation to the education authorities. In many instances the desired results are secured by warnings from the bench.

## VII. NEEDED STANDARDIZATION FOR SCHOOLS.

### SCHOOLHOUSE PLANNING AND CONSTRUCTION.

Great strides have been made in the United States in the construction of better schoolhouses, but there is a bewildering assortment of so-called "model" plans and between these and the disappointing results often arrived at, the school superintendents are at a loss to know what to demand of their architects. State laws governing the construction of schoolhouse are few and most of these deficient.[1] With reference to the subject of lighting, not more than 20 of the States have any provision regulating light and floor space. Only eight of these laws take into consideration windows, while artificial lighting is regulated in but nine of the States. As on lighting, so on other factors of schoolhouse construction, there are striking differences and conflicting provisions showing only too often the lack of any authoritative basis for these legislative attempts. Perhaps with the formulation of sound and universally acceptable standards for schoolhouses, there may be enacted uniform legislation for school buildings in the United States. The Committee on Standardization of Schoolhouse Planning and Construction of the National Education Association has been at work for over two years. This committee

[1] Bureau of Education, 1915, Bulletin No. 21: Schoolhouse Sanitation, by W. A. Cook.

may reasonably be expected to establish standards for well-planned, well-equipped, healthful schools.

*Lighting.*—The subject of standardization of lighting, both natural and artificial, has already been touched upon elsewhere in this survey and attention called to the work of the Code of Lighting School Buildings, prepared by a committee of the Illuminating Engineering Society. This subject also is being considered by the committee on schoolhouse standardization of the National Education Association. The problem has been engaging the attention of an English committee for several years past. The standards for daylight illumination of schools proposed by this committee are given in an interim report published in 1913.

> No place is fit for use in a classroom where diamond type can not be read easily by a normal observer at a distance of half a meter (20 inches). The darkest desk in any classroom should receive an illumination equivalent to that derived from 50 reduced square degrees of visible sky.[1]

*Desks and seats.*—Notwithstanding the commendable efforts at standardization, both American and European, discussed in the chapter on the desks and seats in this survey, agreement is still lacking on the most essential features of hygienic school-desk construction. The American Posture League has not only applied itself to the study of the subject, but it has actually constructed a combination school desk and seat embodying its principles of hygienic seating. In the surveys of seating arrangements, made by the present writer, two blank forms were used which were designed to record all the vital details of arrangement, construction, sanitary condition, etc. It is my belief that any desk or set of desks found to record or "score" satisfactorily on these details in accordance with a scientific set of standards, should be the perfect product. As yet, however, we have no such standards and a rational endeavor to formulate them is highly desirable. In Appendix II will be found the blanks referred to, with opinions received from the American Posture League in answer to questions regarding some of the details of desk construction.

*Books.*—American school administrators should adopt as standard the recommendations of the British Association for the Advancement of Science. The abstract of the report of the oculist of the subcommittee (p 25 above) states clearly and concisely the physiology of the eye, and the pathology of defective vision. The following conclusions of the oculist of the subcommittee were reached after a thorough discussion of all details of schoolbooks in relation to vision defects:

> (1) The existence of a very serious amount of visual defect among children of school age is established as a result of official inspection. Some portion of this defect is preventable by greater care in the selection of books.

[1] The Medical Officer (London), Sept. 26, 1914. Reprinted from the Illuminating Engineer, July, 1914.

(2) It is desirable that a standard of book production should be established, and that the publication of books below standard should cease.

(3) It appears possible that the adoption by local education authorities of a common standard would render unprofitable the publication of books which failed to reach such standard.

(4) It is hoped that this report may assist the responsible authorities in the work of determining the standard of book-production requisite for the protection of the eyesight of children so far as it is influenced by the books which the children are compelled to read in school.

A table of typographical standards has been formulated by the British association's committee carefully fixing, with reference to the age of the reader, the minimum requirements of the size of letters, interlinear space, length of line, and other purely technical details requiring consideration. Practical illustrations of these standards are given in the several specimens of printed matter which are here reproduced from the British association's report. Unless material additions to the findings and conclusions of this committee can be made by independent research and experiment, there is no reason why local school boards should not be willing to profit from the efforts of so authoritative a body as the British association. It can not too strongly be urged upon officials having control over the matter of books that they provide themselves with copies of the report here considered. The suggestion is here offered that as a first step in this direction school officers interested in the problem should compare the books which their schools are using with the specimen pages reproduced in this report. (See Appendix I.) There may be slight differences between types used in the United States and England. Indeed, to quote from the report, "The committee draws attention to the fact that there is considerable variation in the size of the faces of the various types coming under the same rating in point body, or bearing the same trade description." It should be borne in mind that in testing books, as suggested above, not only should the types be compared with those in the specimen pages but the printed page as a whole should be subjected to a careful measurement by the standard typographical table.

The committee of the American School Hygiene Association has recommended that experimental tests should be made to determine whether school books should be made of smooth or somewhat rough paper. "There is no satisfactory consensus," it reported, and to this may be added that any agreement there may be on this or other characteristics of bookmaking is based largely upon conjecture and generalities.

The time is opportune for some definite action. The investigations of the committees here referred to, the experimental studies made at one or two American universities, all offer a good groundwork for the efforts of a representative body toward formulating school-

book standards which shall go forth as a mandate to all school authorities. Undoubtedly, the fullest cooperation of schoolbook publishers could be counted upon, for even in the absence of universally recognized book standards and without official guidance notable progress has been made by American publishers in the production of improved schoolbooks.

A representative national committee for the standardization of schoolbooks should be appointed by the United States Commissioner of Education. Such a committee would not fail to avail itself of the excellent achievements of the British and American committees already referred to and still find enough to accomplish without duplicating the work already done.

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# APPENDIX I.

(From the Report on Influence of Schoolbooks upon Eyesight, by the British Association for the Advancement of Science, 1913.)

## SPECIMENS OF TYPE.

The committee draws attention to the fact that there is considerable variation in the size of the faces of the various types coming under the same rating in point body, or bearing the same trade description. The following specimens are inserted for the purpose of illustrating the dimensional rules proposed by the committee in the standard table below. The committee does not undertake to recommend these or other individual designs of type.

For the purpose of testing books, reference should be made to the standard table, as in several instances the specimens exceed the minimum requirements.

*Standard typographical table.*

[1 inch = 25.4 mm.]

| Age of reader. | Minimum height of face of short letters. | Minimum length of alphabet of small letters. | Minimum interlinear space. | Maximum number of lines per vertical 100 mm. or 4 inches. | Maximum length or measure of line. |
|---|---|---|---|---|---|
| | *Mm.* | *Mm.* | *Mm.* | | *Mm.* |
| Under 7 years | 3.5 | 96 | 6.5 | 10 | ..... |
| 7 to 8 years | 2.5 | 72 | 4.0 | 15 | 100 or 4 in. |
| 8 to 9 years | 2.0 | 55 | 2.9 | 20 | 93 or 3¾ in. |
| 9 to 12 years | 1.8 | 50 | 2.4 | 22 | 93 or 3¾ in. |
| Over 12 years | 1.58 or $\frac{1}{16}$ in. | 47 | 2.2 | 24 | 93 or 3¾ in. |

No. 1.

# UNDER SEVEN.

This type may be used for books to be read by children under seven. The letters are larger than the minimum given in the typographical table. Printed from 30[1] Point Old Style.

[1] In corresponding American font this type is 24 point.

No. 2.

# UNDER SEVEN.

This type may be used for books to be read by children under seven. The letters are larger than the minimum given in the typographical table. Printed from 24 Point Old Style.

No. 8.

## UNDER SEVEN.

This type may be used for books to be read by children under seven. The letters are larger than the minimum given in the typographical table. Printed from 24 Point Old Style Antique.

No. 4. AGE SEVEN TO EIGHT

This type may be used for books to be read by children from seven to eight years old. The letters are larger than the minimum given in the typographical table. Printed from Eighteen Point Old Style Antique.

No. 5.* AGE SEVEN TO EIGHT.

This type may be used for books to be read by children from seven to eight years old. The letters are larger than the minimum given in a typographical table. Printed from Eighteen Point Old Style, with a 2 point Leading.

## No. 6. AGE SEVEN TO EIGHT.

This type may be used for books to be read by children from seven to eight years old. The letters are slightly larger than the minimum given in the typographical table. Printed from Old Style Great Primer with 3 Point Leading.

## No. 7. AGE EIGHT TO NINE.

This type is suitable in size for books to be read by children from eight to nine years old. The size of the letters is slightly larger than the smallest given in the typographical table. Printed from Fourteen Point Old Style with 2 point Leading.

No. 8. AGE EIGHT TO NINE.

This type is suitable in size for books to be read by children from eight to nine years old. The size of the letters is slightly larger than the smallest given in the typographical table. Printed from Twelve Point Modern, with 2 point Leading.

No. 8.* AGE EIGHT TO NINE.

This type is suitable in size for books to be read by children from eight to nine years old. The size of the letters is slightly larger than the smallest given in the typographical table. Printed from Twelve Point Antique Old Style with 3 point Leading.

No. 9.* AGE EIGHT TO NINE.

This type is suitable in size for books to be read by children from eight to nine years old. The size of the letters is slightly larger than the smallest given in the typographical table. Printed from Twelve Point Old Style Antique, No. 7 with 2 point Leading.

No. 10. AGE NINE TO TWELVE.

This type is suitable in size for books intended for readers over nine years old. The size of the letters is slightly larger than the smallest given in the typographical table. Printed from Eleven Point Modern, with 2 point Leading.

No. 11. AGE NINE TO TWELVE.

This type is suitable in size for books intended for readers over nine years old. The size of the letters is equal to the minimum given in the typographical table. Printed from 12 Point old Style, with 1 Point leading.

No. 12. AGE NINE TO TWELVE.

This type is suitable in size for books intended for readers over nine years old. The size of the letter is equal to the minimum given in the typographical table. Printed from 12 Point Old, with 1 Point leading.

No. 13. OVER TWELVE.

This type is suitable in size for books intended for practiced readers over twelve years old. The size of the letters is in conformity with the smallest dimensions given in the typographical table. Printed from Ten Point Modern, with 2 point Leading.

No. 14. OVER TWELVE.

This type is suitable in size for books intended for practiced readers over twelve years old. The size of the letters is in conformity with the dimensions given in the typographical table. Printed from 11 Point Old Style, with 1 Point leading.

No. 15. OVER TWELVE.

This type is suitable in size for books intended for practised readers over twelve years old. The size of the letters is in conformity with the smallest dimensions given in the typographical table. Printed from Ten Point Antique Old Style, with 2 point Lending.

No. 16.* OVER TWELVE.

This type is suitable in size for books intended for practised readers over twelve years old. The size of the letters is in agreement with the requirements specified in the typographical table. Printed from Ten Point Old Style Antique, No. 7, with 2 Point Leading.

## APPENDIX II.

Specimens of survey blanks for classroom illumination, blackboards, desks, and seats. These are from a set of 20 schedules, covering all details of school buildings with reference to hygiene and sanitation. They were devised by the author and used in the surveys referred to in this monograph. Illumination of other parts of the school buildings, e. g., corridors, offices, etc., is included in the separate schedules covering these respective subdivisions.

It will be noted that items not requiring measurements are to be indicated by "yes" or "no" or checked, thus reducing the amount of writing by the inspector or surveyor and permitting of no variation in method of description. Data thus obtained may be used as a basis for rating schools by merits and demerits, according to the various known standards, or by any of the so-called score-cards.

### COOPERATIVE SCHOOL SANITARY SURVEY.

DEPARTMENT OF EDUCATION, NEW YORK CITY. BUREAU OF WELFARE OF SCHOOL CHILDREN, A. I. C. P.

P. S. number.....Date.....Hour.....Weather: Clear.....
Borough.....cloudy.....rain.....snow.....

### ILLUMINATION.

*Room number*.....Length.....Width.....Height.....Floor area.....
*Surface colors.*—Walls: Upper.....Lower.....Ceiling.....glazed.....
unglazed.....Woodwork: Sashes.....doors.....windows.....
closets.....glazed.....unglazed.....
*Windows.*—Number:.....total area.....sq. ft.....
(Take all-over glass area, disregarding small sash partitions. Do not include interior glass partitions.)
Proportion window area to floor area.....Proper window height to width of room.....Height of window from floor.....Distance of window top from ceiling.....Window exposure: North.....
south.....east.....west.....
(Give number of windows in each direction.)
*Direction of light with reference to children.*—Right.....left.....front.....rear.....
*Shades.*—Color.....roll from top.....bottom.....middle.....
Condition: Good.....bad.....
Rollers work: Yes.....no.....strings.....pulleys.....
*Light obstruction.*—Outside: Yes.....no.....describe.....
Adjoining buildings: Are walls painted white? Yes.....no.....
Color: Dark.....light.....stone.....brick.....wood.....stucco.....
tile.....
*Inside obstructions.*—Flower pots or other objects on window sills: Yes....no...
Curtains.....Other light obstructing objects.....
*Other factors affecting light.*—Pictures: Dark.....light.....
unframed.....framed.....with glass.....without glass...
Do glass and frames reflect light?.....
Charts: Dark.....light.....where hung?.....
*Artificial illumination.*—Method: Direct.....indirect.....semi-indirect.....
Height of fixture from floor.....
*Electric.* Clusters.....Position: Horizontal.....vertical.....
Number of lamps.....type.....B.....C.....
Size of lamps.....Watt Tungsten.....Watt carbon.....
Plain.....frosted.....half-frosted.....burnt out.....
Single lamps: Number.....size.....Watt Tungsten.....
Watt carbon.....type.....B.....C.....
Reflectors: Color.....dull.....polished.....flat.....bowl.....
*Gas.* Number of brackets.....open.....mantles.....globes.....
reflectors.....color.....

## COOPERATIVE SCHOOL SANITARY SURVEY.

DEPARTMENT OF EDUCATION, NEW YORK CITY. BUREAU OF WELFARE OF SCHOOL CHILDREN, A. I. C. P.

P. S. number.....Date.....Hour.....Weather: Clear.....
Borough.....cloudy.....rain.....snow.....

### BLACKBOARDS.

*Room number*.....Grade.....Number of blackboards.....
*Material*.....Dimensions.....Area.....
*Location with reference to pupils:* Front.....rear.....right.....left.....
*Distance from:* Floor.....nearest seat.....farthest seat.....
*Surface:* Even.....smooth.....chipped.....cracked.....
Peeling.....clean.....not clean.....stained.....
Color: Solid.....uneven.....dull.....glossy.....

| *Light from:* | Right. | Left. | Front. | Above. |
|---|---|---|---|---|
| Natural | | | | |
| Artificial | | | | |

*Noticeable glare on b. b. from different angles?*
Cause.....
Remediable?.....

| | | | | |
|---|---|---|---|---|
| Above b. b. | | | | |
| *Pictures:* | Yes. | No. | Framed. | With glass. |
| Alongside b. b. | | | | |

*Do pictures cause glare?*.....reflection?.....
*Anything hung on b. b. causing glare?*.....
Maps.....Charts.....Drawings.....Pictures.....
*How often is b. b. washed?*.....By whom?.....
*Chalk trough:* Clean.....chalked filled.....broken.....
*Erasers:* Material.....number.....
How cleaned.....when.....by whom.....

## COOPERATIVE SCHOOL SANITARY SURVEY.

DEPARTMENT OF EDUCATION, NEW YORK CITY. BUREAU OF WELFARE OF SCHOOL CHILDREN, A. I. C. P.

P. S. number.....Date.....Hour.....Weather: Clear.....
Borough.....cloudy.....rain.....snow.....

### DESKS AND SEATS.

Room number.....Grade.....Regular.....Departmental.....Register.....
Number of desks.....Floor area.....Area per desk.....Desks used.....
*Placing:* Number single file.....Number double file.....Number of rows.....
Distance of first row from front blackboard.....
*Aisles:* Number..... Width: I..... II..... III..... IV..... V..... VI.....
(In order from left to right, facing pupils).
*Types of desks:* Fixed..... Movable..... Adjustable..... Nonadjustable.....
Make (trade name or manufacturer).
See separate schedule for structural details.
*Desks and seats adjusted:*
(1) *As to height:* Desks..... seats..... both.....
When done..... by whom.....
Number desks too high.....too low.....; number seats and desks.....
Number seats too high.....too low.....; too high.....too low.....
(2) *Plus and minus distances:* Number plus...number minus...number zero...
On back of this sheet give number plus and number minus from 1 inch up.
*Writing surface:* Adequate for arm and paper in writing?
Number of desks adequate..... number inadequate.....
Surface defects: Cracked...cut...holes...uneven...inkstains...dusty.....
(Number of desks in each case.)
*Place for books:* Clean.....dusty.....broken.....
*Observations:* Note any defects of desks or seats not stated above.
Pupils obviously uncomfortable: Number.....reasons given.....
Posture record of class..... Teacher's observations.....

## COOPERATIVE SCHOOL SANITARY SURVEY.

DEPARTMENT OF EDUCATION, NEW YORK CITY. BUREAU OF WELFARE OF SCHOOL CHILDREN, A. I. C. P.

P. S. number.....Date.....Hour.....Weather: Clear.....
Borough.....cloudy.....rain.....snow.....

### DESKS AND SEATS—STRUCTURAL DETAILS.

(Use separate sheet for each type of desk and seat.)

*Make:* Trade name.....
Manufacturer's name.....
Single..... Double..... Fixed..... Movable..... Adjustable.....

| *Dimensions.* | *Width.* | *Depth.* | *Height from floor.*[1] |
|---|---|---|---|
| Desk top..... | ..... | ..... | ..... |
| Seat..... | ..... | ..... | ..... |

1. In the case of nonadjustables obtain manufacturer's table of sizes and grading according to pupils' ages.

| *Adjustability.* | *For height.* | *Plus and minus.* | *Mechanism.*[2] |
|---|---|---|---|
| Desk..... | ..... | ..... | ..... |
| Seat..... | ..... | ..... | ..... |

Are they adjustable independently of one another?
2. If bolts and nuts, how many? Describe mechanism as to ease of operation.
*Desk:* Writing surface—area..... degree of slope.....
Finish—color..... dull..... glazed.....
Top—movable.....non-movable.....how operated (describe on reverse side)..Inkwell—right side... left side.. place for pen.. groove... ledge....
*Seat:* Seat floor—S shaped..... rim and scoop..... other modelling.....
Seat back—erect..... reclined..... degree of reclination.....
flat across shoulders..... concave.....
*Book rack:* Place.....ample for books, pencil bag, etc.....
How many sides open....easy to clean.....
*Frame work:* Metal—flat.....grooved.....color.....paint.....enamel.....
Design—simple.....complicated.....ornamental filigree.....

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## OPINIONS OF AMERICAN POSTURE LEAGUE.

*Area of writing surface:* (Adequate to support "arm and paper" in writing?)

*Query.* Judged by individual pupil or by standard measurement? If standard, what should it be?

*Answer.* By individual pupil. This has not been standardized and the gathering of data is needed. There is much complaint from teachers of lack of supporting arm space on the desks.

*Slope of writing surface:*

*Query.* Has the A. P. L. fixed the degree?
What should it be?

*Answer.* The A. P. L., pending further investigation, accepts the 15-degree slope recommended by the Vienna Commission. The A. P. L. committees are inclined to think that some modifications may be necessary and that perhaps an elastic range of slopes may prove feasible, but none of this has been worked out by the league as yet.

*Inkwell:* On right side—left side.

*Query.* Which does the A. P. L. approve?

*Answer.* Our committees have approved the inkwell on the right side to prevent dragging the ink over the writing surface with its danger of dropping thereon.

*Seat back:*

*Query.* What should favorable answer be to the following: (*a*) Is seat back concave or flat across shoulders? (*b*) Erect or reclined? (*c*) Degree of inclination?

*Answer.* (*a*) The seat back should be flat or practically so across the shoulders to favor flattening of the shoulder blades on the back. A concaved seat throws the scapula around on the sides in the round-shouldered position.

(*b*) If the modelling of a seat were correct, either an erect or inclined back might be acceptable. Some seats allow so much recline that the head is thrust forward in reaction to maintain its balance. In other words, were the head to continue the inclination backward, gravitation would draw it backward, and this is instinctively avoided by thrusting the head forward. This sometimes happens in schools where the depth of the seat floor is too great for pupils, making an excessive inclination backward.

## APPENDIX III.

### THE COMMONWEALTH OF MASSACHUSETTS.

(Ch. 502, acts of 1906, as amended by ch. 257, acts of 1910.)

### DIRECTIONS FOR TESTING SIGHT AND HEARING.

In accordance with the provisions of section 6, chapter 502, acts of 1906, the State board of health issues the following directions for testing the acuteness of vision and hearing.

The purpose of the school test of vision is:

1. To find out which pupils have such a defect in their acuteness of vision as may interfere with their school work.

2. To be able to notify the parents of such pupils that a careful medical examination of the eyes is needed to see if the vision can be improved.

#### DIRECTIONS.

1. The tests will be made as early in the school year as possible, preferably in September.

2. The tests will be made under the most favorable conditions, and as nearly as possible under the same conditions, preferably in well-lighted rooms, in the early part of the day.

3. The testing will be done by the teacher of the class, and will be supervised by the principal to see that the conditions of the test are as uniform as possible for the different classes.

4. Children wearing glasses will be tested with the glasses, and if found normal will be so recorded.

5. Examine all children, but record as defective only those whose vision is $\frac{1}{2}$ or less in either eye.

6. Report to the State board of education the whole number of children examined and the number found defective according to the standard given in No. 5.

TO TEST THE EYESIGHT.

Hang the Snellen test letters in a good clear light (side light preferred) on a level with the head, and so placed that the child does not face a strong light. Place the child 20 feet from the letters. Cover one eye with a card held firmly against the nose, without pressing on the covered eye, and have him read aloud, from left to right, the smallest letters he can see on the card. Make a record of the result.

Children who have not learned their letters, obviously, can not be given this eyesight test until after they have learned them.

TO RECORD THE ACUTENESS OF VISION.

There is a number over each line of the test letters which shows the distance in feet at which these letters should be read by a normal eye. From top to bottom, the lines on the card are numbered, respectively, 50, 40, 30, and 20. At a distance of 20 feet the average normal eye should read the letters on the 20-foot line, and if this is done correctly, or with a mistake of one or two letters, the vision may be noted as $\frac{20}{20}$, or normal. In this fraction the numerator is the distance in feet at which the letters are read, and the denominator is the number over the smallest line of letters read. If the smallest letters which can be read are on the 30-foot line, the vision will be noted as $\frac{20}{30}$; if the letters on the 40-foot line are the smallest that can be read, the record will be $\frac{20}{40}$; if the letters on the 50-foot line are the smallest that can be read, the record will be $\frac{20}{50}$.

If the child can not see the largest letters, the 50-foot line, have him approach slowly until a distance is found where they can be seen. If 5 feet is the greatest distance at which the 50-foot letters can be read, the record will be $\frac{5}{50}$ ($\frac{1}{10}$ of normal).

Test the second eye, the first being covered with the card, and note the result, as before. With the second eye, have the child read the letters from right to left, to avoid memorizing. To prevent reading from memory, a hole 1½ inches square may be cut in a piece of cardboard, which may be held against the test letters, so as to show only one letter at a time, and may be moved about so as to show the letters in irregular order. A mistake of two letters on the 20 or the 30 foot line, and of one letter on the 40 or the 50 foot line may be allowed.

NOTIFICATION OF PARENTS.

The teacher will notify the parent or guardian on one of the notice cards, as required by law, whenever the vision in either eye is found to be $\frac{20}{30}$ or less. No notice will be sent when the vision is $\frac{20}{30}$ in both eyes, $\frac{20}{40}$ in one eye and $\frac{20}{30}$ in the other, or $\frac{20}{40}$ in both eyes.

When glasses are used the vision will be tested with the glasses. A notice card will also be sent when the teacher finds that the eyes or eyelids are habitually inflamed; when there is complaint of pain in the eyes or head after reading or writing, especially toward the end of school hours; when one or both eyes deviate from the normal position—squinting; when the book is habitually held at less than 1 foot from the eyes; when there is constant scowling and evident effort in using the eyes.

METHOD OF TESTING HEARING.

If it is possible, one person should make the examinations for an entire school in order to insure an even method. The person selected should be one possessed of normal hearing, and preferably one who is acquainted with all of the children, the announcement of an examination often tending to inspire fear.

The examinations should be conducted in a room not less than 25 or 30 feet long, and situated in as quiet a place as possible. The floor should be marked off with parallel lines 1 foot apart. The child should sit in a revolving chair on the first space.

The examination should be made with the whispered or spoken voice; the child should repeat what he hears, and the distances at which words can be heard distinctly should be noted.

The examiner should attempt to form standards by testing persons of normal hearing at normal distances. In a still room the standard whisper can be heard easily at 25 feet; the whisper of a low voice can be heard from 35 to 45 feet, and of a loud voice from 45 to 60 feet.

The two ears should be tested separately.

The test words should consist of numbers, 1 to 100, and short sentences. It is best that but one pupil at a time be allowed in the room, to avoid imitation.

For the purpose of acquiring more definite information concerning the acuteness of hearing, one may have recourse to the 512 v. s. (vibrations per second) tuning fork and the Politzer acoumeter.

For very young children, a fair idea of the hearing may be obtained by picking out the backward or inattentive pupils and those that seem to watch the teacher's lips, placing them with their backs to the examiner, and asking them to perform some unusual movement of the hand, or other act.

[NOTE.—When not in use, the chart of test letters should be placed in the envelope in which it is sent, to keep it from becoming soiled and illegible. When the test letters are damaged, a requisition should be made on the State board of education for a new set.]

## THE COMMONWEALTH OF MASSACHUSETTS.

(Ch. 502, acts of 1906.)

### REPORT OF SIGHT AND HEARING TESTS TO SUPERINTENDENT OF SCHOOLS.

Town or city.....School.....

.....19

Number of pupils enrolled in the school.....

Number found defective in eyesight.....

Number found defective in hearing.....

Number of parents or guardians notified.....

.....

(Teacher or principal.)

### RECORD OF SIGHT AND HEARING TESTS, 191–.

City or town.....School.....Class.....

| Name. [If notice is sent to parent or guardian, star name.] | Examination of eyes. | | Hearing. | | Remarks. |
|---|---|---|---|---|---|
| | Eyesight. | | Whisper heard (distance in feet) | | |
| | Right eye. | Left eye. | Right ear. | Left ear. | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## INDIANA RULES FOR TEACHERS.

The teachers in all the public and parochial schools of the State of Indiana shall test the sight and hearing of all school children under their charge once in each school year and at such other times as may be necessary. The sight test shall be made by the use of the Snellen's test type chart. * * * An individual record shall be kept of said test and whenever a defect of vision or hearing is noted the case shall be referred to the school physician. Teachers and school officials shall rigorously exclude from school all children specified in any notice of exclusion issued by the school physician or by the local health officer until such children shall present a certificate of admission from the school physician or the health officer.

### RULES FOR TESTING EYESIGHT.

Rule 1. The annual test for eyesight and hearing shall be made as early in the school year as possible, preferably in September. Individual pupils may be tested at any time that a test is considered necessary.

Rule 2. All tests shall be made as nearly as possible under the same conditions and shall be supervised by the principal or superintendent, in order to see that the conditions of the test are uniform as far as possible for the different classes.

Rule 3. Do not expose the test type chart except when in use, as familiarity with the chart leads children to learn the letters "by heart." Children should be examined singly.

Rule 4. Test each eye separately. Have the pupil begin at the top of the test card and read down as far as he can, first with one eye, and then with the other. Hold a card over one eye while the other is being examined, but do not press on the covered eye, as pressure may produce an incorrect examination.

Rule 5. Place the test chart on the wall in a good light at about the level of the pupil's head and at a measured distance of 20 feet from the pupil. The chart should have a good side illumination and not hang in range of a window, which will dazzle the eyes.

Rule 6. Children wearing glasses shall be tested with the glasses properly adjusted, and if sight is found normal with the glasses it shall be recorded as normal.

Rule 7. Record as defective only those whose vision is $\frac{1}{8}$ or less in either eye.

Rule 8. Where the child can not name the individual letters, although able to read, the chart figures may be used. If the child does not know figures or letters, use the chart or inverted E's asking the child to tell you by the movement of the hand the side on which there is an opening on the E's—i. e., up, down, right, or left.

Rule 9. The lines on the chart are numbered to indicate the distance the respective letters should be read by the normal eye. The record is made by a fraction, of which the numerator represents the distance of the chart from the child and the denominator the lowest line he can correctly read. Thus, if at 20 feet the pupil reads correctly the line marked "20 feet," the vision is $\frac{2}{8}$ or normal. If he only reads correctly the line above marked "30 feet," his vision is $\frac{2}{3}$, or two-thirds normal. If at a distance of 20 feet a pupil can only read correctly the line marked "40 feet," the vision is $\frac{2}{8}$ or $\frac{1}{2}$, which must be recorded as defective.

If a pupil can not read the largest letters he must go slowly toward the chart until he can. The distance he is from the chart when he can read the largest letters will be the numerator and 200 the denominator.

Rule 10. Report to the State board of health the total number of children examined and the number found defective in eyesight and hearing by test.

## APPENDIX IV.

### STANDARD FOR ADMISSION TO THE CONSERVATION OF VISION CLASSES.[1]

1. Children who can not read more than $\frac{6}{60}$ at distance, and who can not read 2.00 at 20 c. m.

2. Myopes under the age of 14 who have more than 8 diopters of myopia.

3. Hyperopes who have symptons of asthenopia and who have more than 8 diopters of hyperopia.

4. Children who have an astigmatism of more than 3.5 diopters and whose vision can not be brought up more than $\frac{6}{24}$.

5. Children with macula, nebula, leukoma, which interfere with sight and lead to eye strain.

6. Children with interstitial keratitis, uveal or corneal disease, under treatment, who have been withdrawn from regular classes.

7. The committee assumes that these conditions exist after the proper refractions have been made.

#### GENERAL RULES FOR THE GUIDANCE OF TEACHERS AND NURSES.

1. Children suffering from some acute or subacute eye disease, such as interstitial keratitis or choroiditis should not be permitted to read or write or do close work. Efforts nevertheless should be made to keep the children abreast with their classmates by allowing them to take part in mental work and listen to the recitation of others. Teachers will be governed by the report of the attending physician, notation of whose report will be recorded on the patient's card by the nurse every three months.

2. Children suffering from hereditary or congenital defects of vision rarely suffer progressive changes later in life. After proper correction with glasses the degree of vision will remain stationary. The degree of vision determined, experiment will prove whether they can read ordinary type. As a class they will require the enlarged letters at the blackboard and special textbooks.

3. High myopes must especially be cautioned against doing home work or reading books. They should not be encouraged to do much close work. It is highly essential that they have perfect correction, especially of their astigmatism. As a general proposition their myopia is progressive and is apt to lead to choroidal disease and detachment of the retina. All of these conditions are aggravated by excessive convergence. This convergence can be prevented by removing the near point to 10 or 12 inches. For distance myopes should read only type the size of the Snellen $\frac{6}{60}$ or $\frac{10}{100}$, and for near fairly large type as the $\frac{1}{60}$ or 2.00 at 10 or 12 inches. The special textbook is indicated when there is widespread choroiditis. Myopes should be referred to their physician twice a year by the nurse in charge.

4. Children in conservation of vision classes should never be required to do night work or lessons at home, excepting children who have been operated for cataracts, or children whose eye defect is due to scars of the cornea.

5. Every effort should be made to give them all of the physical training possible.

6. Wherever possible, in order to conserve their vision during the years of bodily development, some one ought to read to the child at home. This is an opportunity for the "big sister" movement.

7. Up to the twelfth year these children should not be held down too closely to scholastic work. A good deal of their time should be occupied in training their hands—e. g., in doing reed and raffia work, modeling, and sewing. Subsequent to the twelfth year, depending on the ability of the child and advance in its general education, the

[1] Cincinnati, Ohio.

scholastic work should be increased and other branches of manual training added, such as music, cooking, wood sloyd, etc.

8. Nurses for conservation of vision classes will personally direct the children to the attending oculist for his advice in these matters.

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## APPENDIX V.

Series of five blank forms adopted for experimental cooperative health supervision by New York City education and health departments, teachers making merely preliminary observations and referring suspected or apparent cases to physicians for examination. Notice provision for recording in each grade condition of eyes with and without glasses, treatment, if defective, and result.

Name ..... Born .....

[✓, Defect. O. K., Cured and corrected. M, Medical. O, Operation. S, Eye strain. G, Glasses. D, Dental. +, Improved. −, Unimproved. R, Refused.]

| School year. | Kindergarten. | | 1st | | 2d | | 3d | | 4th | | 5th | | 6th | | 7th | | 8th | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. | Defect. | Treat. Result. |
| Date. | | | | | | | | | | | | | | | | | | |
| Class. | | | | | | | | | | | | | | | | | | |
| 1. Eyes—Without glasses. | | | | | | | | | | | | | | | | | | |
| Vision—With glasses. | | | | | | | | | | | | | | | | | | |
| 2. Ears—Hearing. Discharge. | | | | | | | | | | | | | | | | | | |
| 3. Teeth. | | | | | | | | | | | | | | | | | | |
| 4. Nutrition. | | | | | | | | | | | | | | | | | | |
| 5. Nasal breathing. | | | | | | | | | | | | | | | | | | |
| 6. Tonsils. | | | | | | | | | | | | | | | | | | |
| 7. Heart. | | | | | | | | | | | | | | | | | | |
| 8. Lungs. | | | | | | | | | | | | | | | | | | |
| 9. Nervous system. | | | | | | | | | | | | | | | | | | |
| 10. Speech defects. | | | | | | | | | | | | | | | | | | |
| 11. Orthopedic. | | | | | | | | | | | | | | | | | | |
| Examiner. | | | | | | | | | | | | | | | | | | |

DEPARTMENT OF HEALTH. PHYSICAL RECORD. DEPARTMENT OF EDUCATION.

DEPARTMENT OF HEALTH. DEPARTMENT OF EDUCATION

Office of the Principal of Public School No.....

To the parents of..... Class..... Date.....

As the result of an examination we believe that your child has some defect (as indicated by underlining) of his/her eyes, ears, teeth, nutrition, nasal breathing, tonsils, heart, lungs, nervous system, speech, orthopedic defect, for which your family physician, (dispensary) dentist, or some specialist, should be consulted. It is earnestly requested that this matter be attended to at once.

(Signed).....
(Principal.)

To physicians receiving this notification

Please enter diagnosis, treatment, and recommendations as indicated

Diagnosis.....

Treatment instituted, medical..... Surgical..... Other.....

Recommendations .....

(Signed).....M. D.

(Signed).....D. D. S.

(The pupil is requested to return this slip to his class teacher.)

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DEPARTMENT OF HEALTH. DEPARTMENT OF EDUCATION.

Office of the Principal of Public School No.....

Date.....

To the parents or guardian of.....

You have previously been notified that an examination of your child shows that he needs treatment

Please call at the school at.....o'clock to confer with the principal, school doctor, or nurse, on this important matter.

.....
*Principal.*

Class.....

Defects.....

(Please bring this slip to school.)

TEACHER'S SUMMARY OF PHYSICAL DEFECT CASES.

| Class. | Examined. | | | | | | Terminated. | | | | | | Pending. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date. | Number of pupils examined. | With teeth defects only. | With general defects. | Total with physical defects. | Reexamined. | Date. | With teeth defects only. | With general defects. | By transfer or discharge. | By refusal. | Total with physical defects. | Date. | With teeth defects only. | With general defects. | Secured by transfer. | Total with physical defects. |
| | | | | | | | | | | | | | | | | | |

DEPARTMENT OF HEALTH. DEPARTMENT OF EDUCATION.

TEACHER'S SUMMARY OF PHYSICAL DEFECTS.

| Class. | Found on examination. | | | | | | | | Terminated {Cured or improved +, Unimproved or refused −} | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date. | Defective eyes. | Defective ears. | Defective teeth. | Defective nasal breathing. | Defective nutrition. | Total defects. | Date. | Defective eyes. | | Defective ears. | | Defective teeth. | | Defective nasal breathing. | | Defective nutrition. | |
| | | | | | | | | | + | − | + | − | + | − | + | − | + | − |
| | | | | | | | | | | | | | | | | | | |

DEPARTMENT OF HEALTH. DEPARTMENT OF EDUCATION.

## APPENDIX VI.

### ENGLISH AND AMERICAN SPECIMEN FORMS.

The English school and health authorities appear particularly fortunate in devising blank forms for the various purposes. The record card of the Liverpool Education Committee is a good example of the better types of forms used in England for recording the eye conditions found in school children.

It is interesting to note with what care instructions are issued to teachers and parents, which will insure the best cooperation with the school authorities in safeguarding the children. No better illustration is needed than the directions for applying the atropine ointment issued by the Essex Education Committee. The notice to the head teacher, issued by the County Borough of Brighton Education Committee is

something as yet unknown in American cities. This is a valuable precaution in avoiding any possible strain on the part of the child whose vision is temporarily impaired by the application of the mydriatic.

The forms at present used in most children's clinics are deficient in the following respects:

1. They require a great deal of clerical work which investigation has shown is not always performed.

2. Sociological information, family history, former diseases, etc., are called for which are seldom obtained correctly and in many cases are not recorded at all.

3. The clinic doctors are required to do much writing which takes up time that should be devoted to medical work.

4. A great deal of medical data, such as the record of the refraction errors found and glasses prescribed is not provided for. The result is that these records present a slipshod appearance and lack of uniformity.

5. In some clinics no separate forms are used for the refraction and contagious cases. Each child upon registration at the clinic is given two blank forms. The card not required in the case is marked as a "terminated" history. Both cards have to be marked by hand, one "Refraction" and the other "Contagious."

Shortcomings in the clinic records are as detrimental to the service as they are to the work of outside agencies interested in studying the achievements of the clinics.

The printed forms used in a number of children's eye clinics have been compared with forms used in other institutions both here and abroad. Inquiries were made at the children's clinics as to the needed improvements. With the cooperation of Dr. W. M. Carhart, one of the oculists of the New York City health department, improved forms have been designed. The tentative drafts were then submitted to Dr. Ward A. Holden, a practicing ophthalmologist and professor at the College of Physicians and Surgeons.

The proposed forms are:

1. Diagnosis, history, and treatment records for contagious eye cases.
2. Diagnosis, history, and treatment records for refraction cases.
3. Prescriptions for eyeglasses.

### PRESCRIPTION.

The prescription blank differs materially from the ones used in most clinics. In addition to the technical requirements, these new features are considered important.

(*a*) Notice to pupil to call personally on the optician so as to insure the proper fitting of glasses.

(*b*) Notice to optician to let the patient retain the prescription.

(*c*) Notice to pupil to bring prescription back to the clinic with the eyeglasses to be tested.

The value of the first notice is self-evident.

The notice to the optician is intended to act as a warning that the correctness of the glasses will be passed upon at the clinic; should they prove otherwise they will, of course, be returned to him for correction.

The third notice has a twofold purpose:

1. To act as a reminder to the child that the glasses must be brought to the clinic to be tested.

2. The presentation of the prescription upon return visit to the clinic will save time and effort of looking up the original clinic record for the purpose of checking it up.

The oculist can indicate on the prescription his findings. If the glasses are incorrect, the fact will be noted and the prescription returned to the child to be taken once more to the optician. If the prescription has been properly filled and the glasses fit, the prescription will be marked O. K. Final entry can then be made upon the original clinic record (on which provision is made for this) either by the clerk or by

the doctor, when the latter is not engaged with patients. The prescription may then be destroyed, a transcript of it having already been made on the record card at the time it was originally issued.

### A. AMERICAN CITIES.

A very careful examination of all available printed forms used in American cities, where eye clinics are maintained within schools or otherwise as part of the public health work, has disclosed very few which reach the same standard of excellence and practicality as those used in English cities. The best specimens are here reproduced. In Philadelphia, the city ophthalmologist provides the patients with homatropine and atropine, as may be required, in small vials inclosed in envelopes, on which the directions for application are printed. The case history card used in Philadelphia is also superior to those commonly used in eye dispensaries. For eyeglass prescriptions of the best type, we have to go to the small cities of Newark and Hoboken, N. J. It will be noted that the prescription blank provided by the Hoboken board of education is strikingly similar to the one heretofore recommended for the New York clinics. In the Newark school clinic, the case history card used has also been carefully devised and compares favorably with the best English forms.

Case number .....

Diagnosis ..... ..... M. D.
Space for clinic stamp. Inspector.

Name ..... Age .... Address ..... P. S. .....
Grade .... Times not promoted .... Nationality of father .....
Years in United States .... In New York City .....
Personal history .....
Present condition ..... Duration present illness .....
Treatment [date of each visit, describe change, if any] .....
.....
.....
.....
.....
.....
Cured .....
Improved ..... Case terminated, date .....
Unimproved ..... Case transferred, reason .....

Department of Health—City of New York—Bureau of Child Hygiene. | School Medical Inspection. Oculist's Case Card.

Case history card for contagious eye disease used in New York City school clinics, embodying improved features.

Case number .....

Diagnosis .....

Space for clinic stamp.

..... M. D.
Inspector.

Name ..... Age .... Address ..... P. S. .....
Present grade ... Times not promoted ... Nationality of father .....
Years in United States ..... In New York City .....
Personal history ..... Has worn glasses? Yes ..... No .....

| | | |
|---|---|---|
| Vision on admission (Without glasses.) | R..... (With present glasses.) | R..... |
| | L..... | L..... |
| Ophthalmoscopy and retinoscopy | R..... | Fundus ..... |
| | L..... | |
| Ophthalmometer | R..... Mydriasis with atropine .....{at clinic. | |
| | L..... with homatropine .....{at home. | |

TREATMENT.

| Date. | Vision under mydriasis. | Final refraction (without drops). | Glasses ordered. | Case terminated. |
|---|---|---|---|---|
| ..... | R..... L..... | R..... L..... | R..... | Date ..... |
| ..... | R..... L..... | R..... L..... | L..... | Cured.....Improved ... |
| ..... | R..... L..... | R..... L..... | ..... | Unimproved. Transferred. |

Department of Health—City of New York
Bureau of Child Hygiene.

School Medical Inspection.
Oculist's Case Card-Refraction.

Improved record card for refraction cases in New York City school clinics. Compare with "standard" form used previously for both refraction and contagious cases. (See next form.)

EYE CLINIC.

DEPARTMENT OF HEALTH, CITY OF NEW YORK.

Borough of ..... New York .....

CASE HISTORY CARD.

Name ..... Age .....
P. S. ..... Years at school .....
Present grade ..... Present rating .....
Number of times not promoted .....
Nationality: Father ..... Mother .....
Years in United States ..... New York City .....
Family history: Rheumatism ..... Alcoholism .....
(To be recorded only if obtained from parent.)
Specific disease ..... Tuberculosis .....
If dead, cause of death .....
Personal history .....
.....
Present condition .....
.....
Treatment required .....
.....
Dicatated by
..... M. D.
Eye surgeon.
Describe treatment applied under date ..... M. D.
..... M. D.
..... M. D.
..... M. D.
..... M. D.

REFRACTION EYE CLINIC ..... Date ..... 191...
(Address)

| To date. | This date. | Totals. |
|---|---|---|
| Patients registered..... | New..... | Total No. of patients..... |
| Revisits..... | Revisits..... | " " " revisits..... |
| Visits to dispensary..... | Visits..... | " " " visits..... |
| Patients discharged..... | Discharged..... | Total No. discharged..... |
| Cured..... | Cured..... | " " cured..... |
| Dropped..... | Dropped..... | " " dropped..... |
| Treatments..... | Treatments..... | Total No. of treatments... |
| Refractions..... | Refractions..... | " " " refractions..... |
| Medical prescriptions filled. | Prescriptions..... | " " " ℞ filled..... |
| Prescriptions for glasses... | Prescriptions..... | " " " ℞ for glasses. |
| Visits by nurses to homes.. | Visits..... | " " " visits by nurses to homes..... |

.....
Registrar.

DEPARTMENT OF HEALTH, CITY OF NEW YORK. BUREAU OF CHILD HYGIENE, DIVISION OF SCHOOL MEDICAL INSPECTION
REFRACTION EYE CLINIC

A cumulative record of work accomplished and disposition of cases in New York City school clinics.

## PROPOSED MODIFIED FORM OF PRESCRIPTION FOR SCHOOL CHILDREN'S EYE CLINICS.

EYE CLINIC.

TO OPTICIAN: Please let the patient retain this prescription.

(Address of individual clinic printed in this space.)

TO PATIENT: Be sure to bring this prescription back to the clinic with your eyeglasses to be tested.

.....19

For.....

Address.....

| | Spherical | Cylindrical. | Axis | Prism | Base. |
|---|---|---|---|---|---|
| R | | | | | |
| L. | | | | | |

School use. Constant Eyeglasses Spectacles.

Remarks.....M. D.

NOTE.—The pupil whose name appears on this prescription should call PERSONALLY on the optician, as it is important to have the frames for the glasses properly fitted.
The actual size of the printed form to be 4 in. x 5½ in.

(A.)

Hoboken, N. J.....191

For M.....

O. D.....

O. S.....

Remarks.....

NOTE.—It being important that the frame for the lenses should be accurately fitted, the one for whom this prescription is intended should call PERSONALLY on the optician.

BOARD OF EDUCATION,
DEPARTMENT OF OPHTHALMOLOGY,
HOBOKEN, N. J.....191

For.....

℞ Address.....

| | Spherical. | Cylindrical. | Axis. | Prism. | Base. |
|---|---|---|---|---|---|
| O. D. | | | | | |
| O. S. | | | | | |
| O. D. | | | | | |
| O. S. | | | | | |

Distant
Near
Constant
Intermediate

℣ Remarks.....

.....M. D.

*Size of Eye*.....

*Torics, Bifocals, Eye Glasses. Spectacles, till 10°.*

Optician.....

Address.....

Hours.....

(a) Desirable prescription blank for eyeglasses. Compare with (b) ordinary blank used in most school clinics and public infirmaries in American cities.

(B)

EYE CLINIC.....
For.....
Address.....
℞
O:
D:
Remarks.....

.....
.....191...
.....M. D.
Surgeon.

---

CITY OF PHILADELPHIA.
DEPARTMENT OF PUBLIC HEALTH AND CHARITIES,
BUREAU OF HEALTH.

EYE DISPENSARY.
Room 708, City Hall.
L. C. WESSELS, M. D., Ophthalmologist. PHILADELPHIA.....191
THIS IS TO CERTIFY that..... Age.....
Residence..... School..... Grade.....
is in need of glasses and the parents are unable to pay for the same.
Father's name..... Father's nationality..... Occupation.....
SOURCE OF INFORMATION (parent, nurse, principal, etc.).....

.....
.....
Inspector.

Present this card at room 708, City Hall, between 9 a. m. and 12 noon.

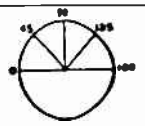
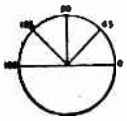
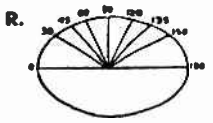
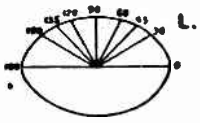
Philadelphia is one of the very few American cities where some means is provided municipally for furnishing glasses to needy children other than by charity organizations. Above is blank for certification of case to city ophthalmologist.

### B. ENGLISH CITIES.

Model forms used in different parts of England for the several steps to be taken in the complete routine of medical inspection with reference to eyesight, from notice of defect to parents to the provision of spectacles to necessitous children.

The wide field covered by these specimens should indicate the painstaking care with which these blanks were secured and studied. Undoubtedly some worthy examples have been overlooked. The intention has been to select representative forms which when taken together might compose a comprehensive and suggestive set. They do not, however, cover the entire range of medical inspection, several blanks not differing from those already commonly used in American cities having been omitted.

*Name*.....

| | Right Eye. | Left Eye. |
|---|---|---|
| Distant Vision | | |
| Error of Refraction under Atropine |  |  |
| Prescription | R.  | L.  |
| | SPH. / CYL. | SPH. / CYL. |
| Distant Vision with lenses as prescribed | Right Eye. | Both Eyes. / Left Eye. |
| Any eye disease present to be recorded | | |

Are the glasses to be worn both for near and for distant vision?

Is it necessary for the child to return within a year for re-examination?

Are any special precautions necessary at school or at home?

Should the child be taught in a class for defective sighted children?

If glasses are not prescribed are they unnecessary, or is it impossible to improve the vision by their use?

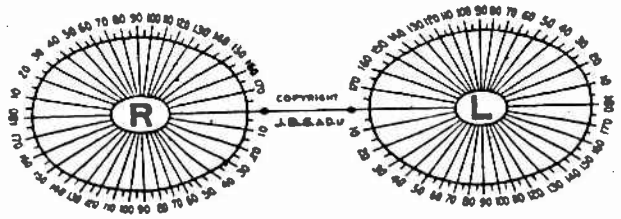
Remarks, if any.

FIG. 3.—Record form for testing eyesight used by Liverpool Education Committee.

## EAST HAM EDUCATION AUTHORITY

*R V* =

*L V* =




| | SPH. | CYL. | PRS. | SPH. | CYL. | PRS. |
|---|---|---|---|---|---|---|
| Reading Distance | | | | | | |
| | | | | | | |

*Ophthalmic Surgeon.*

FIG. 4.—Typical form of spectacle prescription used in English medical inspection system.

Leaflet 4.

CITY OF YORK EDUCATION COMMITTEE.

GENERAL HYGIENE.

## THE CARE OF THE EYESIGHT.

*Good eyesight is a most valuable possession*, not as well cared for as it ought to be.

It is very important that the eyes of children should be medically examined from time to time and from the earliest years, and that is now being done by medical inspection in the schools.

Children should not be allowed to read small print which strains the eyesight.

Neither should they be allowed to read much by gas, lamp, or candle light, nor in twilight.

Reading and writing should always, if possible, be done with the light coming from the left-hand side; light coming from other directions is not so good and may even be injurious.

"Blight," "blast," "pink eyes," "sore eyes," and "sore eyelids" should receive immediate medical attention and should on no account be neglected.

*A squinting eye should be attended to by a doctor at once*, otherwise total blindness in that eye may result.

*Want of attention to the eyes during an attack of measles or scarlet fever* is a frequent cause of imperfect eyesight.

In every case of injury to the eye, however slight, get a doctor's advice at once, and do not trust such a serious matter to anyone else, who, through ignorance, may use measures which might result in permanent blindness.

Bad or weak eyesight and eye strain are the cause of headache, and consequently of much suffering; *a child with bad eyesight can not do well at school.*

If you notice that a child has to bend closely over books or work, or screws up his eyes when looking at things at a distance, or holds his head crookedly under the same circumstances, or suffers from pains in the head, there is probably something wrong with the eyes, and he should be promptly taken to a doctor or to the hospital for treatment.

Always go to a qualified doctor about the eyesight. Don't go to chemists' or oculists' or opticians' shops without a doctor's prescription for proper spectacles (which usually cost only 3 or 4 shillings), as otherwise you may pay dearly for wrong glasses, because sometimes the bad eyesight is due to something wrong with the constitution, which only a doctor can find out and cure.

24, St. Saviourgate, York. *October, 1910.*

Attention is particularly directed to the last paragraph of this instructive leaflet.

150051°—20——8

Private. Medical Inspection.

BIRKENHEAD EDUCATION COMMITTEE.

B

.....

NOTICE OF DEFECTIVE SIGHT.

Right eye..... Left eye.....

*To the parents or guardians of*.....

The medical inspector of schools having examined this child reports the above defect, which is likely to affect, not only progress in school, but future prospects in life. You are therefore strongly urged to secure *immediate medical advice* as to the wearing of proper spectacles and other means of relief. A doctor's prescription is necessary before obtaining the spectacles.

When treatment is completed, kindly return accompanying form to head teacher.

BIRKENHEAD EDUCATION COMMITTEE.

B2

NOTICE ABOUT SPECTACLES.

*To the parents or guardians of*.....

The school medical officer draws your attention to the fact that your child is not wearing h.... spectacles in school. The eyes have been tested, and it is still necessary for glasses to be worn.

If they are lost or broken they should be replaced without delay. You must see that the child brings the spectacles to school.

Similar forms, printed on distinguishing colored cards, are provided for notice of squint and eye disease.

BOROUGH OF CAMBRIDGE EDUCATION COMMITTEE.

GUILDHALL, CAMBRIDGE,

.....191

*To the parents or guardians of*.....*residing at*.....

The medical inspection of your child attending.....School shows the eyesight to be defective, and that a fuller examination is necessary. If the defect is not properly treated now it may interfere with progress in school work, and may lead to serious difficulties later on.

You are therefore requested to take your child to a medical man. If, however, you are unable to pay for private medical attention, you may send your child to the Borough Eye Clinic, 12A, Parkside, when (s)he will be examined without charge, by the assistant school medical officer. The school nurse will call upon you in a few days to hear which course you desire to pursue. You are particularly warned against obtaining spectacles without a doctor's prescription.

ANDREW J. LAIRD,
*School Medical Officer.*

Notice of defective vision coupled with invitation to utilise school clinic if necessary. (See next notice.)

## BOROUGH OF CAMBRIDGE EDUCATION COMMITTEE.

PUBLIC HEALTH DEPARTMENT,
GUILDHALL, CAMBRIDGE,
.....191

DEAR SIR Your attention has been directed to the fact that your child.....
.....is suffering from..... and I regret to learn that you have not yet obtained treatment for the condition.

I now desire to point out that under the children act, 1908, "a parent or other person legally liable to maintain a child shall be deemed to have neglected him if he fails to provide adequate medical aid."

Yours, faithfully.

*To*.....
.....
.....

"Laying down the law," as above, has proved an effective method in England for neglectful parents. But then, they have the law.

## COUNTY BOROUGH OF BRIGHTON EDUCATION COMMITTEE.

MEDICAL DEPARTMENT, SCHOOL CLINIC,
7, GLOUCESTER PLACE, BRIGHTON.

**EYE CLINIC.**

THIS FORM IS TO BE SHOWN TO THE HEAD TEACHER.

Name of patient.....

Date.....

The vision of this child is at present being examined. Please notice the pupil of the eye; if this is at all large, the child will be unable to see objects close at hand plainly, and should not do any reading, writing (including written arithmetic) or needlework.

This condition will gradually pass off in between two and three weeks when the child may resume ordinary work and will have been provided with spectacles, if these are necessary.

The child has been asked to attend here on.....in the morning.

C. W. HUTT,
*Senior School Doctor.*

**Precautionary notice to avoid injury to eyes while under effect of mydriasis.**

M. I. 20.

## ESSEX EDUCATION COMMITTEE.

### DIRECTIONS FOR APPLYING THE ATROPINE OINTMENT.

The ointment is POISONOUS.

Place the child in a good light.

Direct him to look up to the ceiling and be sure that he is doing so at the moment of applying the ointment.

Take on the tip of a small camel's hair brush a particle of the ointment of the size of a grain of wheat.

With the thumb and forefinger of the left hand gently draw forward the patient's right lower eyelid and place the ointment just within the margin of the lid.

Direct the child to close his eye tightly, thus wiping the ointment off the brush.

Lightly rub the closed eyelids in order to bring the ointment into thorough contact with the eye.

Repeat the process with the left eye.

The application should be made morning and afternoon on five or six successive days before the child is to be examined.

The ointment will make the pupils very large and the sight will be blurred, especially when looking at near objects; but this need cause no alarm and will pass off in a few days.

The application is absolutely painless.

J. H. NICHOLAS, *Secretary.*

Clearly and plainly worded directions for a simple process, which is nevertheless fraught with danger if not properly explained to laymen.

## RECORD OF ATTENDANCES AT THE SCHOOL CLINIC.

This card should be retained by the head teacher as a record of the child's attendance at the clinic during school hours. *The card should be handed to the child when leaving school for the clinic*, and the child should hand it back to the teacher on returning to school.

| Date. | Left school. | Arrived clinic. | Left clinic. | Nurse's initials. |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Record of attendance at school clinic of Dunfermline (Carnegie Trust). On other side of card are entered advance appointments.

## HOW TO OBTAIN SPECTACLES.

Spectacles may be obtained from Messrs. J. T. Davies (chemist) (Ltd.), Walter Road, Swansea, at contract prices.

If the parents of the child can not afford to pay for them, application should be made to the clerk, education offices, 9, Grove Place, Alexandra Road, Swansea, who will in cases of necessitous circumstances supply the spectacles, and the cost or portion of the cost will be borne by the education committee.

THOMAS EVANS, M. B., D. P. H.,
*School Medical Officer, Swansea.*

Reverse of prescription given to children requiring spectacles, at Swansea Education Committee's Clinic. Similar forms are used in many English cities where reduced spectacle prices are contracted for with reputable opticians by the school authorities.

---

A fl.

## LONDON COUNTY COUNCIL.

SPECTACLES—APPLICATION FOR LOAN.

.....School ..... Dept.....Electoral area.
Name of child.....
Address.....
Hospital attended.....
Name of optician.....Cost of glasses.....
Care committee's recommendation as to grant or loan .....
.....
*Hon. Sec. Children's Care Committee.*
Date.....

Decision of Spectacle Committee—
Hon. Treasurer of Spectacle Committee.....(Date).....

Spectacles, among other necessities, are provided by the Children's Care Committees in London. Form used in such needy cases. Note that application is made by the secretary.

### C. LIVERPOOL: INSTRUCTIONS TO PARENTS.

The four circulars to parents issued by the Liverpool Education Committee are unique. In these few succinct paragraphs are found the essentials for the protection of the child with defective vision in and outside the school.

---

## LIVERPOOL EDUCATION COMMITTEE.

### IMPORTANT NOTICE.

CARE OF DEFECTIVE EYES.

*To the parents or guardians of .....:*

Your child has defective eyesight requiring the constant wearing of glasses in order to preserve the sight and prevent the defect from getting worse. With reasonable care school work should not strain the eyes nor aggravate the defect. But in order to guard against either of these results it is advisable that school work should be made easier for the eyes, and certain precautions, which will be carried out at school, should also be observed at home as far as they are applicable there. They are important for the future sight of your child, and you can materially help in this matter by paying particular attenion to them.

These precautions are as follows:

(1) SPECTACLES.—The glasses must be worn constantly (see separate sheet).

(2) BOOKS.—Books for reading must be printed in good, clear, easily readable type; they *must be kept at a proper distance (16 or 18 inches) from the eyes*, in a good light.

(3) WRITING.—This must be done in bold, large letters. Reading or writing should not be carried on for more than 20 minutes without a break; and reading or writing by artificial light should not be allowed unless the light is particularly good and steady. Girls must do no *sewing* but may learn *knitting* provided it be taught by touch and not by sight. *Home lessons* of any sort will be prohibited.

(4) POSTURE.—The child should sit in the front row of the class; *must sit upright* (that is, with the back held straight and no stooping), with good light coming from the left whenever possible; light from the front or back is harmful.

(5) ORAL LESSONS AND GAMES.—The child may attend as many of the oral and object lessons as class arrangements will permit, and take part freely in drill, dancing, and games of all kinds.

RESULTS.

If these precautions are borne in mind and the child taught to act upon them at home, headaches and other symptoms of eyestrain will be prevented, school progress will be more satisfactory, vision will probably improve considerably, and further increase of the defect with the handicap of poor vision in work after leaving school will be avoided.

E. W. HOPE,
*Medical Officer to the Education Authority.*

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## LIVERPOOL EDUCATION COMMITTEE.

### IMPORTANT NOTICE.

THE PROPER USE OF SPECTACLES.

*To the parents or guardians of*.....:

Spectacles have been ordered for your child, with the object of preserving the eyes and improving the eyesight. It is absolutely necessary that you should carefully attend to the following points regarding their use:

(1) FITTING OF FRAMES.—Each eye should look through the center of its glass, so that the child does not look over, under, or to one or other side of the lenses; the frames should fit without hurting the bridge of the nose, the ears, or the temples; the eyelashes should not touch either glass.

(2) CLEANLINESS OF LENSES.—The glasses must be kept quite clean and free from dirt and grease by being wiped when necessary with some soft material that will not scratch them.

(3) WEARING OF SPECTACLES.—Except when told otherwise by the doctor, the glasses must be worn *constantly*, that, is, every day, Saturdays and Sundays included, both in and out of school, and should be put in the case provided only when taken off at bedtime.

(4) REPAIR OF SPECTACLES.—Should (*a*) the glasses become chipped or broken, (*b*) a glass fall out without breaking and need replacing, or (*c*) the frames get bent or out of shape in any way, or hurt the child, the child should be taken with the spectacles to the opticians, Messrs. Lizars, 71 Bold Street, Liverpool, who will see to their repair and renewal according to the original prescription at the contract price. If the glasses are lost, new ones can be obtained at the contract price from Messrs. Lizars, who have a copy of the original prescription.

E. W. HOPE,
*Medical Officer to the Education Authority.*

## LIVERPOOL EDUCATION COMMITTEE.

### IMPORTANT NOTICE.

CARE OF SERIOUSLY DEFECTIVE EYES.

*To the parents or guardians of.....*

Your child suffers from a serious defect of vision, which quite prevents him (or her) from joining in the ordinary work of an elementary school; indeed, such work would be most harmful. This defect is permanent, and liable to get worse and bring on disease in the eyes unless great care is exercised, both at school and at home, so that in the best interests of the child your help is essential. It is therefore necessary that the child should be taught in a special class for children who are suffering in a similar manner, and for whom a special scheme of school work has been devised. Until admission to such a class can be arranged, the child may attend an elementary school with a view to gaining the educational advantages of school discipline and drill, along with such general knowledge as can be given in the oral lessons of the classes. Reading or writing of any kind (except blackboard work) must not be undertaken except at the special class.

These restrictions are made with a view to the child's future welfare as to sight and ability to earn a livelihood, but are absolutely useless without your careful and continued cooperation at home.

You are particularly requested to watch the child and to pay constant attention to the following important points:

(1) Follow the general directions as to the wearing of the spectacles (see separate sheet).

(2) *Stop completely all reading and writing* when not at school. Books, pens, paper, pencils and slates must not be used. In the case of a girl, *sewing must also be stopped*, but knitting may be done, provided the child does it by feeling the stitches and not by looking at them.

(3) Let the child be out of doors as much as possible, and be taught games and outdoor play, but violent gymnastic exercises and rough games should be avoided.

(4) Impress upon the child that it is because of the importance of taking care of the eyes that these restrictions are made for his (or her) benefit in after life, and that the child must do at home only what is taught and allowed at school.

E. W. HOPE,
*Medical Officer to the Education Authority.*

## LIVERPOOL EDUCATION COMMITTEE.

### IMPORTANT NOTICE.

TREATMENT OF SQUINTING AND DEFECTIVE-SIGHTED EYES.

*To the parents or guardians of*.....

Spectacles have been ordered for your child with the object of preserving and improving the eyesight, especially of the *RIGHT/LEFT eye, which **squints/is defective* from its not being used properly owing to an error in focus. It is important that the general directions as to the wearing of spectacles (see separate sheet) should be carried out. But in order that full advantage from the use of the glasses may be obtained, and the sight of the weak eye improved, this eye must be practiced separately *with the glasses on* at home *for half an hour twice daily for six months*, under the supervision of a responsible person, who will take an interest in this matter, and see that it is done carefully and regularly.

DIRECTIONS FOR PRACTICE.—Cover up the good *RIGHT/LEFT eye thoroughly with a thin folded pocket handkerchief tied around the head, so that the child can not possibly peep with this eye. When the good eye is covered, put the glasses on, and then try and find some printed type which the child can just manage to see and read with difficulty with the weak eye. Practice this eye with print of this size for half an hour twice daily regularly for one month. For the next month use slightly smaller print, and so on, using smaller print each month until six months have expired.

At the end of this time, if these exercises have been regularly and carefully carried out, the eye will be stronger, and on reexamination by the doctor its sight will frequently be found to have improved. Many cases of squint are benefited by these means, so that operations or the permanent disfigurement and disability of a nearly blind squinting eye are avoided. The eyes of young children, until they know their alphabet and can practice as above, may be practiced by threading beads with a blunt needle, using smaller beads as the sight improves.

E. W. HOPE,
*Medical Officer to the Education Authority.*

## APPENDIX VII.

*Visual acuity tests.*—Most of these test cards can be secured from jobbers and large school supply houses as well as from publishers.

A. *The Snellen test types.*—The original form devised by Snellen, of Utrecht. Published by E. B. Meyrowitz, New York and Minneapolis; or F. A. Hardy & Co., 10 South Wabash Avenue, Chicago. (Publication No. 987.)

B. *The vision chart for schools.*—Allports modification of the Snellen chart. This contains the usual test letters with the addition in each line of at least one letter for illiterates. F. A. Hardy & Co., 10 South Wabash Avenue, Chicago, Ill.

C. and D. *Vision charts for illiterates.*—Two types: The letter E in different positions; objects (chair, bell, hat, etc.) same relative size as letters. F. A. Hardy & Co. (Nos. 962 and 983, respectively.)

E. and F. *McCallie test cards.*—Literate and illiterate tests; standardization of the Snellen test and the organized dot test. Six cards to each set. Edwin Fitzgeorge, agent, Box 67, Trenton, N. J.

Vision chart and color blindness test combined. F. A. Hardy & Co. (No. 987-E.)

(Instructions for principals, teachers, etc., are printed on a separate card, which can be detached from the vision chart.)

* Cross out whatever is inapplicable.

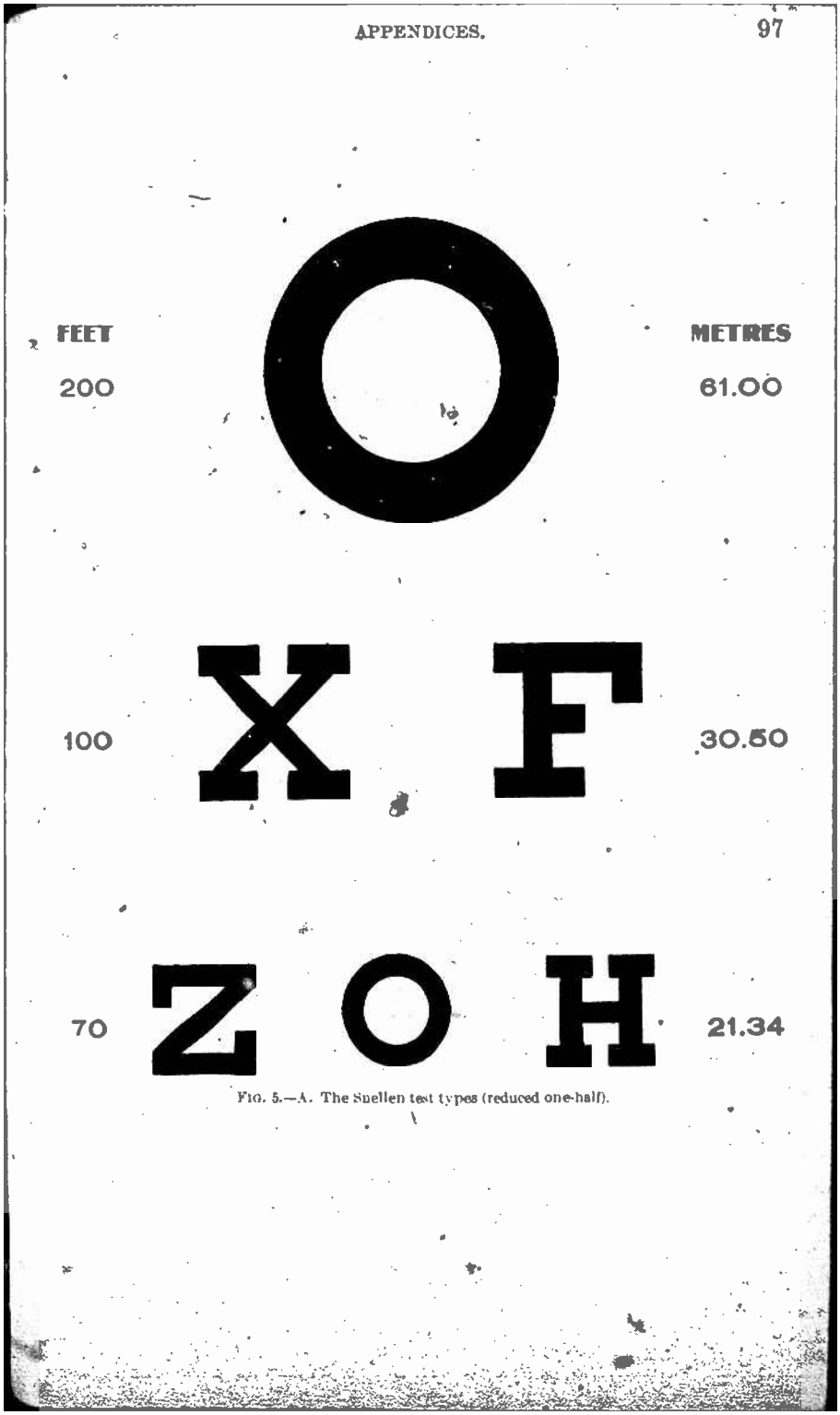



FIG. 5.—A. The Snellen test types (reduced one-half).

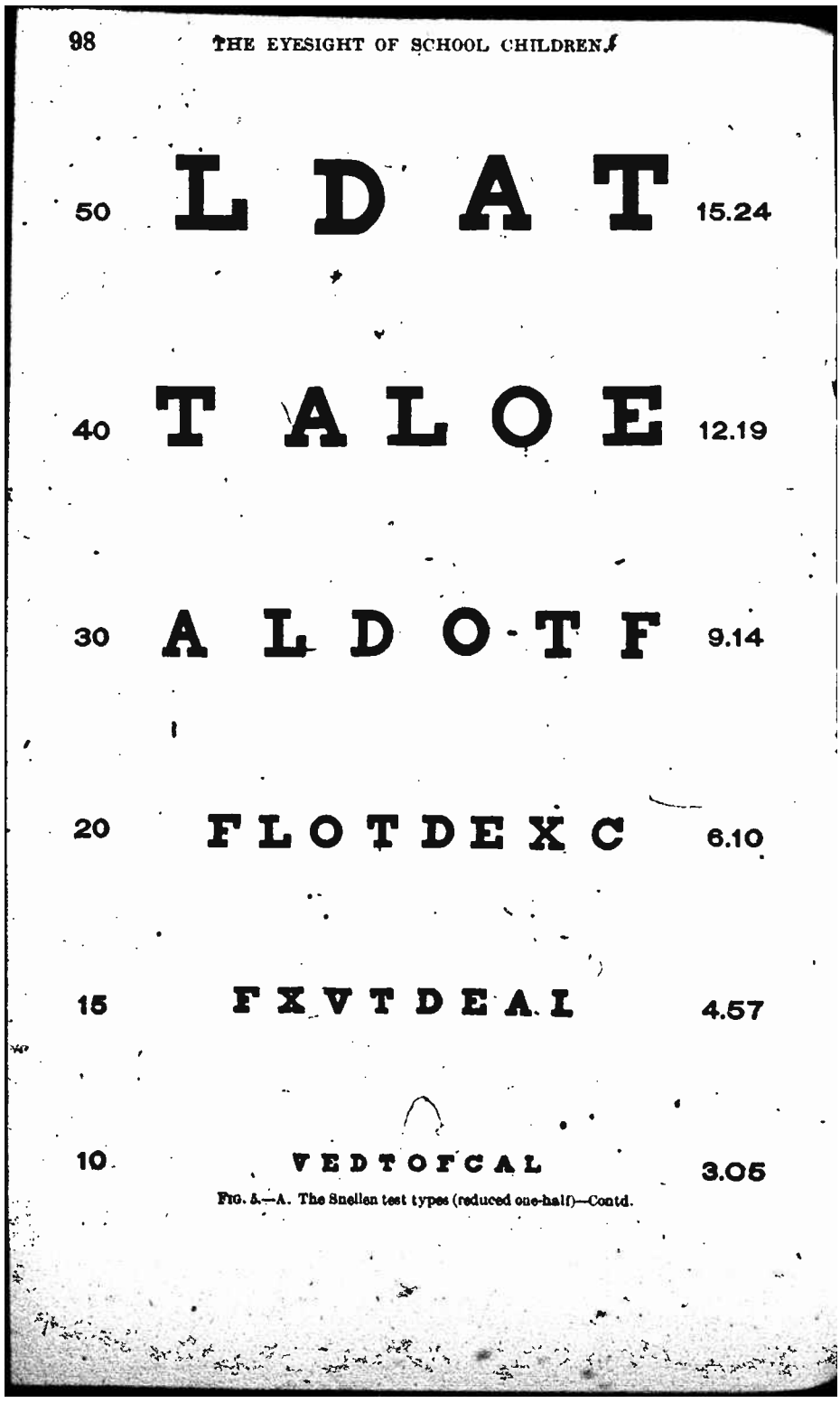



FIG. 5.—A. The Snellen test types (reduced one-half)—Contd.

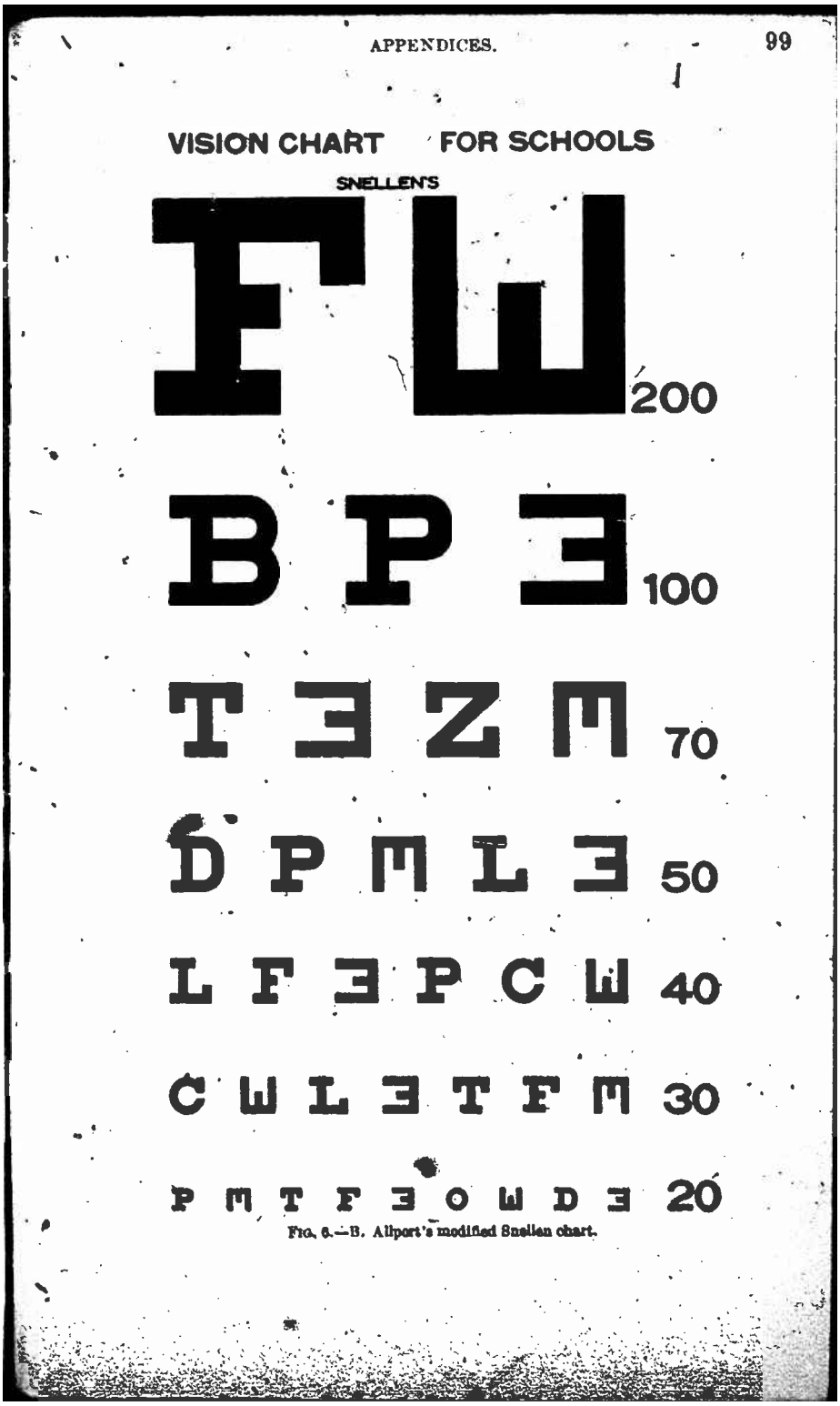



FIG. 6.—B. Allport's modified Snellen chart.

## DR. ALLPORT'S INSTRUCTIONS FOR THE EXAMINATION OF SCHOOL CHILDREN'S EYES, EARS, ETC.

*(To accompany his modified Snellen vision chart.)*

### FOR USE OF PRINCIPALS, TEACHERS, ETC.

Do not expose the card except when in use, as familiarity with its face leads children to learn the letters "by heart."

First-grade children need not be examined.

The examination should be made privately and singly.

Children already wearing glasses should be tested with such glasses properly adjusted on the face.

Place the "Vision chart for schools" on the wall in a good light; do not allow the face of the card to be covered with glass.

The line marked 20 should be seen at 20 feet, therefore place the pupil 20 feet from the card.

Each eye should be examined separately.

Hold a card over one eye while the other is being examined. Do not press on the covered eye, as the pressure might induce an incorrect examination.

Have the pupil begin at the top of the test card and read aloud down as far as he can, first with one eye and then with the other.

For the use of those children not knowing the names of letters, the sign (Ш) has been placed on each line in various positions. The child should indicate in which position this sign is placed. A cardboard symbol (Ш) can be easily cut out, which the child can hold in its hand. It should hold the figure in the same position as the one it is expected to see on the chart. For the purpose of convenience each line ends with the sign (Ш) in various positions.

### FACTS TO BE ASCERTAINED.

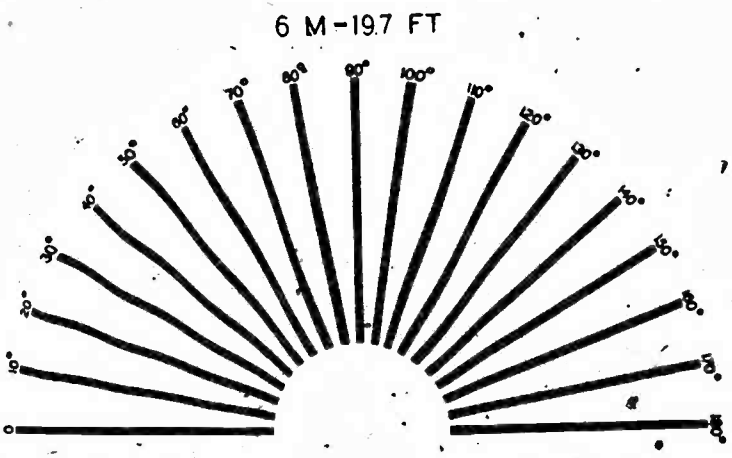
1. Does the pupil habitually suffer from inflamed lids or eyes?
2. Does the pupil fail to read a majority of the letters in the number 20 line of the test types with either eye.
3. Do the eyes and head habitually grow weary and painful after study?
4. Does the pupil appear to be "cross-eyed"?
5. Does the pupil complain of earache in either ear?
6. Does matter (pus) or a foul odor proceed from either ear?
7. Does the pupil fail to hear an ordinary voice at 20 feet in a quiet room? Each ear should be tested by having the pupil hold his hand over first one ear and then the other. The pupil should close his eyes during the test.
8. Is the pupil frequently subject to "colds in the head" and discharges from the nose and throat?
9. Is the pupil a habitual "mouth breather"?

If an affirmative answer is found to any of these questions, the pupil should be given a printed card of warning to be handed to the parent, which should read something like this:

### CARD OF WARNING TO PARENTS.

After due consideration it is believed that your child has some eye, ear, nose, and throat disease, for which your family physician or some specialist should be at once consulted. It is earnestly requested that this matter be not neglected.

Respectfully, ..... School.




60 M - 196.8 FT.

E 1

30 M - 98.4 FT

M E 2

FIG. 7.—C. Vision chart for illiterates (reduced one-half).

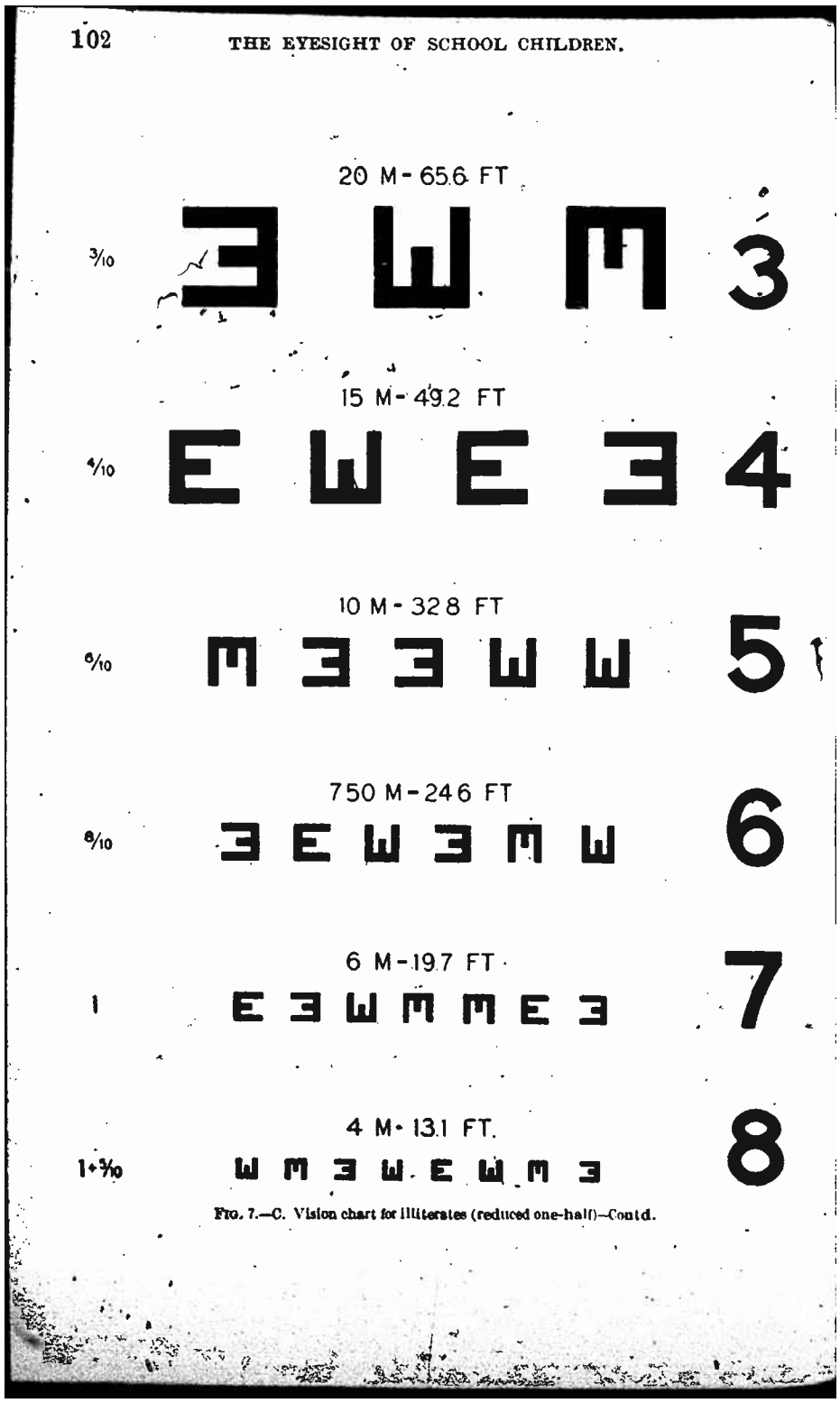



FIG. 7.—C. Vision chart for illiterates (reduced one-half)—Contd.

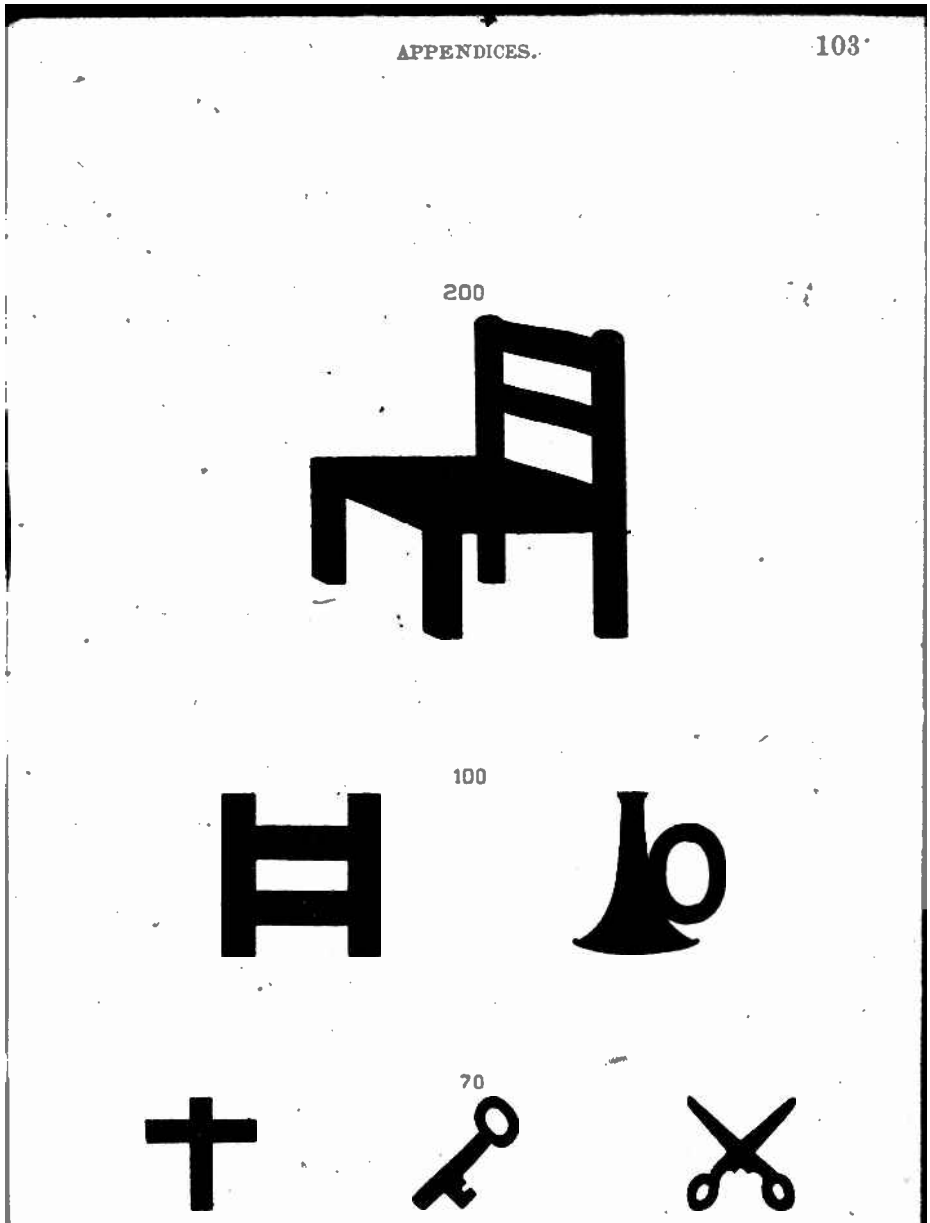



FIG. 8.—D. Vision chart for illiterates (reduced one-half).

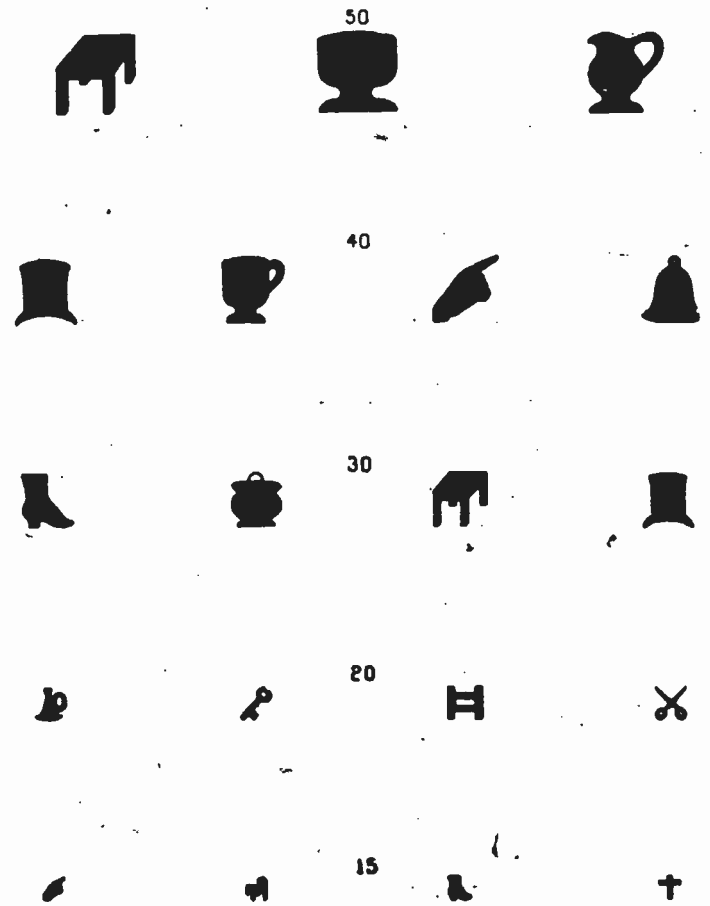



FIG. 8.—D. Vision chart for illiterates (reduced one-half)—Contd.

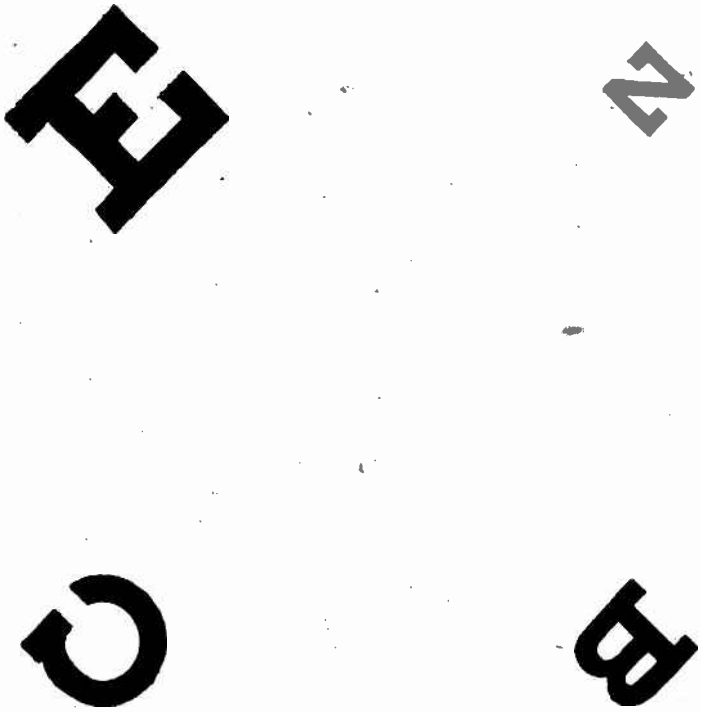


FIG. 9.—E. Face of McCallie test card. (Actual size.)

150051°—20——9

Back of McCallie test card (Fig. 9.)

Z 20 FEET. B 30 FEET. C 40 FEET. E 50 FEET.

## HOW TO TEST VISION.[1]

1. The normal eye can see to read the smallest letters on these cards at a distance of 20 feet, the next size 30 feet, the next size 40 feet, and the largest size at 50 feet.

2. Select the best position for light in the schoolroom. Avoid a glaring or direct sunlight. Draw a chalk mark on the floor at this place and mark it 0; measure from this 2 feet, make another line and mark it 2; from this measure 2 more feets etc., until 20 feet are measured off

3. The pupil to be tested is to stand with his toes to the 20-foot mark, with a card over one eye. The teacher arranges the cards so that all of the smallest letters will be up. She then holds them vertically in her hands, face toward the pupil, so as to receive the best light. The pupil is required to read the letter at the top of the card only, as the teacher presents them from the back of the pack. Do not correct errors. Do not allow pupils to hesitate longer than three seconds in naming a letter.

4. If four out of five of these letters are read correctly, with little or no hesitation, record the result $\frac{20}{20}$. This indicates normal vision.

5. If a pupil can not read four out of five of the smallest letters turn the cards to the next size. If he can read four out of five of these letters correctly, record the result $\frac{30}{30}$. If the 30-foot letters can not be read, four out of five, turn the cards to the 40-foot letters. If these can be read, record the result $\frac{40}{40}$. If the 40-foot letter, can not be read, turn the cards to the 50-foot letters. If these can be read, record the result $\frac{50}{50}$. The fractions $\frac{30}{30}$, $\frac{40}{40}$, and $\frac{50}{50}$ signify, respectively, $\frac{2}{3}$, $\frac{1}{2}$, and $\frac{2}{5}$ normal vision.

If the 50-foot letters can not be read, have the pupil move up 2 feet and try again, and 2 more, etc., until he can read the letters. The distance in feet from the teacher when the letters are read correctly will always be the numerator and 50 will always be the denominator of the fraction representing the pupil's vision. Thus, if he had to move up to 10 feet his vision would be recorded $\frac{10}{50}$, which indicates one-fifth normal vision.

6. When one eye is tested, proceed in the same manner with the other. It is often necessary to let the pupil rest for a moment or two.

7. If a pupil can not read the 20-foot letters satisfactorily at 20 feet, he should have his eyes attended to by a competent physician, and, even if he can read the 20-foot letters and has headaches, or inflamed eyes or complains of eye troubles, he very likely has visual defects that need correction.

NOTE.—These cards are to be used in the schoolroom, in the presence of all the pupils. The order of the letters can never be remembered if the cards are now and then shuffled.



[1] On the original cards these letter and distance indications are printed in positions corresponding to those on the face of the card, for the teacher's guidance.

FIG. 10.—F (1). Face of McCallie test card for illiterates.

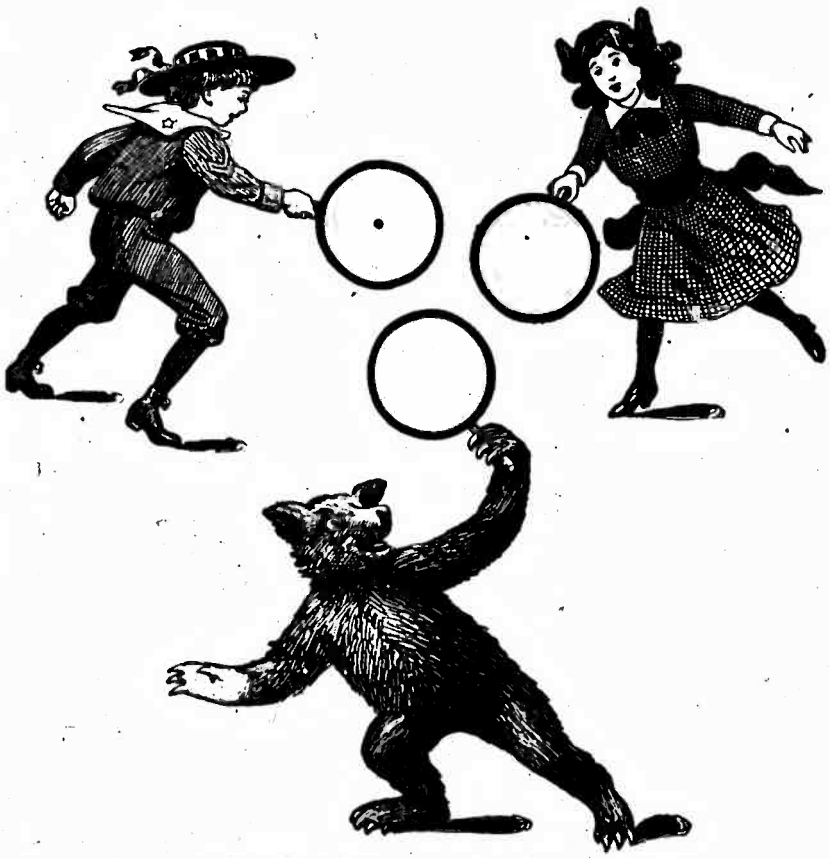


FIG. 71.—F (2). Face of McCallie test card for illiterates.

Back of McCallie test card. (Figs. 10 and 11.)

## HOW TO USE THE ILLITERATE TEST CARDS.

The normal eye can see the dot on these cards at a distance of 20 feet, low first grade 18 feet, kindergarten children 16 feet.

1. Determine where the light is best for seeing the dot. Neither sunlight nor bright light should fall on the cards. Do not make tests on dark days.

2. Beginning with the place selected for showing the cards, place on the floor a chalk mark every 2 feet. Mark off 20 feet.

3. Place the pupil to be tested with his toes to the 20-foot line, and with a stiff card over one eye. (If kindergarten, child toes should be placed at the 16-foot line; if low first grade, at the 18-foot line.)

4. Shuffle the cards and hold them with their faces toward the pupil being tested.

5. As soon as the face of a card is shown the pupil is expected to answer: "The bear has it," "The boy has it," "The girl has it," or, "Neither has it." according to where the dot appears or when it does not appear.

6. The cards are taken from the back of the pack and placed in front. The words, "boy," "bear," etc., at the top of each card, enables the one making the test to know whether the answers are given correctly or not.

7. If an answer is not given within 5 seconds, present another card. Do not correct the pupil's errors.

8. As soon as a pupil has made two mistakes, have him try again 2 feet nearer, and if mistakes are still made, have him move up 2 more feet, etc., until not more than one mistake is made in five trials.

9. If a pupil has to move to the 12-foot mark before he can locate the dot, mark his vision $\frac{12}{20}$. If he can do this at 20 feet, record his vision as $\frac{20}{20}$, etc. $\frac{20}{20}$ indicates normal vision; $\frac{16}{20}$ or less indicates a defective eye that needs attention. (In the *kindergarten* $\frac{16}{20}$ may be taken as normal and $\frac{12}{20}$ or less as sufficiently defective to need attention, and in the *low first grades* $\frac{18}{20}$ may be taken as normal, and $\frac{14}{20}$ or less as needing attention. If the dot can be seen at a greater distance than 20 feet such a pupil has sharp vision.

10. After testing one eye proceed in the same manner with the other.

11. These tests are to be made preferably in the schoolroom in the presence of all the pupils, who may look at the cards while the others are being tested, if they wish.

12. Often allow pupils to rest a few seconds, especially before beginning to test the other eye.

NOTE.—This method of testing vision can be made very interesting to small children by telling them that the boy, bear and girl are playing ball, and they are to watch and see which one gets the ball (the dot). Before beginning the tests call all the pupils of the room up in front and near you. Explain the game. Show a number of cards and have the pupils answer quickly, which has the ball. Continue this for a minute, or until you are sure that each one knows what you want him to do, then test the pupils one at a time, as described above. Kindergarten children should be drilled in locating the dot at close range several times before making the tests.

# APPENDIX VIII.

## STATE LAWS REQUIRING VISION TESTS.

A summary table of State laws, 19 in number, requiring the testing of school children's eyesight, is given in this appendix. Connecticut was the first State to enact a law especially providing for the testing of eyesight of all children in the schools of the State. This was in the year 1899. Subsequently 18 other States made such provision either in special acts or in parts of general school health supervision laws.[1] In all but two of these States, these examinations are compulsory.

For the most part, the routine and record forms for eye tests are prescribed jointly by the State health and State education authorities. The instructions issued to teachers in Massachusetts and Indiana appear to be especially satisfactory. (See Appendix III.)

*Summary of State laws governing eye tests in school (in chronological order).*

NOTE.—Wording of statutes closely followed in the summary.

| State. | Date of act. | Mandatory or permissive. | By whom eye tests are made. | Frequency of tests. | Miscellaneous provisions. |
|---|---|---|---|---|---|
| Connecticut | 1899 | Mandatory. | Superintendent, principal, or teacher. | Fall term, annually. | Forms, procedure, etc., prepared by State board of education. |
| Massachusetts | 1906 | ....do.... | Teacher | At least once every school year. | Directions for tests prescribed by State board of health. Test cards, forms, etc., furnished by State board of education. |
| Colorado | 1909 | ....do.... | Teacher or principal or county superintendent. | First month of each school year. | Needed appliances and supplies furnished by State superintendent of public instruction. (Where there is no principal.) |
| Maine | 1909 | ....do.... | Teacher or school physician. | At least once in every school year. | Directions and forms prescribed by State superintendent of public schools after consultation with State board of health. |
| Indiana | 1911 | ....do.... | Teacher | Once in each school year and at such other times as may be necessary. | Under joint direction of State boards of health and of education. Law prescribes fully rules for testing eyesight. |
| Pennsylvania | 1911 | ....do.... | Medical inspector | At least once each year. | Under direction of commissioner of health. |
| Rhode Island | 1911 | ....do.... | Teacher or school physician. | ....do.... | Commissioner of public schools to furnish appliances and forms approved by State board of health. |
| Utah | 1911 | ....do.... | Teacher | First month of every school year and whenever children enter school thereafter | Board of education or district board of trustees may employ physicians to make tests. State board of health prescribes rules for making tests. |

[1] In eight other States the school health supervision laws are sufficiently broad to permit or require testing of eyesight.

*Summary of State laws governing eye tests in school (in chronological order)*—Con.

| State | Date of act. | Mandatory or permissive. | By whom eye tests are made. | Frequency of tests. | Miscellaneous provisions. |
|---|---|---|---|---|---|
| Vermont | 1912 | Mandatory | Superintendent, principal, or teacher. | Biennially, in September of every even year. | Of every pupil 7 years of age and older. At any time, children in school becoming 7 years of age and of any pupil apparently defective, State board of health and superintendent of education prepare directions and forms. |
| New Hampshire | 1913 | ....do.... | Teacher under directions of school physician. | At least once in every school year. | Directions and forms prescribed by State board of health in cooperation with superintendent of public instruction. Pupil exempt from examination if parent or guardian protests in writing to teacher. |
| New Jersey | 1914 | ....do.... | Medical inspector | At commencement of each school year. | Law specifies examination of eyes to be for "far and near sightedness and the condition of the eye lids." |
| New York | 1913 | ....do.... | Medical inspector, principal, or teacher. | At least once in each school year. | Commissioner of education, after consultation with State commissioner of health, to furnish rules and forms. Commissioner of education appoints State medical inspector of schools. |
| North Dakota | 1913 | Permissive. | Medical inspector | At least once annually. | School boards may and shall, if petitioned by a majority of persons having children attending schools. |
| West Virginia | 1913 | Mandatory | ....do.... | Once during each school year. | District school boards appoint medical inspectors. |
| Maryland | 1914 | Permissive. | ....do.... | At least once in every two years. | Board of county school commissioners may employ medical inspectors. Rules and forms prescribed by State superintendent of public education in consultation with State board of health. |
| Delaware | 1915 | Mandatory | Teacher | Once every school year. | Under direction of State commissioner of education. |
| Virginia | 1915 | ....do.... | ....do.... | Annually | State superintendent of public instruction must in accord with the State board of health provide suitable test blanks, etc., for testing sight and hearing of the pupils. Teachers must report results to parents. |
| Wyoming | 1915 | ....do.... | ....do.... | First month of each school year. Later entrants immediately upon entering school. | Under direction of State superintendent of schools. Law contains guide questions for determining defects. |
| Nevada | 1917 | ....do.... | ....do.... | Annually | State board of health shall prescribe rules for such examinations and furnish blanks for same. School trustees enforce regulations. |

## GENERAL REFERENCES.


American medical association. Committee on preservation of vision. Conservation of vision series. Pamphlets I–XV.

*Chairman*, Dr. Frank Allport.
School children's eyes. Pamphlet I.
Relation of illumination to visual efficiency. Pamphlet IV.
Opthalmia neonatorum. Pamphlet XI.
Ocular hygiene in schools. Pamphlet XV.

Berkowitz, J. H. Better schoolhouses as a factor in race betterment. *In* American school board journal, June, 1918.

"To a very great extent the foundations of national vigor are built on the physical environment of childhood during school life. Unfortunately the number of school boards and individual school officials who are yet to be convinced of this is not small. Many are the schools in which children are compelled to receive daily instruction under conditions that would be condemned in industrial plants where sturdy adults are employed. In such schools compulsory education spells compulsory physical unfitness."

Berry, Gordon L. Saving the sight of school children. *In* American school hygiene association. Proceedings, 1916. p. 136–145.

*Also in* National education association. Journal, 1:816–19, April, 1917.
Teaching in New York City's grade schools, care of eyes and eyesight.
Gratuitous loan of lantern slides by the National committee for the prevention of blindness (130 East Twenty-second street, New York, N. Y.). School exhibit panels, 5 to a set *re* trachoma, improper illumination, etc., "available for permanent use in any city at the cost of postage alone."

Burnham, William Henry. Hygiene of the eye. *In* Monroe, Paul, *ed.* A cyclopedia of education, vol. 2: 560–62.

"The errors of refraction have been studied in hundreds of thousands of school children, and . . . investigators have often found that at the beginning of school life more than half of the pupils have hyperopic eyes. In the later grades the majority of eyes have become emmetropic, or passed through this stage and become myopic."
Number with defective visions as recorded by investigators, from 10 to 97 per cent, "and probably few, if any, absolutely emmetropic eyes can be found."

Burrage, Severance, *and* Baily, Henry T. School sanitation and decoration: a practical study of health and beauty in their relations to the public schools. New York, D. C. Heath & Co.

Chapter X. Influence of school life upon the eye.

Dresbach, M. Ocular defects and their relation to the health and work of the student. Educational review, 46: 492–509, December, 1913.

Students at Cornell university, whose "statistics show that the great majority of our students are hyperopic." Other student body, "40 per cent have never had their eyes examined. . . . Among our regularly enrolled students at least 25 per cent have eyestrain and we have found the highest per cent of failing eyes among the students of the technical courses."
Among the young men who come from rural districts, the author states, "we find only 13 per cent of eyestrain cases, yet there are many with marked ocular defects. A number of these students from the country develop eyestrain symptoms during their 12 weeks' course in the university. Another interesting thing is the greater per cent, 17 as against 8, of myopia."

Kerr, James. Eyesight in school life. *In his* Newsholme's (author) school hygiene . . . London, George Allen & Unwin (*Fourteenth edition, March, 1916*). p. 141–75. figs.

In regard to examinations, detailed, in the elementary schools of English towns, states:
"(1) The percentage with normal vision increases at every year of age and standard, till in the highest classes it is over 80 per cent.
"(2) About 10 per cent have visions as bad as V. $A_c = 6/18$. This remains constant through school-life. The greater part of the defective vision is due to slight defect which gives fair but imperfect

vision, due probably to both ocular and mental conditions, and of the greatest importance educationally in the visual acuity (V. A. = 6/36 or worse), due to accident or disease and probably also to spasm and myopia, is met in small proportion, increasing from about 1.5 in Standard I to about 3.5 in Standard VII."

Lewis, Francis Park. The vision of the school child. *In* American school hygiene association. Proceedings, 1916, p. 131–36.

*Also in* New York State journal of medicine, 16:486–89, October, 1916.

Luckiesh, M. Safeguarding the eyesight of school children. Illuminating engineering society. Transactions, 10: 181–201, no. 2, 1915. illus.

Bibliography: p. 199–201.
*Also in* American school board journal, 50:13–15, 67–72, June, 1915.
Reprinted.
Résumé of requirements used as basis for Code on school lighting of the committee on school lighting.

Lyster, Robert A. School of hygiene. 2d ed. Baltimore, Md., Warwick & York. 388 p. Illus.

Part I. The school building. Chapter IV, Lighting.
Part II. The scholar. Physical training and the laws of health.
Chapter I. School fittings (desks, blackboards, etc.).
Chapter II. Postures.
Chapter III. The eyes and eyesight.
Part III. Medical supervision and school medicine and surgery.
A practical handbook with convincing conclusions by an experienced English public-health officer.

Massachusetts commission for the blind. School problems of defective sight. Methods of investigation, eye tests, school eye records, etc. *In its* Eighth annual report, 1914, p. 48.

Newman, *Sir* George. Annual report of the chief medical officer of the board of education, London.

Annual issues 1909–1917, covering England and Wales. Comprehensive surveys of the physical condition of school children distinguished by freshness and authenticity so obviously lacking in the majority of American reports.
Summaries and conclusions of medical officers' reports for individual "areas" are given. The presentation of the subjects in general and the discussions by the chief medical officer are always highly significant and authoritative.
The following quotations are from the annual report for 1915: "So far as the figures in the school medical officers' reports may be accepted as a basis of calculation, it would appear that the percentage of children with defective vision in attendance at elementary schools is approximately 30, and that in 17 per cent of the children the extent of the defect indicates urgent need of treatment." (p. 34.)
"The policy of the board's medical department in regard to defects of vision, obviously one of the most serious of all school disabilities, is briefly as follows: (*a*) To secure for all school children an adequate examination by appropriate methods of their eyesight (external diseases of the eye, squint vision, and physical or mental conditions accompanying eye-strain); (*b*) early and effective treatment of diseases or defects; (*c*) the proper and adequate following up of these cases; (*d*) the removal of all conditions or habits in school or home which are injurious to eyesight." (p. 35.)
"A study of the reports of the school medical officers leads to the conclusion that the percentage of children suffering from defective vision is not decreasing as it should. We mend the ailing child with greater acidity and expenditure than formerly, but we do not stop the manufacture of new cases. It is satisfactory to see the increased attention being given to this serious defect, and the larger place that it occupies in school medical work—the great improvement in organization of ophthalmic work in the schools, the establishment of eye-centers in rural districts and the provision of special classes and schools for children defective in vision—but the real solution to the problem has yet to be attempted, and it must be attempted on preventive lines—better lighting, better educational methods from the hygienic point of view, and much less strain of the delicate and growing vision of the child." (pp. 35, 36.)

Parson, Agnes A. Report on the possible effect of needlework on the eyes of young children, shown by a comparison of errors of refraction in "entrants" at age of 5 and "leavers" at age of 12 of both sexes. School hygiene, 4: 35–37, February, 1913. tables.

Children at age of 5 apparently start school with boys and girls apparently having much the same number of eye defects, the girls' figure being 0.93 per cent, lower than boys'. In the age 12 group, the girls have a much higher per cent, the increase being in defects of myopia, myopic astigmatism and mixed astigmatism. All are under same school and home conditions.

Posey, William Campbell. School life and the care of the eyes. *In his* Hygiene of the eye. Philadelphia, Lippincott, 1918. Chapter VI.

The periodic examination of eyes; the hygiene of instruction as it relates to conservation of vision; schoolroom lighting; proper print of textbooks; proper paper of textbooks; seats; special classes for myopes and children partially sighted from other causes.

Pyle, Walter L., *ed.* A manual of personal hygiene. 6th ed. Philadelphia, W. B. Saunders Co., 1915.

The hygiene of the eye, p. 169–275.
Topics discussed include: The dangers of the kindergarten; Care of children's eyes at home; The pernicious influence of modern school life upon the eye; School hygiene; Construction, lighting, interiors; Desks and seats; Blackboards; Books; Fitting and care of eyeglasses, etc.

Risley, Samuel Doty. Good vision as a factor in school progress. *In* Fourth international congress on school hygiene, 1913. Transactions, 3: 168-72. chart.

A report on conclusions, from study made by Dr. Risley, 1878–1880, of eyes of grade children lowest to highest, Philadelphia public schools; accurate records, ages 8½ to 17½ years, showing "the static refraction and existing conditions of the eyes."

"The percentage curves, based upon states of refraction at different ages, which also stood for school progress, revealed the striking fact that while the emmetropic standard or model eye remained in nearly uniform percentage throughout school life from 8½ to 17½ years of age, the hypermetropic eyes diminished and myopia advanced in corresponding ratio. The near sight increased from 4.27 per cent at 8½ years to 19.33 per cent at 17½, while emmetropia remained in uniform percentage."

Emmetropic eyes, 9.64 per cent; more or less defective 90.36 per cent. Of these abnormal eyes, sufficiently defective to suffer from lowered sharpness of vision, weak and painful eyes or some phase of the symptom complex, asthenopia, upward of 60 per cent."

Royer, B. Franklin. A statistical study of the physical defects of 300,000 rural school children. *In* Fourth international congress on school hygiene, 1913. Transactions, 2: 519–27. tables. diagrams.

In Pennsylvania.
"Statistics upon which this analysis is based deal with a total of 305,372 rural school children, none of whom reside in settlements having over 5,000 population and in fact quite 90 per cent of them are children living in the country districts or farms or in little villages. More than 210,000 of them were found to have some defect, that is upward of 74 per cent of the children were defective.

"The total number of children examined was 305, 373; those having defective vision, 82,454; defective in both eyes, 56,749."

The above analysis omits children under 6 and over 16 years of age.

Shawman, Jacob Albright. Report of Committee on prevention of blindness and conservation of vision. *In* National education association. Journal of proceedings and addresses. 1912. Published by the Association, 1912. p. 1306–12.

Lines of inquiry covered in this report of the National education association are:
"1. The amount of light admitted into the schoolroom and the direction from which it comes.
"2. The effect of a shiny surface, whether the blackboard or printed page, and the possibility of getting rid of it.
"3. The size and clearness of type and the tint of the paper used.
"4. The use to which the eyes are put and the reduction in the amount so as to prevent eyestrain.
"5. The prevention of progressive near sight by limiting the use of the eyes for close work.
"6. The correction of focal defects in so far as school authorities can act or suggest."

Terman, Lewis Madison (*and* Hoag, E. B.). The hygiene of vision. *In their* Hygiene of the school child. Boston [etc.], Houghton Mifflin co., [1914]. p. 245–81. figs. tables.

Selected references: p. 279–81.
States: "Tests of vision in the school should be made by teachers and school nurses. This not only results in a great saving of expense, but . . . gives the teachers the intimate knowledge which they need to have regarding the eye conditions of their pupils."
*N. B.* Burnham says, for myopes, examination by "competent oculists."

## SOME EYESIGHT CONDITIONS.

### ASTIGMATISM.

Burnham, William Henry. Astigmatism and brain work. Pedagogical seminary, 25: 225–38, September, 1918.

Bibliography: p. 237-38. Historic, in part. Reprinted.
Dr. Burnham states in his conclusions "(2) Almost everybody has some degree of astigmatism; more than 90 per cent of all eyes, probably more than 95 per cent, are to some degree astigmatic.
"(5) Children should be tested for astigmatism at the beginning of school life. The common practice of testing for other defects of vision and not for astigmatism is very unfortunate."

MYOPIA.

(Burnham, William Henry.) Myopia. *In* Monroe, Paul, *ed.* A cyclopedia of education. vol. 4:360-362.

References.

"With the net result of modern investigations has been shown that heredity is the primary cause of myopia; . . . and that the school and near work are only in a secondary way responsible. . . . It is a significant fact for hygiene that probably from 10 to 25 per cent of the children in any school are likely to have this defect or else a tendency to it, and it is necessary to make the conditions hygienic for such myopic eyes. They should be tested by competent oculists.

Cornell, Walter Stewart. The prevalence of eye defects in school children. *In his* Health and medical inspection of school children . . . 1912. p. 578–58[illegible] tables.

Harman, Nathaniel Bishop. The eyes of our children. London, Methuen & co. (1916: first pub. 1910). 119 p. figs. tables.

Author states: "Short sight is never, or hardly ever, present at birth. It is rare at 5 years of age. It usually begins during school life, and increases more or less from year to year during the period of growth. It sometimes continues to increase after growth is completed."

In a study of 2,500 London school children who had bad vision, 68 per cent were hyper metropic and 32 per cent myopic.

The table shows that myopia "comes on during school life, and increases in frequency and in degree with each year of school age."

Favors lighting from left-hand side of classrooms—one large window extending from 4 feet above the floor to the clear level of the ceiling and from the hind wall forward for a full [illegible] thirds of the wall. Where obscured glass is used, blunted, never ground glass. "Skylights give a fine light, but . . . they are cold in winter, hot in summer, and dirty at all times."

For walls "a pale gray or green tint serves best."

The chapter on reading gives the British association's "standard typographical table" for scale of print and spacing and relation of lines, for children of different ages.

Chapters on writing, sewing, handicraft, and drawing prohibit all pens, copy books, slates, and pencils from the infant's school, sewing, for short-sighted children at any age; the child with ordinarily healthy eyes may do any handicraft.

Lewis, Francis Park. Sight saving and brain building. *In* Fourth international congress on school hygiene, 1913. Transactions, 5:56–62.

Gives the following definite formulation of Dr. Dufour:

(1) In all schools the number of near-sighted pupils increases from class to class.

(2) The average degree of short-sightedness increases from class to class.

(3) The number of short-sighted pupils increases with the increase in school demands.

(The study of myopia in the schools of Glasgow, Scotland.) School hygiene, 8:147–148, December, 1917. tables.

Widmark, Johan. The decrease of short-sightedness in secondary schools for boys in Sweden. *In* Papers on school hygiene, published by the Royal Swedish committee on the Fourth international congress on school hygiene, 1913. p. 8–25. tables. diagrs.

With increasing school grade, first to upper seventh inclusive, near-sightedness of pupils increased with grade from class to class; unquestionable increase as shown by figures, and a greater prevalence of near-sightedness in the "classical" than the "modern" school, a school with both these sides of education having a slightly less percentage of near-sighted pupils than the classical school.

In all the state secondary schools for boys in Sweden Dr. Widmark shows a steady decrease in the percentage of short-sightedness in the highest classes, from 1895 to 1908. He attributes this decrease to, first, the improvement in the lighting of rooms and in the printing of the books used by pupils, and that the influence of these changes is of effect in the homes; also eye strain in home study being lessened.

The abandonment of old gothic types is a significant factor in book strain upon the eyes of students.

SQUINT.

Henderson, W. E. Causation and treatment of squint. Medical officer, April 10, 1915.

From Dr. Henderson's Seventh annual report, Westmoreland.

Neave, Edward F. M. Squint in school children. Child, 4:705–708, June, 1914. tables.

Of Manchester, England.

School conditions not responsible for production of squint. Boys more commonly affected than girls. Out of 498 boys, 24, or 4.8 per cent, had squint; out of 491 girls, 17, or 3.4 per cent. Left eye more frequently affected than right. In 272 cases, 163 with left eye affected. In the majority of cases squint appeared before school age. Of these children, 88 per cent had been affected.

Spence, J. E. Squint and defective vision in school children. School hygiene, 6:71–81, May, 1915. tables.

England, Cumberland county.

Records of the vision of 3,322 children available between ages 12 and 14.

Findings: (1) Greater incidence of visual defects among girls. (2) Greater percentage of defects in the left eye.

These differences do not exist at birth; have been observed by school medical officers elsewhere and by ophthalmic surgeons; must be due to some cause between birth and age of 12 years.

### TRACHOMA.

Leupp, Constance D. Removing the blinding curse of the mountains. World's work, 28:426–430, August, 1914.

The U. S. Public health service in the Appalachians. Study and report of the eyes of 76,000 school children.

Power, William T. The treatment of trachoma. *In* American school hygiene association. Proceedings, 1917, p. 253–256.

Following brief historic sketch of introduction of trachoma into Europe, Dr. Power states that, despite the "general clamor" regarding the "appalling prevalence of this affection among school children," to which he also has "added his voice," true trachoma is of infrequent occurrence, if not actually a "rare disease"; and that "the disease that is so very prevalent among our school children and which we have been diagnosticating as trachoma . . . is for the most part follicular conjunctivitis.

"While it is true that this disease is communicable, its results are seldom if ever serious."

Williams, Anna Wessels, *and others*. Trachoma and allied conditions in New York school children. Journal of infectious diseases, March, 1914.

A study of 4,000 school children. During the past four years "no cases of conjunctival affection answering in their entirety to the classic descriptions of trachoma were found" in the 60 public schools lower East side. "None of the 3,000 and more cases of follicular affections in these children have developed cicatrical changes due to the infections; on the contrary, the great majority of them now present normal conjunctivitis, chiefly due to (a) the carrying out of treatment such as ophthalmia schools and school clinics, summer camps, mothers' demonstration classes, home instructions and 'follow-up' work. (b) More minute care of acute, as well as chronic, cases. . . . . (c) Nonoperative procedure in a large number of cases formerly operated."

N. B.—For further study of trachoma in school children see U. S. Public health service: Reprint 101, 196, 263 (Kentucky); reprint 220 (Georgia and Tennessee); reprint 207 (North and South Carolina); reprint 198 (Virginia and West Virginia); reprint 143 (Cebu, P. I.); reprint 241 (Porto Rico).

### SCHOOLROOM LIGHTING.

Alger, Ellice M. The relation of illumination to scholastic visual efficiency and health. *In* American school hygiene association. Proceedings, 1916, p. 145–50.

Nash, Elwin H. T. School lighting. School hygiene, 5: 1-23, February, 1914. figs.

Daylight and artificial.

A comparative study, England, United States, etc.

New York City. Superintendent of school buildings. Lighting of classrooms. A study of natural and artificial illumination and standards derived. *In his* Report for 1913. p. 55.

*Also in* American architect, September, 1915. p. 170.

## NATURAL LIGHTING.

Betelle, James O. Some details of schoolhouse planning. American school board journal, 54: 19–20, April, 1917. illus.

The use of "factory ribbed glass" in all schoolhouse windows except a few of the lower panes as adopted in a number of Newark, N. J., new schools.

Another says of this glass, that "besides the advantage of practically never having to be cleaned and polished, it has a refractive quality, which reflects and diffuses the light in the classroom. . . . Where it has been installed, the classroom can be used when the sun is shining directly against the windows without lowering the window shades or discomfort to the pupils."

The daylight illumination of schools. Illuminating engineer, July, 1914.

*Reprinted in* School world, 16: 342-47, September, 1914. figs.

Luckiesh, M. Lighting in public buildings. *In his* The lighting art . . . 1st ed. New York, McGraw-Hill book co., 1917. p. 158–61.

"Records show that the percentage of school children possessing defective vision increases with their age under improper lighting and decreases under proper lighting.

"Unilateral lighting appears to be satisfactory for rooms less than 20 feet in width."

Rapeer, Louis Wm. The case against unilateral lighting. American school board journal, 57: 33–34, July, 1918.

Author's solution of the lighting of school houses: "Place *high, small windows over the blackboards on the right side of pupils*, perhaps the size of and directly opposite the upper sashes on the left. Place these on pivots at top and bottom if they open into a hall and on hinges, opening inward from the top if outside windows." "In places where author had studied similar lighting, as in the New York training school for teachers for three years, no shadows were observable."

Overhead lighting may be used with plan, although not necessary.

Rear windows also to be used, not full length but "same kind of sashes as described for the right." Recommends, then, "three-sided lighting of classrooms."

——— Standardizing lighting and ventilation in public schools. Journal of education, 84: 451–54, November 9, 1916.

From personal studies Dr. Rapeer recommends: "1. Lighting principally from the left of the pupils by means of large double-sash windows, reaching from the rear of the room (within one foot), entirely to the ceiling, and without break except for window weight boxes and frames forward to within six feet of the front of the room, the bottom to be no higher than four feet from the floor (practically one large window on the left, about 24 feet long).

"2. Windows high on the *right*, opposite to and the same size as the upper sashes of the left-hand windows described.

"These would be single-sash windows with blackboards beneath along the entire right-hand side of the pupils . . .

"3. Windows at the *rear* of the same size and as close together as on the right and the upper sashes on the left."

Investigations (Ayres and Terman, Springfield and Denver) show that "teachers practically universally lower the lighting efficiency of windows far below the desirable number of candle powers by failing to keep shades rolled up when the sun is not shining in. One-third of all the light of a room comes in at the upper one-fourth of the window."

Short history of investigations on the natural lighting of schools. Illuminating engineer, 7: 27–30, January, 1914.

## ARTIFICIAL LIGHTING.

Alt, Harold Lynn. Electric lighting. American school board journal, 53: 21–22, October, 1916. figs.

*Also in his* Mechanical equipment of school buildings . . . [c1916.] p. 99-103.

England. Illuminating engineering society . . . Report (1913).

Two years ago a joint committee of illuminating engineering experts and educational and medical authorities was appointed in England to investigate the artificial lighting of schools. Facilities were granted by the London education department for experiments and observations to be made respecting gas and electric lighting in several of its schoolrooms. The conclusions so far reached by the committee are embodied in a preliminary report which has just been published by the Illuminating engineering society in England.

The terms of reference included both daylight and artificial lighting but the latter was to be first dealt with.

The report first remarks that the intensity of illumination necessary in schoolrooms depends on the nature of the work to be done, and a distinction may be drawn between the needs of children and those of adults. The needs of the children were chiefly considered, and as a result of the experiments it is suggested that—

(a) For ordinary clerical work (reading, writing, etc.), the minimum illumination measured at any desk where the light is required should not fall below 2 foot-candles. (Four members of the committee favored a minimum of 2.5 foot-candles.)

(b) For special work (art classes, drawing offices, workshops, and stitching with dark materials, etc.), a minimum of 4 foot-candles is desirable.

(c) For assembly rooms, etc., and for general illumination there should be a minimum of 1 foot-candle measured on a horizontal plane 3 feet 3 inches from the floor.

The question of the permissible diversity factor remains to be considered.

In regard to needlework only coarse work on white material should be executed by artificial light in schools, the minimum in this case being the same as for (a).

The respective merits of direct, indirect, and semidirect lighting were all investigated but the above standards of illumination were provisionally adopted irrespective of method.

Ferree, C. E. The problem of lighting in its relation to the efficiency of the eye. Science, n. s. 40: 84–91, July 17, 1913.

*Abread before the* American philosophical society of Philadelphia, April 4, 1913 (with some changes).
*Also in, with charts,* Fourth international congress on school hygiene, 1913. Transactions, 5: 351–64.
*Title* Efficiency of the eye under different systems of lighting.
Four systems. Daylight. Indirect. Semiindirect. Direct.

Ker[illegible]nus. Glare and the student's life. School hygiene, 7: 11–20, February, 1916.
*Also in* American journal of school hygiene, 2: 39–49, March, 1918.
Reprinted.

Gives as absolute rule that "*No naked filament, mantle or flame should be permitted, nor any source of light-with greater intrinsic brilliancy than three foot candles per square inch.*"

In placing blackboards, excessive contrast, as from a white wall behind, is objectionable. The blackboard is a noticeable source of glare in teaching.

Eye strain due to glare becomes increasingly obtrusive after the twelfth year.

Luckiesh, M. Glare in school illuminating. American school board journal, 48: 22–23, 66–68, April, 1914.

Powell, A. L. Artificial lighting of schoolrooms. *In* American school hygiene association. Proceedings, 1916, p. 150–61, tables, figs.

Study of different kinds of artificial lighting.

### CODE OF LIGHTING SCHOOL BUILDINGS, UNITED STATES.

Illuminating engineering society. Committee on school lighting. Report on Code of lighting schools. *Its* Transactions, 13: 185–200, April 30, 1918. illus. figs. tables.

*Chairman,* M. Luckiesh.
Code, p. 187–200.
Final draft of the first edition of the Code published August 30, 1917.
*See also* American school board journal, 56: 37–38, 51–52, April, 1918.

——— Committee on school lighting. Code of lighting school buildings. New York, N. Y., copyright 1918 by Illuminating engineering society. 18 p. figs. diagrs. tables.

*Chairman,* M. Luckiesh.

### REGULATIONS AND LAWS.

Berkowitz, J. H. Standardization of medical inspection facilities. A contribution to modern schoolhouse planning. Washington, Government printing office, 1919. 22 p. illus. charts. plans. 8°. (Bureau of Education. Bulletin, 1919, No. 2.)

Cooper, Frank Irving, *comp.* Chart showing status of regulation of schoolhouse construction in the United States in the year 1915. (Department of the Interior. Bureau of Education.)

States having, 1915, regulations in force that affect the lighting of schoolrooms—
Light (air-floor space): California, Delaware, Idaho, Indiana, Louisiana, Maine, Massachusetts, Minnesota, Montana, New Jersey, New York, North Dakota, Ohio, Pennsylvania, South Dakota, Texas, Utah, Vermont, Virginia, Wisconsin, 20.
Artificial lighting: Indiana, Maine, Maryland, Minnesota, Montana, New York, Ohio, Vermont, Wisconsin, 9.
Windows: Delaware, Indiana, Louisiana, Minnesota, North Dakota, Ohio, Wisconsin, 7.
Blackboards: Arizona, Indiana, Maine, Minnesota, Montana, New Jersey, New York, South Dakota, Vermont, 9.
Desks and seats: Arizona, Indiana, Minnesota, New York, Ohio, South Dakota, Utah, Vermont, Virginia, Wisconsin, 10.
Window shades: Indiana, Vermont, 2
All points, Indiana, 1.

Marks, L. B. School buildings. Illuminating engineering society. Transactions, 11:42–46, February 10, 1916.

A part of author's article: Lighting legislation.

## SOME TYPES OE SCHOOLROOM LIGHTING.

### UNILATERAL LIGHTING.

A group school and stadium. The San Diego high school. American school board journal, 53:54–57, November, 1916. illus. plans.

Main study hall is top-lighted.
Manual arts building "is equipped with continuous sawtooth roofs arranged with skylights having a northern exposure."

Bruce, William C. Some new schoolhouses in Chicago. American school board journal, 43:22–27, November, 1911.

The Mozart, Nicholas Senn high, Hyde Park high. illus. plans.
The classrooms receive their principal light from east and west, and every classroom receives sunlight.

East Orange, N. J. Washington school. American school board journal, 44:19, 20, April, 1912. illus. plans.

All classrooms have unilateral lighting and prismatic glass in upper sash.

Hanson, W. L. Two unit elementary schools. American school board journal, 53:31–32, October, 1916. illus. plans.

The Charles Elliott Perkins and the North Hill Schools. Classrooms all have north lighting.

Hiawatha school. American school board journal, 52:20, 21, April, 1916. illus. plans.

Twelve classrooms, each with a built-in wardrobe. Unilateral lighting.

Hines, Linnaeus Neal. An experiment in lighting. *In* American school hygiene association. Proceedings, 1910. Springfield, American physical education review, 1910. p. 116–19.

The Tuttle school, Crawfordsville, Ind.; an 8-room schoolhouse having no windows save on the north side.

[New Castle high school.] American school board journal, 55:30–31, 32, 65, August, 1917. illus. plans.

Has 62 classrooms; gymnasium; auditorium, seating 1,200 persons; all rooms have unilateral lighting; 2 large inner courts give direct lighting to gymnasium and auditorium, auditorium having ceiling light of art glass measuring 650 square feet.
Cost, not including movable furniture, $225,000.

Oberholtzer, E. E. Tulsa's system of building schools. American school board journal, 54:26, 66–68, April, 1917. illus. plans.

"The unit buildings consist of 2 individual schoolrooms each, each, together with their accessories well grouped about an entire city block so as to form a hollow and square used as playground. The buildings are placed around the outside of the block, three units on a side."
Classrooms are unilaterally lighted, facing the outside of the square; space of 7 feet between units.

[Oliver School, Lawrence, Mass.] American school board journal, 57: 39, 40, 79, September, 1918. illus. plans.

Built in 1918; contains 36 classrooms, 12 for primary and 24 for grammar grades. "Arrangement of the plan is such that every room where classes assemble, hall, every teacher's room and the administrative offices, receive the direct rays of the sun at some time of the day." The glass area is equal "in every case to 20 per cent of the floor area of the class rooms, with light on but one side of the room."

Pavlista, J. A. A model schoolhouse. American school board journal, 44:30–31, 52 April, 1912. illus. plan.

Schoolrooms are located on the north side of building, receive north light only. Along the south side the corridors and stairways receive the direct sunlight. In the middle of the building are the light shafts, cloakrooms, and sanitary equipment, two for each room, one for boys and one for girls. The upper portions of the center partitions are of glass, so that cloakrooms and accessories receive an abundance of both north and south light. The light shafts, extending from the basement through the roof, inclose the sanitary gravity ventilating ducts, water and steam pipes, downspouts, etc.

BILATERAL AND TRILATERAL LIGHTING.

Corwin, Richard Warren. The unit schoolhouse and its lighting. *In* American school hygiene association. Proceedings, 1915. p. 131–32.

Considers the unit plan "cheaper and more sanitary. It permits the abandonment of stair construction; . . . entrance to these buildings is gained by an incline. Under this plan it is possible to have the room lighted from three sides, which is far better than to light from one side only."

"Central building from which the wings are constructed is utilized for social gatherings, parent-teacher meetings, school exercises, or any civic or social function. It is so constructed as to permit using the wings for the accommodation of a larger number of people."

Fehring, Albert. Defects in school lighting and their remedy. American school board journal, 54:34, April, 1917. fig.

Plan for diagonal seating in classroom having 2-side lighting, 6 windows.

TOP LIGHTING.

Dresslar, F. B. [The Silas Willard school, Galesburg, Ill.] *In his* Rural schoolhouses and grounds. p. 100–103. plate 35, illus. plans. (Bureau of Education. Bulletin, 1914, no. 12.)

The assembly room is intended for general community use.

Kelsey, William B. The Eli Whitney school, Stratford, Conn. American school-board journal, 49:20–21, August, 1914. illus. plans.

Lighting is from above, an adaptation of the saw-tooth type; each room has side windows, but these are not used for lighting.

McDonald, A. A. One-story schoolhouses in Sioux Falls. American school-board journal, 52:27–30, 91, February, 1916. illus. plan.

Bancroft school, occupied September, 1915; site comprising 2 city blocks.
Longfellow school, opened February 1, 1916; site a block and a half.
Lincoln school, on plot of ground with an old building with which it is connected by a tunnel.
Classrooms are arranged along a central court which also serves as assembly room.
Classrooms wider than long, have built-in wardrobes. Receive their main light through large skylights; depend upon windows for auxiliary light only. "The overhead lighting is almost ideal in softness and evenness."

Nida, W. L. Lighting and ventilation of schools. American school-board journal, 42:16–19, 40, April, 1911. illus. plans.

River Forest, Ill., Elm Street school, a four-room one-story wing of a future central building. Saw-tooth skylighting; "parallel ridges running east and west, the south slope of which has the usual opaque roofing, while the north slope is of reinforced glass." The glass is set at such an angle that direct sun rays never strike it.

Perkins, Dwight Heald. One-story school buildings. American school-board journal, 56:17–20, 77–78, April, 1918. illus. plans. table.

The Holly, Mich., high and elementary school; Lincolnwood, elementary, Evanston, Ill.; Stokie, elementary, Winnetka, Ill.; Osseo, Wis., high and elementary.

Author considers that top lighting is perfect if controlled. "In these schools "each skylight has a series of revolving sheet-metal vanes which are counterbalanced and easily controlled by the teacher. "No corner or inside desk has less than a full measure of light, and shades or flowers in the windows may be enjoyed without injury to the pupils' eyes through insufficient light."

Rochester, N. Y. Board of education. One-story type. *In its* Fifty-sixth annual report, for the years 1911, 1912, 1913. p. 75–77. frontis. plan, facing p. 74.

"First of its kind in the country for a complete grammar school." Follows the saw-tooth skylight plan of the one-story schoolhouse of River Forest, Ill., the Elm street school. (*See* American school board journal, 42:16-19, 40, April, 1911.) River Forest, having found 53 per cent of school children having eye defects, blazed the way, in the absence of precedents, with its skylighted building which it considers "a distinct advance in sanitary school architecture." The River Forest school is "a four-room wing of a future central building." The Rochester school is a 15-classroom building, with domestic science, manual training, kindergarten, office, library, and assembly rooms; plunge; boiler and engine rooms.

Each room has one window and a glass door opening on the schoolyard.

## COLOR SCHEME OF SCHOOLROOMS.

Bell, Louis. Reflection from painted surfaces. Examination of the coefficient of different tints in its relation to indirect and semi-indirect lighting. Electrical world, 65:211–12, January, 1915. tables.

Calls attention to the fact that traces of carbon in a paint (gray) or dust on a painted surface immensely decreased the illuminating value.

Gardner, Henry A. The light-reflecting value of white and colored paints . . . Philadelphia, Educational bureau manufacturers' association of the United States, 1916. 13 p. chart. tables. figs.

"A search of the literature on illumination has produced one article which gives a series of carefully made photometric measurements on the reflective value of paints. This is by Louis Bell."
*N. B. See* Bell, Louis.

A. C. Rapp, of Pittsburgh, was the first to call attention to the necessity of a careful selection of colors for schoolrooms in order to bring out the greatest mental and physical effort among the occupants. The adoption of his suggestions would doubtless result in a greater efficiency in the schoolroom and a higher degree of physical fitness among the students.

Quotes experiments on color-effects, of investigations made by Dr. L. E. Landon as follows: Black—melancholia, decreased work; red—temporary stimulation followed by a reaction accompanied by nervousness and headache; green—increased vitality, happiness; yellow—increased vitality, amiability.

Heckel, G. B. Colors and surfaces for schoolroom walls and ceilings. American school-board journal, 54:25–26, February, 1917.

One of a series. "Author has an international reputation as an expert on the chemistry and use of paints," for many years has been editor of the leading technical paint journal of the United States.
*Second article*: Surfaces and colors for special schoolrooms. April.
*N. B.* Kerr says "light neutral dove or gray or pale greenish tints."

Illuminating engineering society. Committee on glare. Interior furnishings. *Its* Transactions, 10:397–402, July 20, 1915. tables.

*Chairman.* P. G. Nutting.
Ceilings, walls, floors.

## SCHOOL SEATING AND EYESIGHT.

Alger, Ellice M. Eyesight and posture. *In* American school hygiene association. Proceedings, 1916. p. 114-17.

Gould, George Milbry. Eyestrain and occupational disease. *In* Fifteenth international congress on hygiene and demography, 1912. Transactions, 3: 582–604. tables.

"Not one good school desk exists in the United States, and every child writes with body and head and eyes in disease-producing posture."

## THE EYESIGHT HYGIENE OF SCHOOLBOOKS.

American school hygiene association. Committee on the standardization of schoolbooks, etc. Report. *In its* Proceedings, 1911. Springfield, Mass., American physical education review, 1911. p. 141–44.

Bibliography: p. 144.
*Also in* American physical education review, 16: 254–57, April, 1911.

Bell, J. Clark. The hygiene of reading. Child, 5: 464–70, May, 1915. tables.

A survey of schoolbooks, p. 468-70.
This survey is a study of paper, type, and interspacing. In the 116 examined, paper was found "unsatisfactory" in 20; the opacity, in 42. "As a percentage of type measurements": of height, "unsatisfactory," 105; of breadth, 83; "very unsatisfactory," of height, 82; of breadth, 91. "As a percentage of books": of height, "unsatisfactory," 49; of breadth, 40; "very unsatisfactory," height, 53; breadth, 59. Interspacing, books, "unsatisfactory," 49; measurements, "unsatisfactory," 69. Final tables relate to lines.

British association for the advancement of science. Committee, appointed to inquire into the influence of schoolbooks upon eyesight. Report—Schoolbooks and eyesight. *In its* Report, 1912. p. 295–305. tables.

Appendix. *Note on technical terms used in this Report.* p. 306.
Supplement. Specimens of type. p. 307-18.
*Chairman*, Dr. George A. Auden; *Secretary*, G. F. Daniell. Committee appointed, 1911.
Revised Report. *In same*, 1913. p. 268–88 (involving substantial alterations).
Appendix (*same*). p. 289–90.
Supplement (*same*). p. 291–300.
Oculist sub-committee report.
Hygienic requirements with which schoolbooks should conform. typographical tables.
To the typographical section of the Report, revised since original presentation, contributions have been made by "oculists, school medical officers, directors of education, teachers, publishers, printers, and type founders."
This Report is in pamphlet form. 1913. 33 p.

Daniell, G. F. Schoolbooks and eyesight in relation to open-air education. *In* Kelynack, T. N., *ed.* Yearbook of open-air schools. . . . 1915. vol. 1: 105–10. illus.

Standard typographical table (revised July, 1913), p. 108.

Huey, Edmund Burke. Hygienic requirements in the printing of books and papers. *In his* Psychology and pedagogy of reading. New York, Macmillan co., 1916. p. 406–18.

## GLARE FROM PAPER.

British association for the advancement of science. Committee on schoolbooks and eyesight. School world (London), 17: 369–70, October, 1915. fig.

Report presented at the Birmingham meeting, 1913. During the last two years investigations have been made in order to obtain an objective measurement of the gloss of paper, A. P. Trotter, of the committee, having designed a new form of gloss tester, and for use in carrying out tests with books and writing papers used in schools.
This gloss tester is described in the above-named article.

Illuminating engineering society. Committee on glare. Papers and inks. *Its* Transactions, 10: 379–87, July 20, 1915. tables.

*Chairman*, P. G. Nutting.

Ingersoll, L. R. A means to measure the glaze of paper. Outline of the theory and construction of the glarimeter . . . Electrical world, 63: 645–47, March 21, 1914. figs. tables.

Luckiesh, M. An analysis of glare from paper. Electrical review and western electrician, June 1, 1912. figs.

*Also in* Scientific American supplement, 76: 170, September 13, 1913. Reprinted.
A study, with measurements of "the distribution of brightness across the 'glare spot' on the paper."

——— Glare from paper. *In* Fourth international congress on school hygiene, 1913. Transactions, 5: 365–68.

Reprinted.
Author states there has been as yet no concerted movement inaugurated for the elimination of glossy paper from general use; the greatest progress toward its elimination "will arise from a concerted demand for the use of *nonglare* paper."

## MALNUTRITION AND EYESIGHT.

Snell, A. C. Phlyctenular keratitis, a common ocular manifestation of improper diet in children. Dietetic and hygienic gazette, 27: 16–21, January, 1911.

The disease "is nearly always a manifestation of malnutrition . . . . often caused directly by improper feeding and lack of good air."

## EYESIGHT AND RETARDATION.

Carhart, William Merle. Retardation in school from refractive errors. *In* American school hygiene association. Proceedings, 1917. p. 290–96. tables.

In his conclusions regarding eyesight and retardation among New York City's school children, Dr. Carhart says: "Retardation in school has as one of its principal causes the existence of refractive errors in the eyes of the school children;" and that "there is no more brilliant success in school hygiene than the results in improving the eyesight and in relieving the eyestrain which follow proper correction of refractive error in children."

Mann, Frederick J. Eyestrain and retardation in school life. School and society, 3: 33–36, January 1, 1916.

Noyes, Guy L. The relation of sight and hearing to early school life. Columbia, Mo., University of Missouri, 1914. 34 p. diagrs. 8°. (University of Missouri bulletin, v. 15, no. 3, medical ser. 5.)

Shaw, J. Holbrook. Some important ocular conditions found in backward children with report of cases. *In* Fourth international congress on school hygiene, 1913. Transactions, 5: 114–23 tables. figs.

Among conclusions are:
The investigation of backward children indicates that ocular defects are most important as a cause of retardation.
Hypermetropia should be corrected early . . .
There is a form of amblyopia among children which is little understood.

Weesels, Lewis C. Defective vision in school children from an economic standpoint. *In* Fourth international congress on school hygiene, 1913. Transactions, 5: 78–85. tables. illus.

In Philadelphia, Pa. Says the author: "We now refract over 2,500 cases a year. If we save each one of these children but one year during its entire school life, we will save the city over $87,000 annually, not counting the child's time and its increased efficiency. So the furnishing of free glasses to school children is not a charity *per se*, but is a duty and an economic problem."

Williams, Edward R. Eyestrain in school children. *In* American school hygiene association. Proceedings, 1917. p. 283–90.

Primary and grammar school children treated in the Boston city hospital, in majority, with a few private cases used for comparison, and a few high-school pupils. The children divided into normal, and retarded, for school grade. In grade, 62 per cent; 1 grade behind, 22 per cent; 2 grades behind, 14 per cent.

## CONSERVATION OF VISION CLASSES.

Boston. School committee. Semiblind children. *In its* Annual report, 1913. p. 54.

Class for semiblind school children of Boston organized April 3, 1913, Thornton Street school. "The only school in the country doing this particular thing." Teacher from Perkins Institute.

*See same*, 1915. p. 70.

An experienced oculist has oversight of the work; assembled in one center, Roxbury; 22 children in 7 classes; the 2 teachers are of Perkins Institute training.

*See same*, 1917. p. 34.

Three centers for this work.

Campbell, Marion A. The public school pupil with partial eyesight. *In* American school hygiene association. Proceedings, 1917. p. 92–97.

"First sight conservation class was organized in Boston in 1913." Cleveland followed a few months later.

"Sight-saving classes attempt to combine the most modern methods of education with the soundest principles of sight conservation.

"Sight-saving classes have three well-defined aims: (1) To instruct these pupils with the least possible eyestrain; (2) to train each child to conserve his own vision by teaching him exactly what he may and what he may not do; and (3) to provide him with such vocational guidance and, if necessary, vocational training as will enable him to fit into the community with the greatest advantage to himself and to his associates."

Cincinnati, Ohio. [Board of education.] Conservation of vision. *In its* Eighty-seventh annual report, school year ending August 31, 1916. p. 75–76; 255–258; 293.

Under direction of R. B. Irwin, of Cleveland, work on the partially blind children "has been so organized, systematized, and related to the work for seeing children," that they, as well as the totally blind under same director, are making in most cases the same rate of school progress as the seeing children.

At the Sands school are two classes for the totally blind and one for the partially blind, and one for the partially blind at the Bloom and at the Jackson schools. One for mental defectives totally blind, at Special school No. 3.

Standards for admission proposed by a local committee of oculists were adopted in May, 1915, following a conference arranged by the chief medical inspector.

General rules and regulations have been published for the guidance of teachers and nurses, and that they might better understand the handicaps of their pupils. Dr. Edward King gave a course of lectures for teachers and normal-school girls in training, covering the anatomy of the eye, fundamental principles in optics, etc.

*N. B.*—A distinct innovation was the physical examination of all children in the schools for the blind and conservation of vision classes. This examination was the basis for intensive medical, surgical, orthopedic, and gymnastic treatment.

*From* Eighty-eighth annual report, p. 289.

Cleveland, Ohio. Superintendent of schools. Class for the conservation of vision. *In his* Annual report, school year 1913–14. p. 51–54.

Opened, in 1913, at Waverly school; special textbooks being prepared in "Clear face heavy font." Work is oral, written, and manual.

Defects of eyesight in two classifications: (1) Opacities, etc., either congenital or the result of inflammation of the cornea or abnormalities of the lens. (2) Progressive myopia.

The children are kept under close observation by the medical inspection department. "Many children now bringing on conditions in their school work which will result in blindness in later life will be relieved from eyestrain to such an extent that the defect may be largely corrected."

R. B. Irwin, special teacher of the blind, has undertaken to supply the children with the regular school texts in 36-point bold-face type.

Green, John, *jr.* The need of special classes for children with defective sight. Modern medicine, 1: 257–262, July, 1919. Illus.

Dr. Green states: "Ohio leads in this work with classes for the semisighted in seven cities: Alliance, Ashtabula, Cincinnati, Cleveland, Lorain, Mansfield, and Toledo. Massachusetts has provided special classes in Boston, Cambridge, Lynn, Worcester, and New Bedford; New York in Buffalo and Rochester; and Michigan in Detroit.

Hathway, Winifred. Manual for conservation of vision classes. A manual to assist in the establishment and conduct of classes for conservation of vision. New York, 1919. 108 p. Illus. (National committee for the prevention of blindness publications. no. 18.)

The most valuable compendium on the subject yet published; is historic, filled with data of the work of the conservation of practical operation, and suggestions.

List of large-type books available: p. 106–107. These are obtainable from Robert Irwin, Department of the Blind, Board of Education, Cleveland, Ohio.

Irwin, R. B. Classes for the conservation of vision. Ohio teacher, 37: 52–54, September, 1916. tables.

New York City. Superintendent of schools. Sight conservation classes. *In his* Nineteenth annual report, 1916–17. Reports on special classes. p. 62–64.

Authorized, January, 1916; 4 in Manhattan, 3 in Brooklyn. September, an additional number to be opened in each borough, and one in both Queens and The Bronx.

Infectious eye clinic. p. 66–67.

From September, 1916, to June, 1917, 238 children admitted to the Infectious eye disease classes, a total enrollment of 1,318 since the opening of these classes in September, 1912—Public school no. 65, Manhattan.

——— ——— [Infectious eye disease classes.] *In his* Nineteenth annual report, 1916–17. Reports on special classes. p. 66–67.

In Public school no. 65, Manhattan, opened September, 1912.

Ungraded classes; children's eyes treated daily by the nurse, at the 1.15 p. m. clinic. One session day, with recreation period 10.30 to 11.30 and recess, lunch, 11.30 to 12 m.

Total admitted to date, 1,318 children.

von Sholly, Anna L. Ophthalmia schools for the prevention of trachoma and other infectious eye diseases. *In* Fourth international congress on school hygiene, 1913. Transactions, 5: 101–106.

In October, 1912, two classes in close connection with health department, started in lower east side, New York; three days a week, a health department ophthalmologist holds clinic. All the children with eye disease from some 60 public and parochial schools are either sent or brought in squads by the school nurse for treatment; these children, who formerly would have been excluded, are at once transferred to the infectious eye diseases classes, their principals being notified by printed post card. Children in the classes are given treatment twice daily by nurse under the doctor's prescribed directions.

Up to June 20, 1913 (?), nine school months, 312 pupils had passed through the ophthalmia school; when school closed, June 28, there were about 25 children in the classes, some ready for discharge; all the others were discharged cured. Only three returned after discharge with recurrence of the disease. Shortest stay in class was two days; longest, the entire nine months.

The health department reports, 1912, showed of the 700,000 school children, 33,860 as having during the year suffered from contagious conjunctivitis, and 15,245 from so-called trachoma.

## MYOPE SCHOOLS, LONDON, ENGLAND.

Harman, Nathaniel Bishop. Sight-saving schools. School hygiene, 10: 1–14, March, 1919.

Records of the short-sighted children show two-thirds to be proper myopes, and that 1 in every 3 is shortsighted by reason of a congenital defect of the eyes or because of damage done by some early attack of inflammation.