

CHRISTIAN EDUCATOR

A SCHOOL AND HOME MAGAZINE

DECEMBER



SUPT. GABRIEL BAMBERGER.
JEWISH TRAINING SCHOOL, CHICAGO.

1898

50c
PER YEAR

5c
PER COPY

The Christian Educator

IS DEVOTED TO

The Thorough, Systematic, and Symmetrical Culture
of the Hand, Head, and Heart, in the
Home, School, and Life.

Edited by FRANK WILLIAM HOWE.

Entered at the Post-office in Battle Creek, Michigan.

SUBSCRIPTION RATES.

YEARLY SUBSCRIPTION (10 months)	\$.50
CHRISTIAN EDUCATOR and <i>Youth's Instructor</i>	1.25
" " in clubs of 5 to 10 (to one address)	.35
" " " " 10 to 25 " " "	.30
" " " " 25 upward " " "	.25

Club agents sending 10 names may order an extra copy free. All subscribers to the *Youth's Instructor* whose subscriptions are not yet within three months of expiration, may secure the EDUCATOR on our clubbing offer by sending 25 cents immediately. Special terms on both magazines to school clubs. Add for Postage to Foreign Countries, 25 cents extra for each single subscription.

Remit by P. O. or Express Money-order, or Postage-stamps in registered letter. Make all remittances payable to

REVIEW & HERALD PUB'G CO.,

DEPT "C."

BATTLE CREEK, MICH.

PRINCIPAL CONTENTS.

Frontispage.
Gems for Thought.
Church and State Education.
Chicago Jewish Training School.
Manual Training.
The Unity of Nature.
Scientific Study.—IV.
Bible Psychology.—II.
The Reading Circle.
Schoolroom Notes.
Queries for Students.
Educational Hand-Work.—No. 6.
Education for Home-Making.
Do You Do It?
Nature Study.—Carbon.
Current Interests.—Porto Rico—Senator Hoar—
"Majestatsbeleidigung"—The Peace Treaty—Col-
lapse of the "United States of Central America"—
The Capitol Fire—Li Hung Chang.
Editorial Bulletin.—Correspondence Notes—Book No-
tices—Publishers' Announcements.

A PLAIN TALK.

We have been carefully studying the EDUCATOR for some time, and have discovered an important fact that is true of it,—it fails to make much impression on teachers who read it but have not investigated its special field and purpose. The publishers of the EDUCATOR have recognized from the beginning that the magazine did not appeal very obviously to the ordinary public-school teacher whose main purpose is to do in the most economical way the every-day, routine, grade work prescribed by the law or the local superintendent. The EDUCATOR appeals most strongly to teachers who think beyond the daily, mechanical requirements of their work,—teachers who are independent, progressive, and thoughtful,—who are investigative students of the larger scope and principles of the broadest educational work. Such of these as have already become acquainted with the EDUCATOR are its warmest admirers and friends; but the EDUCATOR has not yet made acquaintance with all of this class. It probably needs an introduction in company with some widely known educational journal that would bring it in touch with the largest possible circle of public-school teachers. Then the magazine can be trusted to speak for itself.

We have made arrangement for just this kind of an introduction in combination with the *Teachers' World*. We tell all about it on our last page of cover. The *Teachers' World* will furnish every public-school teacher with all the practical school-room work that can be used in addition to that furnished in the various State and local school papers. It is "a journal of methods, aids, and devices." It is overflowing in the very kind of matter in which the EDUCATOR makes no claims of superiority, while the EDUCATOR itself excels in a kind of matter that can not be found in the *Teachers' World* or any other educational journal. The combination of the two journals ought to give every reader the very best of both kinds of matter at the price of only one paper.

It is unnecessary for us to classify the excellences of the EDUCATOR. Look through this number, and then, if you wish, send for free samples of the two preceding numbers (we have none left of the September issue), and convince yourself that the EDUCATOR is worth to you fifty cents from October, 1898, to January, 1900. Turn to our combination offer on the last cover, send for sample copies of the *Teachers' World* if desired, and then immediately send us—

\$1.00 for the "Teachers' World" one year, with the "Christian Educator" one year and three months.

THE CHRISTIAN EDUCATOR

A School and Home Magazine

Edited by FRANK WILLIAM HOWE.

VOL. III.

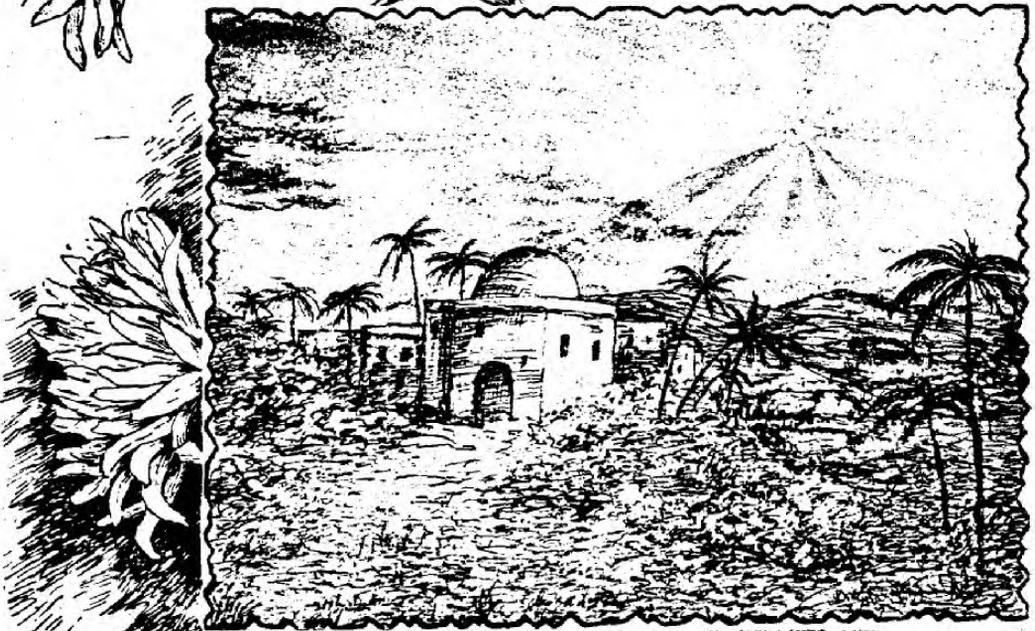
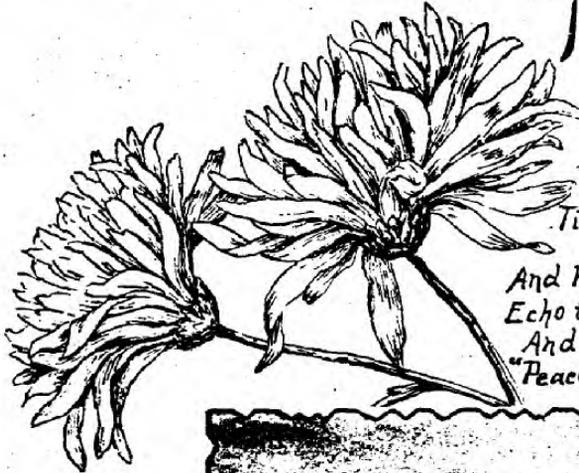
DECEMBER, 1898.

No. 4.

Peace on Earth.

The Christ is born! sing, angels, sing!
Behold, what glorious news ye bring!
Come, let the tidings blest ring out,
Till earth shall join the gladsome shout,

And hill and dale and sea and plain
Echo the angels' sweet refrain,
And sing and shout and shout again:
"Peace, peace on earth; good will toward men."



Shine on, bright Star; thy cheering ray
Shall turn earth's darkness into day,
Shall pierce the blackness of the tomb
Until sweet flowers of hope shall bloom.

Still, as o'er Judæa's plains that night,
The Star of Hope is shining bright;
Still men proclaim a Saviour's birth,
And sing the song: "Peace, peace on earth."

Mrs. L. D. Avery - Seattle.



GEMS FOR THOUGHT.

[From the author of "Christian Education."]

IN childhood and youth the character is most impressive.

LESSONS must be given to humanity in the language of humanity.

EVERY gem of thought, every flash of the intellect, is from the Light of the world.

GOD appointed work as a blessing, and only the diligent worker finds the true glory and joy of life.

BY the fireside and at the family board, influences are exerted whose results are as enduring as eternity.

MORE than any natural endowment, the habits established in early years decide whether a man will be victorious or vanquished in the battle of life.

THE exercise that teaches the hands to be useful, and trains the young to bear their share of life's burdens, gives physical strength and develops every faculty.

MEN of the highest education in the arts and sciences have learned precious lessons from Christians in humble life, who were designated by the world as unlearned.

AS the moon and the stars of the solar system shine by the reflected light of the sun, so, as far as their teaching is true, do the world's great thinkers reflect the rays of the Sun of Righteousness.

FROM "JESUS AS A TEACHER."

No society can endure without ordinances.

THE intuitive perception of truth gives a man clearness and courage.

THE word of the Lord shall endure forever. But the spirit and the life,— they are the word of the Lord.

KINGDOMS that rest upon moral ideas may defy time and death, but those that rest on force are sure sometime to come to an end.

THE greatest religious truths lie deeper than formal reasoning. This is the reason why the greatest religious teachers have worked below the proposition-and-proof level; they have something of the prophetic gift. It may be added that no preacher who works mainly on this line will attract the most religious minds; he will not attract even those who have the piety of intellect, to say nothing of the piety of the affections and the will. He may develop logical acumen, critical ability, and controversial power, but he will prove unequal to the generation of spirituality. He has nothing to draw with, and the well is deep. Such a minister will be sure to lead his flock into the error that is now far too common,— the error of assigning a disproportionate place in religious faith and life to the understanding, to the partial exclusion of the heart.

FIFTY CENTS

will pay for a good meal— perhaps for two or three not so good. It will also pay for several other things of passing value. But its investment in 320 pages of the "Christian Educator" buys the best Christmas present you can get for fifty cents. See last page of cover.

NOTES.

OUR first page is reproduced by permission, from the premium number of *The Youth's Instructor*, our excellent companion magazine. This is the best number issued since the *Instructor* assumed the magazine form, and it contains some remarkable premium offers. Send for a copy.

DR. GODSMARK continues to make some eye-opening statements in his articles on "Scientific Study." Read it carefully, with the editor's footnote.

LET the language experts in your school or home, teacher included, try their skill on the exercise on page 107. The EDUCATOR will be sent free for six months to any teacher or student who will send these sentences with the blanks correctly filled, with an accurate statement of the grammatical rule or principle that applies in each case. If correctly filled, this exercise will be reprinted in the January EDUCATOR, with the name, or names, of the successful respondents. It is a free field with no conditions except definite knowledge and legible writing.

In Professor Cady's article on the "Unity of Nature" appears this sentence: "Nature clothed and embellished with mythology, is nature distorted." It is just as true that nature clothed and embellished with *my theology*, is nature distorted. In fact mythology becomes "my theology" to the child who is taught that all "the gods" of the pagans live and move and have their being in the phenomena and forces of nature. Children are peculiarly receptive to ideas of this kind that blossom into actual pantheism in later life. With all our boasted devotion to scientific truth we ought by this time to have found some better way of teaching it to our infants. Sentimentalism and practical incapacity are the natural results of unscientific teaching.

SPECIAL attention is called to Principal H. G. Brownell's excellent article in this issue on "Manual Training." As principal of the Louisville Manual Training High School, whose work was described in the November EDUCATOR, he speaks from years of practical experience. It is to be noted that the report of the National Educational Association in 1889 expressly admitted that the chief value of manual training is "along moral rather than intellectual lines." If moral training is one of the most important things to be gained in education, as is now generally held, manual training should, on this basis alone, be generally provided in the schools. But those who know most about it unite in affirming that it is also a prime requisite in securing well-balanced intellectual training. The most wide-awake teachers and educational journals are alive to this fact.

THE editor of *Learning by Doing* makes these sapient remarks on the subject of ready-made "holiday programs."

An esteemed subscriber writes to ask if we publish a "Thanksgiving Program" for the use of schools. We do not, and assuming that our subscriber might like to append to his query "if not, why not?" we make bold to observe that in our judgment the Thanksgiving and Christmas programs, as usually presented in school journals, cost more than they come to, to all parties who have to do with them. As a rule, they are a hasty jumble of whatever lies next the editorial scissors and paste-pot, or else a badly written lot of "original" but unentertaining twaddle, entirely lacking in educativeness and literary merit. "As a teacher we were never able to make any sort of justifiable use of these cut-and-dried school programs. There may be those who can, and in Lincoln's phrase, "if there are those who like that sort of thing, that is just the sort of thing they would like."

CHURCH AND STATE EDUCATION.

BY THE EDITOR.

THE subject of the natural and proper relations of the state and the church in educational work is one of great importance, and which the EDUCATOR feels called upon to discuss at length when the proper time comes. Has the state exclusive control of education, so that it may compel attendance or instruction on certain courses? Has the state the right to tax all for the free tuition of the few? Has the church no right to demand religious instruction for its adherents? Can the state give moral and religious instruction without infringing the natural rights of conscience?

These are questions that are not yet satisfactorily answered. It would be well, perhaps, if it never became necessary to answer them in full. But there are signs already that circumstances and demands are leading inevitably to a fundamental decision. In the State of California several years ago prominent professors of the State university publicly stated their sentiment and purpose to secure the annulling of the charter of every college whose courses were not substantially parallel with those of the State university in their requirements for scholastic degrees. For several years the people of North Carolina have been agitated over the question of taxation for the support of higher education in the State university, or, as an alternative, the voluntary payment of tuition for what is claimed is a better education in denominational colleges. More recently in Indiana, the presidents of all the leading denominational colleges in the State united in a letter to every Congressional candidate requiring him to define his attitude on the question of "turning down" the denominational colleges, and demanding that the president of the State university should cease to be a member *ex officio* of the State Board of Education. There are probably issues similar to these in other States; certainly in several the question of conscientious reservations concerning the "flag salute" in the public schools is prominent and perplexing.

The time has not come, perhaps, for passing judgment on these questions, but in the meantime the following extracts from a prize oration by W. P. King, of Vanderbilt University, are exceedingly interesting. The oration is entitled "The Church and Higher Education."

It does not occur to many, who have studied only one side of the problem, that there are some real objections against higher education by the state. I mention only a few, without discussing them:—

1. Higher Education by state tends to paternalism in government.

2. Higher Education by state is favoritism unless the state provides colleges and universities for the negroes.

3. The higher institutions of learning receive liberal donations from private individuals and the church. Common schools are dependent on the state, and if not equipped by the state, go unequipped.

4. A very important objection given by President Eliot, of Harvard, is that where the government supports universities, endowments fail and public offerings to education languish. This effect has been produced in all of our Western States which support State universities.

According to the last report of the Commissioner of Education, there are in the United States, including both male and female, 644 colleges and universities. Of these 481 are denominational, while 163 are non-sectarian. There lacks eight of being three times as many denominational as non-sectarian schools, with about three times as many students. Of the 163 non-sectarian schools the large majority are private institutions, many of which are under the direct influence of the church. If, indeed, the church has intruded into a sphere, which does not belong to her, she has very much to repent of.

The church is to-day more enamored of her educational mission than ever before in her history. She can not be false to this mission without being false to herself, untrue to her children, and disloyal to Him who is head over all things unto her.

There is an opinion far too prevalent in some quarters that education, under the supervision of the church, is necessarily narrow, savoring of medieval bigotry and creeds. If this charge has any basis in truth, it is indeed a serious one. No university has the right of existence that will shut itself in with thumb-worn creeds, and refuse to keep pace with the intellectual progress of the age. That college which does not stand for a thorough and genuine mental culture is a cumberer of the ground. No amount of virtue, however pre-eminent its worth, can take the place of philosophy and science in college or university training. Intellectual barrenness and shoddy instruction can not be atoned for by any high-sounding religious pretension.

The purpose of the church is to give thorough and honest mental training. In addition to this, the church throws about the students religious influences, imparts instruction concerning the fundamental principles of life and conduct, and thus makes culture broad as the man himself. Knowledge alone is power, but like the power of a Samson in his blindness, overturning the edifice of Philistine enemies, himself perishing in the crash, or of a blind Polyphemus hurling huge rocks with aimless strength.

A culture which does not acknowledge him who is life's ideal, which is not guided by deep religious convictions, which is not permeated by the Christian spirit of unselfishness, may be flashy and brilliant, but never can be useful. The mischievous cant of Matthew Arnold, "Music for Music's Sake, Art for Art's Sake, and Culture for Culture's Sake," is repudiated by every earnest, honest mind.

Knowledge and virtue are not synonymous; neither are ignorance and vice. Ignorance is not the mother of devotion, neither is knowledge. It does not take an old man to remember when the principal arguments used in favor of more education was that crimes would inevitably diminish. Yet there has come to our day a curious and a perplexing problem. Does education diminish crime? The statement of Victor Hugo that when you build a schoolhouse, you need one jail less, finds its complete refutation in his own country. In France the criminal statistics show that with the increase in the number of schools and pupils, the prisons have been more rapidly filled. Professor Fonillie, in the *Literary Digest* of a few months ago, says that, taking all the data together, the criminality of France has just about doubled in the last fifty years.

The *New York World*, recently discussing the relation between education and crime in our own country, says that the larger crimes, such as the buying of elections, the corruption of legislatures, the bribery of aldermen, and the perversion of republican institutions through the power of money, is in general the work of trained intellects.

On the other hand, England stands almost alone among the nations of the earth in showing along with her educational advancement a marked decrease in crime. And the reason is clear. In England the pupils have not only intellectual instruction, but moral and religious training are stressed.

History has given us many illustrations from which we ought to have learned wisdom. In the very beginning of the Christian era, the civilized world was never more cultured and never more depraved. Athens, the boasted center of culture, was not giving to the world her highest examples of character and manhood. It is not certain that her cynic philosopher really found a man, although he searched her streets, with lighted candle at midday, looking for him. Corinth blended into one, Grecian, Roman, and Oriental civilization, but her very name, synonymous with the most debasing form of immorality, eternally exposes her moral pollution.

A theory of education which ignores the conscience and religious nature of man, may be an agreeable pastime in the studio of the philosopher, but it is a fearful force in the practise of men.

Centuries ago Locke said: "The valuable part of education is virtue. This is the solid and substantial good which the teacher should never cease to inculcate till the young man places his strength, glory, and pleasure in it." The statement of Guizot is forever true: "Education, to be truly good and socially useful, must be fundamentally religious."

I believe in higher education by the church, because I believe that she stands for the true against that which is essentially false, for a broad culture against that which is really narrow, because she takes man as he is, a spiritual being in the grasp of spiritual forces, with his deep soul-yearning and aspirations, with his intense longing after purity and freedom.

"Let knowledge grow from more to more
But more of reverence in us dwell;
That mind and soul, according well,
May make one music as before,
But vaster."

GENERAL ARTICLES

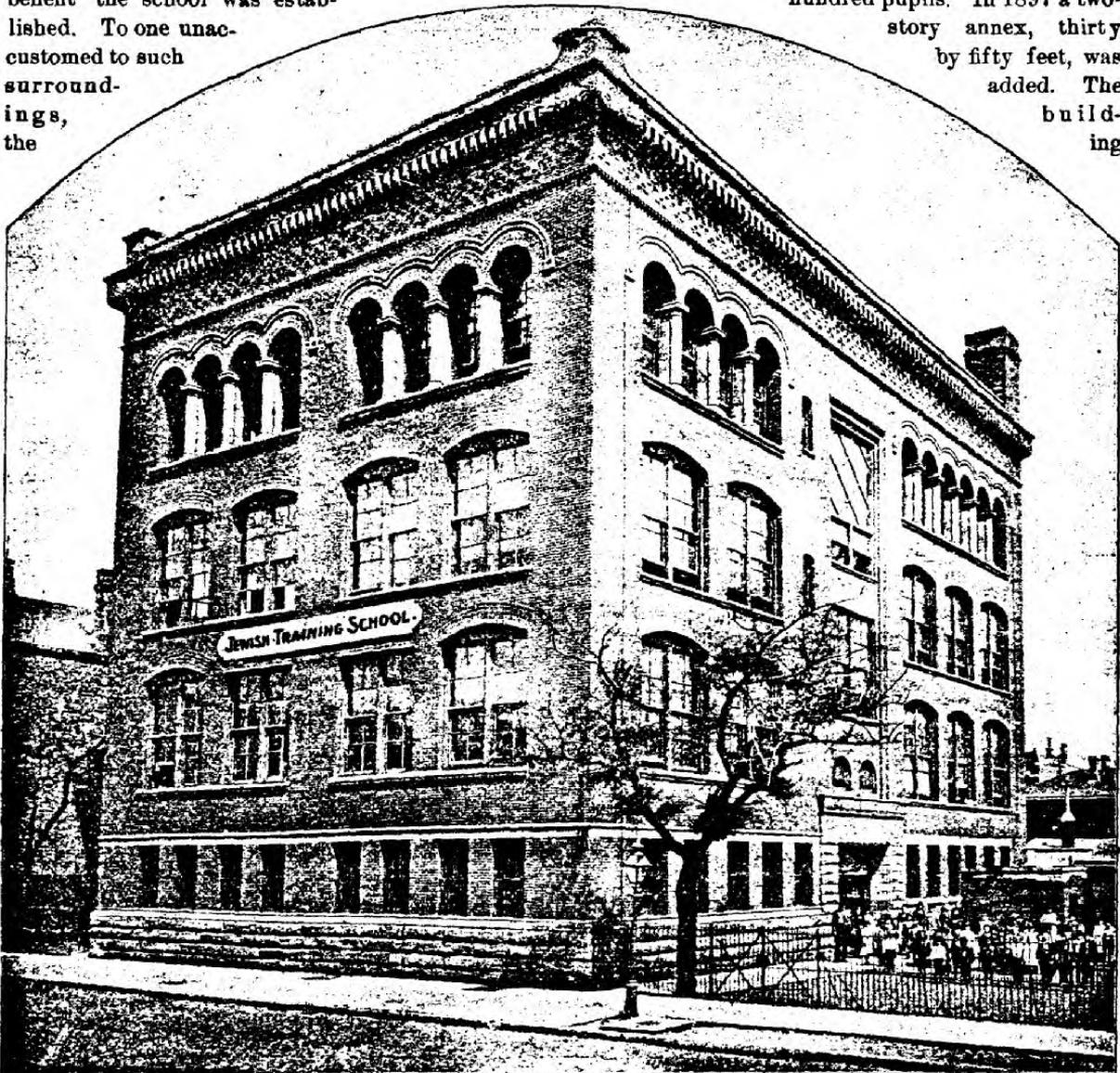
CHICAGO JEWISH TRAINING SCHOOL.

MRS. E. M. F. LONG.

THE Jewish Training School, of Chicago, is located at 12th Place between Clinton and Jefferson Streets, in the very heart of the Jewish-Russian settlement. To reach the school it is necessary to pass through one of the most disagreeable districts of the city. Situated in close proximity to the viaduct, the dust and dirt and grime of many railroads is added to the poverty and general wretchedness of the people in whose midst and for whose benefit the school was established. To one unaccustomed to such surroundings, the

sights and sounds are appalling. But it was the great need of this people that called the school into existence and decided its location. "They could not come to us, so we came to them," said Superintendent Bamberger, when the subject of location and environment was mentioned.

The Jewish Training School Society was organized in 1888. The building which the school occupies was erected in 1890. It is a substantial three-story brick structure sixty by one hundred and ten feet, with accommodations for upwards of eight hundred pupils. In 1897 a two-story annex, thirty by fifty feet, was added. The building



has two main entrances and stairways, and twenty-two well-lighted and airy rooms thoroughly equipped with the most approved school apparatus. The maintenance of the school is entirely a philanthropic enterprise, and is provided chiefly by the wealthy Jews of Chicago. The avowed object of the school is primarily to train and uplift, by the education of the head, hand, and heart, the children of the poorest Jews who have been driven to this country by the cruel inhospitality of other nations. It is non-sectarian, however, and receives every poor child who seeks admission. "None others need apply."

These children need the benefits of the most advanced methods in education. A system has therefore been adopted which provides for every child a liberal amount of manual training on peda-

little value to themselves or the world. There are many others who are physically strong, but are nothing but machines,—can do nothing without an intelligent guide. We aim to educate men and women who combine intelligence, physical force, and skill.

(8) Our aim is, and must be, a harmonious development of the whole being, the intellectual, moral, and physical.

(9) The visible products of the school are of no importance to us. The child itself is our only and constant goal, the target at which we aim.

(10) We claim that our school is a model manual training school, because everything done therein can be traced back to sound pedagogical principles, and the whole institution with all its departments is one,—a unit in its organization. Everything is connected. The various departments are so closely dovetailed that the influence of each is decidedly felt in all the others.

(11) What is of educational value for the boy must also be for the girl, and each receive his share of manual work.



A CLASS IN SLOYD.

gogica grounds. No attempt is made to educate artisans, but in the leading principles which have been adopted for the government of the school it is stated that "we attempt to show —

(1) That the labor of the hand is an invaluable and necessary aid in the development of the brain.

(2) That every being is good for something. Though apparently stupid in one line, he may excel in another.

(3) We give our pupils opportunity to develop the natural bent.

(4) We lead our pupils to self-activity, to independence of thought and action.

(5) We teach our pupils to love labor. Artisans who love their vocation will work with success and satisfaction.

(6) Inasmuch as labor is the strongest antidote for vice and crime, our methods teach morality.

(7) There are many learned people in the world who are learned only in books, and whose learning is of

(12) Nothing in the curriculum is optional. Everything is compulsory and is so arranged that mental and physical work frequently alternate through the day."

For the accomplishment of these ends various forms of manual training are utilized. The superintendent, Gabriel Bamberger, has a practical knowledge of each, having himself taught them all, with the possible exception of sewing. Professor Bamberger was called to the position which he now occupies when the school was organized, and has held it continuously since that time. He is a manual training enthusiast, his interest in that line of work dating from many years back, prior to his coming to this country. He comes from a family of teachers. His father taught fifty years in one place in Germany. His brothers are all engaged in some line of educational work. Professor

Bamberger was graduated from the public school in Germany at the age of thirteen years. Later he finished the course of the Preparatory College at Breslau, and entering the university, devoted himself for one year to the study of medicine. At the end of the year he abandoned that line of work, and continued his studies in Giessen Pedagogical University. After graduation from that institution, he served one year in the army during the civil war of 1866. He then entered the public schools of Darmstadt as teacher, and filled the position of vice-principal of public schools for a number of years until he came to America in 1879, and founded the first manual training school in this country for primary and grammar grades. For eleven years he was principal of that school, which is still in a most flourishing condition, and is known as the Workingmen's School of New York City.

Individuality has been grossly, criminally neglected in this country. Classes are taught, but not individuals. What is good for one may not be for another. There is a great lack of individuality. Children are taught parrot-like, and become imitators without originality. Take writing, for instance. The elements only should be taught. There is character in writing. Let each child express its own. I hold that the individuality of each person should show itself in his features, attitude, and bearing. But it is not so. Everybody tries to look alike. It is different in Germany. There you know a teacher or artist or tradesman at once.

One of the strongest factors in the manual training movement is undoubtedly the sound development of intellect, together with morality. In fact the intelligence of mind keeps pace with moral development and can not well be separated. One illustration: There is a tendency in society as well as in other spheres of life—and I am sorry to say in schools also—to answer questions and express opinions hastily, and to judge people by their readiness to respond. The one who is



A SEWING CLASS.

It is to his zeal and ability that the school owes its present success and reputation.

From this school he received a call to the work in Chicago, and has so successfully met its requirements that the Jewish Training School has become famous for its rational methods and excellent work. It has come to be considered a sort of laboratory for the public schools of the city. Principals and teachers go there for suggestions, advice, and training. So extensive has its influence and reputation become that teachers from a distance come to investigate and learn their methods. Superintendent Bamberger abhors pauperism, and his idea of education is so to develop the individuality of each child that it may become a self-reliant and self-supporting member of society. I quote from a private interview recently given by him:—

most prompt is considered most intelligent. The one who takes time to consider, is inferior. I hold, however, that a reply given without due consideration is often a sign of forwardness, and, to say the least, indicates a superficial character. The thoughtful man, the conscientious man, will weigh matters carefully. Will make sure that everything is correct and well planned. Then when his answer is given, it will be found to stand; while the one who gives the hasty answer will need to correct it. A habit of doing such superficial work leads to many mistakes, often endangering not only our own interests, but also those of others. The thinker will carefully consider the means and methods to attain what is desired; and that takes time. This very consideration is a moral action, because it excludes all means which are base and bad, and would lead to failure.

Manual training is the best means by which we can strengthen this thoughtful nature. For instance, give a child a certain task to perform,— tell him to make a

box. This is a question which he can not answer at once; that is, he can not produce the box at once. There is a series of thoughts necessary for a good answer. This serial thought will pass along a line of questions: What kind of box? How long shall it be? What size? Shall it have a cover? Shall the cover be hinged, or not? What kind of wood? Shall it be polished, or painted?—and many other things will be suggested until the graphic as well as the mental sketch is finished, and the child produces the box complete in his mind. Here the main thing is attained. After that comes what is usually considered the chief thing—the technical skill to produce the box. That is not to be undervalued, but it is not most important. The chief thing is the ability which the child acquires of thinking connectedly and planning carefully.

Among the various forms of manual training which Superintendent Bamberger employs in carrying out his ideas are drawing, clay modeling, wood-work, turning, machine-work, sewing, and cooking. The manner in which these are taught and correlated with regular class work seems ideal. Manual work is made a sort of laboratory method of teaching all other branches, the basis of every

other work. According to the Superintendent the mere handling of material is a practical lesson in natural philosophy. In clay modeling, relief maps are made and used in class work. Wood and metal work are naturally correlated with mathematics. In addition to that, the various woods and metals are studied, and also the geography of the country which produces them. In sewing, the silk, linen, or cotton used are studied from the cocoon or seed to the finished product.

These are merely examples of the method used. Almost every branch taught, in the school is intelligently built up from a solid foundation of material things, and the child acquires, besides technical knowledge and technical skill, a good fund of general information. That these methods have been eminently successful, are evidenced not only by the various awards received from the World's Fair, but also by the hundreds of children who have been rescued from poverty, ignorance, and degradation, and fitted for lives of happy usefulness. On account of poverty most of the children are compelled



to leave school before graduation, but a goodly number are able to finish each year. The group of bright faces surrounding their teacher constitute the class of '98. Their neat and artistic dresses are entirely the work of their own hands, from the drafting and cutting to the last dainty stitch. Every part of the work was done by eager, painstaking fingers as a part of the school work.

Equally good results are obtained in the various other departments, as may be seen by a visit to their exhibit in the bazaar now open in the Auditorium Building in Chicago. Every line of work is represented, and it seems the more marvelous when it is remembered that this is the work of children under fourteen years of age.

What has been accomplished by this school may, with the same zeal, enthusiasm, and good judgment, be accomplished by others. The superintendent and teachers are always ready to assist by advice, suggestion, or practical aid, any who wish to engage in this line of philanthropic work. All are welcome to come and study the Training School methods, and one is constantly impressed with its open-hearted, helpful attitude toward the world. The actuating principle seems to be to do good to all men as they have opportunity, but especially to the poor.

EDITORIAL NOTE.—It is the universal testimony of visitors to the Jewish Training School—including the editor—that superintendent and teachers exert themselves to the utmost to show every facility and courtesy for examining every detail of the school work. This spirit of helpfulness is the motive power of school and workers. It seems fitting to reprint in this acknowledgment of special favors to our correspondent a statement by Prof. Charles R. Henderson, of the University of Chicago, which appeared in the June number of the *EDUCATOR*:—

I regard this school as one of the most significant and distinctive experiments within my knowledge. The manual training work is practical, systematic, and directed by a thorough comprehension of the educational end sought, and of the order of development, in the child. The school management seems to be free from all the driving, coercive features which discourage and warp so many children. The idea is personal perfection, not the selfish strain to beat the others. I feel sure that this school, supported by private enterprise, independent of the necessary reputation of a vast system, yet sympathetic toward all schools, has a power to introduce new ideas without shock or violence. This is part of the mission of the Jewish Training School,—to show advanced educational ideas actually in successful operation. It is rendering a service to the city and to the cause of education by spending its money on the wisest and most fruitful form of philanthropy—preparing youth to take care of themselves in the struggles of existence, and at the same time to be kind and amiable to all.

MANUAL TRAINING.

H. G. BROWNELL,

Louisville Manual Training High School.

At the Centennial Exposition held in Philadelphia in 1876 there was an exhibit from the Imperial Technical School of Moscow, Russia, which attracted the attention of many leading American educators.

The system of education there presented combined in parallel courses with the ordinary academic subjects, free-hand and mechanical drawing, and wood, forge, and machine work. These courses were correlated as much as possible so that they formed a homogeneous whole, educating to a considerable extent, every faculty of the student.

This "new education" found many supporters among teachers who had a knowledge of or a liking for mechanics. But most of our educators had become "set in their ways," and did not look with favor upon anything that would unsettle the already established doctrine upon which they assumed that the whole system of public education rested.

At the meeting of the National Educational Association, held in Nashville, Tenn., in 1889, a committee consisting of four of the leading educators in the United States presented a report upon "The Educational Value of Manual Training," in which they maintained that such a training held no place in our public educational systems, that it might be of value in special schools as a substitute for the old apprenticeship system, but that its chief value was along moral rather than intellectual lines.

In spite of this adverse official criticism, manual training high schools have been built, and manual training departments have been added to existing high schools one after another all over the land. The movement has even invaded the graded schools in many comparatively small cities, and the intellectual educational value of such a training is now no longer doubted. Colonel Augustus Jacobson, in a paper read in 1884, said:—

"It is said that if a boy learns the use of tools, he will necessarily follow the pursuit of a mechanic, and thereby be debarred from rising in the world. Many men are kept down in the world by ignorance and want of skill, but I have never yet seen or heard of any man who was kept down by knowledge and skill. To say that to teach a boy the use of tools is to teach him to become a mechanic is like saying that if I have my boy taught to dance, he must become a dancing-master; if I have him taught to box, or to fence, or skate, he

must earn his bread by these accomplishments; if I have him taught to ride, he must become a cavalryman or a cowboy. The manual training school educates boys, not to become mechanics, but to become men of intelligence and skill." He might also have said that in the manual training school, the pupil comes in contact with things, and learns by doing, thus fulfilling the precept of Comenius, who said more than two hundred years ago: "Let those things which must be done, be learned by doing them."

Mr. Thos. M. Balliet, Superintendent of Schools of Springfield, Mass., in answering the question, "What does manual training accomplish in the way of developing moral character?" says: "In the first place, it gives pupils whose talents lie not in the direction of abstract thought and of book knowledge but in the line rather of the mechanical and industrial arts, an opportunity of discovering, by actual experiment during school life, what they are fitted for, and thus tends to reduce the number of those who fail in life because they have entered upon a calling for which they are by nature unfitted.

"Many a boy's life has been wrecked because he found nothing in the narrow curriculum of the traditional school which could deeply appeal to his interest or arouse the latent talent with which nature had endowed him, and many a man's life has been wrecked, because he did not discover, until it was too late, that he had entered a calling in which he was not fitted to succeed.

"In the second place, it develops a respect for manual labor in the minds of young people, and helps to eradicate the vicious notion that selling goods over a counter at five dollars a week is more genteel than laying brick at three dollars a day. Finding as they do that skill in manual occupations is as difficult to acquire as a knowledge of mathematics or a dead language, they realize that it demands a high order of brain power, and that those who engage in manual labor of a skilled kind may be the peers of those who are supposed to be engaged in intellectual work.

"In the third place, while the manual training school does not aim to teach a boy a trade, it gives him a training which will enable him at once, on leaving school, to earn from one dollar to two dollars a day, and thus become self-dependent. I believe that few things in a boy's life appeal more deeply to his manhood than this feeling of self-dependence.

"In the fourth place, manual training creates sympathy for the laborer in those who do not earn their livelihood by manual labor. It establishes a

bond of sympathy between laborers and employers of labor.

"In the fifth place, manual training helps effectively to develop habits of accuracy which are carried into other lines of work. This is the universal testimony of those in the best position to know."

There is no training that conduces so much toward good citizenship as does that given in the properly organized manual training school. The time is probably not far distant when manual training will be introduced into all schools, not for the purpose of fitting men and women for earning a living, but that they may be qualified for higher living; not that manual dexterity may be acquired, but that accuracy, method, and precision may become habits; not that trades may be learned, but that people may be broadened and that power may be acquired; not that things may be made, but that men and women may be made better.

WHAT IS A USEFUL EDUCATION?

THE distinction between a useful and a useless education is not one of kind, but of service. A form of education that might be very useful to one man, might be entirely useless to another. It is a matter of temperament and individual purpose. Whether the storehouse of knowledge is to be valuable to us, will depend on whether we select what we want. One man may need to know all about the moons and rings of Saturn, another the customs of the ancient Phenicians, a third, the exports and imports of New York, and a fourth, the anatomy and physiology of a starfish. The most successful men and women are they who soonest find out what they are fitted for, and then educate themselves accordingly. Any education is useful which serves the purpose of the one who receives it, and no education is useful unless it is to be used.— *Learning by Doing.*

OAK OR SQUASH?

A STUDENT not long ago asked the president of Oberlin College if he could not be permitted to take a shorter course of study. "O yes," said the wise president, "but that depends upon what you want to make of yourself. When God wants to make an oak, he takes a hundred years; but when he wants to make a squash, he takes six months."— *Normal Instructor.*

THE UNITY OF NATURE

PROF. M. E. CADY.

THERE is no line of study in the public schools which attracts so much favorable attention as "Nature Study." Educators are coming to see that the minds even of young children can readily grasp the principles of elementary science, and that they need not wait until they are prepared to enter the high school or university before they are given a passport granting them opportunities of careful study and thoughtful investigation. If the students who are being graduated from the high school to-day had been accorded the privileges of the children who are now in the preparatory departments, they could have entered the high school with as large a fund of science knowledge as they now possess on receiving their diplomas.

While it is encouraging to note this step of progress in the educational work, we should see to it that the work done is of such a character as to secure the highest and most lasting results. An investigation of the present plans and methods of carrying on the nature-study work shows them to be far from satisfactory. Nature study should be a study of elementary science, and elementary science should be just as true, just as correct, as advanced science. In other words, it should be scientific. Nature, rightly interpreted, is the only natural science there is; anything else is "science falsely so called." Nature clothed and embellished with mythology, is nature distorted. It is truth clothed with error. Let the children learn nothing that they must sometime unlearn, if they would have the truth.

Again, it is found by careful investigation and observation, that there is no uniform plan or method of teaching nature studies in the schools. Why should not the study of nature be just as carefully planned and outlined as that of language and mathematics? Many teachers thus far have been carrying on a sort of hit-and-miss study of nature, each teacher working independently, and trusting that circumstances will provide or suggest the lesson for the day. Yesterday it snowed, so snow was the lesson for the day; this morning the teacher saw a squirrel, and found where it stored away some nuts and grains, so the topic for consideration to-day is the squirrel and its habits; and before class time to-morrow she hopes to see something new or strange,—perhaps the fall of a meteor,—that will be the lesson for to-morrow. By

this method of treating the subject, the pupils learn to look upon nature as a disjointed, jumbled-up affair. For what relation or connection does there appear to be between the snow, the squirrel, and the meteor? These facts are interesting, but should come in as merely incidental and not form the basis of the plan of work. The lesson should be assigned beforehand, and the students should have time to think, to observe, to draw conclusions, before the work of the recitation is begun.

Nature presents a plan. Nature is the thought of her Creator materialized. It is thought that has taken shape or form. Now for us to conceive of God creating things without a thought, plan, or purpose, is to charge him with being thoughtless and purposeless. So when we come to the study of nature, God's creation, let us and our pupils look for the thought, the plan, the purpose of God; for the science (knowledge) of nature is true only in so far as it harmonizes with God's thought, his plan, his purpose. So the real object to be sought in the study of nature, is to learn the art of interpreting God's thoughts, materialized, so that we may also rightly understand the thoughts of his mind that are imaged or symbolized in nature. But why seek to know God's plans, thoughts, purposes,—in a word,—his character?—That we may become godlike by being brought into perfect obedience to him in all things. This is and can be the only *true* stimulus in the study of natural science.

Since nature presents the plan and the purpose of its Creator, it also presents a picture of unity. Every part, every phase of nature contributes its share toward the accomplishment of God's great purpose; hence there is a unity and harmony existing between each of the parts and the whole. The perfection of the whole depends upon the perfection of each of the parts. There is a logic or sequence in nature which teachers must see in order to secure the best result from their study. It is upon this sequence that the unity of nature depends. The skilled mechanic sees the entire building with his mind's eye before a stroke of work is done. He sees the foundation, the frame, the rooms, doors, windows, chimney, lath, plaster, etc., etc., and recognizes that there must be a certain relationship existing between them as regards shape, size, extension, etc., in order that it may, when completed, be a symmetrical building, answering fully the purpose of its designer. The

mechanic also recognizes that there is a certain logical order of procedure that must be followed in the erection of the building, in order that the work may be facilitated, so that there be no waste of time and energy. He will lay the foundation deep and strong before he erects the frame; he will put on the rafters before he attempts to put on the roof-boards and shingles. As he takes each step, he sees the relation that each part sustains to the entire structure. The foundation must be large enough and strong enough to hold up the superstructure; the rafters must be strong enough to support the roof. Each step taken has a vital relation to those that precede and to those that follow.

Did not the Great Master Mechanic follow this same principle of logical sequence when he constructed the grand temple of nature? We can not conceive of him being less wise than ourselves, but on the contrary infinitely wiser. The Bible is the only book that gives us an authentic account of creation, and the different steps taken in its accomplishment. Let us study the order of creation as there recorded. We notice, first, that the earth, when brought into existence, was in a chaotic condition. The materials had been created and brought together, but the earth was still "without form and void;" the remaining creative acts brought order and symmetry out of chaos and confusion. Light was the first potent agency that the Creator spoke into existence. Light was not created that the power of vision might be made possible on the first day, for man was still uncreated, and God did not need it; for, say the Scriptures, "the darkness and the light are both alike unto thee." Why then did God create light first?

The Great Architect had a plan in mind, and light was one of the necessary agencies for its accomplishment. What is this plan?—God created the earth not in vain, "he formed it to be *inhabited*" by beings possessing various degrees of intelligence, and through the lives of these creatures he was to receive pleasure and satisfaction. God saw man and the lower animals when he made light; but did not create it that they should see, but that they might live, and living, then could see. God's first thought was to provide means whereby life should be maintained. This was to be accomplished for the world of animals by means of the plant food which God would provide for them. He did not plan to send them manna from heaven, but the earth itself must feed man and the lower creatures. This was the problem when God said, "Let there be light."

The earth was covered with water, and, as the rays of light fell upon it, heat, the companion of light, changed the water from a liquid to a vaporized condition. These vapors surrounded the earth like a swaddling band, so that it was difficult for the light to penetrate. The second step was to establish the cloudy vapors above the earth, and this was accomplished by making an expansion (firmament) which divided the liquid waters from those in the form of vapor. This expansion was caused by creating the air. The vapors being lighter, ascended on high, leaving the expanse of the atmosphere between the waters.

Let us now consider the third step; for this should help us to understand the preceding steps. On the third day, God caused the "dry land" to appear, by gathering together the waters into one place. Then the Creator commanded the earth to bring forth grass, herbs, and trees,—the food which was to sustain the creatures which he would soon after create. He designed to make a garden to grow all kinds of vegetable food; so he lifted a portion of the solid earth above the waters, and in it he planted grass, herbs, and trees. God placed the clouds on high that they might water the garden he had planted; so that it might bring forth abundantly. But how were the clouds to be brought over the dry land?—The heat, which accompanied the light, so rarefied the atmosphere, that currents were set in motion, and by this means wind circuits were formed which carried the clouds over the earth and watered it.

Thus it becomes plain that the Creator spent the first two days in devising a water-system whereby he might water the plants which he would create on the third day; and that these plants were to maintain the existence of creatures which he would create on the fifth and sixth days; and that through them, especially man, he was to receive pleasure and satisfaction. The Creator carried out the principle of logical sequence in performing his work; those things which were necessary to sustain the life and growth of plants, were created before the plants themselves, and that which was necessary for the maintenance of animal life, before the creation of animals.

Does it not seem from these considerations that the order of creation should be the order of nature or science study? Are not the purpose of the Creator, and the unity of his creation, more clearly and forcibly perceived by adhering to the principle of logical sequence, than they would be by carrying on the hit-and-miss plan of miscellaneous nature study?

The writer finds that the study of nature, in the order of its creation is far more satisfactory than fragmentary study. It provides a simple plan of work, which may be readily adapted to the seasons of the year. During the colder months the subjects, light (heat), air (sound), "dry land," and water, may be considered, while plants, water animals, air animals (birds), land animals, and man may be studied during the warmer months. The first chapter of Genesis, we may say in conclusion, contains a complete plan of study that reveals the logic, purpose, and unity of nature.

SCIENTIFIC STUDY.—IV.

OTHO C. GODSMARK, M. D.

LIGHT.

THERE is no physical manifestation of the power of God that reveals to our senses so much of the infinite goodness and wisdom of the Creator as does light. With it we see not only the things around us, but by it we find ourselves connected with the most distant systems of worlds, and feel that we are indeed children of the one great family, living in our allotted portion of "Our Father's House." He who had but to speak "and it was done," but to command "and it stood fast," even yet regards us more tenderly than an earthly parent can regard and care for his child. But I shall not attempt a flowery dissertation on the many blessings of light, but merely consider a few of the phenomena of this manifestation, as compared with those in our previous studies, and leave the analysis of light itself for consideration in the next lesson.

In our study of sound and of heat, we found them to be but different manifestations of vibration. This is true also of light. This manifestation seems to come next in the order of rapidity; for the vibrations that manifest themselves to our senses as heat merge into the field of light, the red ray of light being produced by the same number of vibrations per second that are found in a moderate degree of heat.

When a ray of light is analyzed by being passed through a prism, we find it to be composed of seven separate and distinct colors; namely, red, orange, yellow, green, blue, indigo, and violet. The number of vibrations per second that produce these different colors varies greatly, the red or lowest form of light being composed of the lowest number, while the violet or highest form of light is produced by the greatest number of vibrations per second that the eye of man is capable of recognizing. From this we see that white light, being

made up of these seven distinct colors, is composite in the same sense that a chord in music is composite, in that it is made up of two or more separate sounds, the number of whose vibrations is such as to harmonize exactly. If the reader will now turn to the October number of the CHRISTIAN EDUCATOR (which we trust has been carefully kept on file), and notice our comments on what was therein termed the "*compositeness of music*," he will be impressed with the harmony existing between the nature and manifestation of sound and light; and if these principles be true, then we are on the highway to the settling of some, at least, of the seeming contradictions between accepted science and the Word of God,— we may better say, between accepted science and the real facts.

In the study of sound we found that while different tones would travel a given distance in the same length of time, yet they had not all the same vitality. Some of these—the higher tones—were either lost in the journey or were changed to some other form; so also with light, for while the higher forms of light, such as the blue, indigo, and violet rays, will travel a given distance in as short a time as will the red, orange, and yellow, yet they are not possessed of the same amount of vigor or vitality, many of them becoming lost or changed to some lower form on the way. As a simple illustration of this, notice the distant headlight of a locomotive, a bicycle lamp, a lantern, or any other light in the distance, especially if it be a damp, foggy night, or when there is much dust in the air, and observe what a reddish-yellow light it gives. Notice that the blue, indigo, and violet rays are so lacking that the light seems to be really red or yellow; but look at the same light when near at hand, and we shall find that it is practically white; simply the distance made the difference. Why is this so?—Simply this: the more rapid vibrations that go to form the blue, indigo, and violet rays have not so much power of penetrating the dust, damp, and dew as have the more vigorous red, orange, and yellow rays; consequently the light reaching us from a distance is robbed of those colors that give it its whiteness when combined with the others.

Now let us see if we can not understand why the rising and setting sun has so often a different color than when in the zenith. When directly overhead, the rays of sunlight come to us through a comparatively thin stratum of atmosphere, and so meet with but a small amount of resistance. But when on the horizon, the rays of light are compelled to pass through a much more dense stratum of air, that lying nearer the earth's surface being

laden with dust and moisture, all of which forms a resistance to the light rays; consequently those colors possessed of the least vigor become lost, or changed on the way, so that there remains a preponderance of the red, orange, or yellow rays, these being the most vigorous. We never think of seeing the sun blue, indigo, or violet in color, but always in some of the colors produced by a smaller number of vibrations per second than are required to produce the white ray. This of itself shows that there is a slowing down of the color vibrations as the light ray passes through a medium that offers considerable resistance to its progress. If the amount of resistance be very considerable, we may see the sun as yellow; that is, many of the rays above the yellow have been cut off, or changed, so that the yellow predominates and we say it looks yellow; and if the resistance be still greater, so that the yellow rays are changed, or so much slowed down in velocity that they become orange or red, then we say the sun is orange or red in color, as the case may be.

This all seems simple, so very simple that it may be asked, Are we justified in spending so much time discussing a matter so evident?—I believe we are; for if right so far, we are prepared to carry our investigations further. On a cold, frosty night, even the reflected light of the moon seems nearly white. The rays reach us in almost their entirety. They are but little distorted. They are nearly pure white rays, having almost their full amount of blue, indigo, and violet rays. This is merely because of the purity of the atmosphere.

In the illustration of the brass band, it will be remembered that when one is standing only a few yards from the musicians he may be pleased with the general harmony of the various instruments; but when a long distance away, he can not hear the higher-toned instruments, but only the low, heavy tones of the bass horns and drums. It is so with the rays of light. In an ordinary atmosphere we get the perfect white ray, but when the light meets with much resistance, the higher-toned rays are lost or changed, and only the lower rays of the spectrum predominate.

Light, like sound and heat, may be reflected; but like sound and heat, is changed by being so reflected. As the pitch of a tone is lowered by being reflected, so the tone of the light ray is lowered by being reflected. We speak of the pale light of the moon. Why pale?—Because the light, in being reflected, has met with a resistance and loss. Its vibrations have been slowed down, and in being thus changed, the light is relatively paler or weaker.

We are told in the books that the setting sun looks red or yellow because the rays being bent, we can see only the lower end of the spectrum; but is this true?—Hardly. In the first place, the simple bending or refracting of the rays does not, in any sense, analyze them as the prism does. So then, there is no spectrum to see. How, then, can we look at the lower end of a spectrum that does not exist? But suppose the mere refracting of the sun's rays by moisture in the atmosphere did cause them to separate into their primary colors, there would be entering the eye each moment, myriads of minute spectra which could produce nothing more than a dazzling view of all these blended together. But still, suppose it to be, as is said, a great spectrum, and we are immersed in the lower part of it; that is, we see the red portion of it, while a man on a church steeple would be somewhere in the orange or yellow rays, and an observer in a balloon or on a mountain top would see the indigo or violet rays; but this is never the case. The clouds reflect to our vision always the lower colors, never the higher portions of the spectrum. So do not tell your pupils that the setting sun is red because we see only the lower end of a great solar spectrum: this is not so, and some of them will be bright enough to see that it is not so.

Our next lesson will take up more fully the analysis of solar light, and continue the study of this phase of physical science.

[We repeat our standing invitation for criticisms on this series of articles. Dr. Godsmark is given free course to develop his views, in order to provoke a deeper study of natural phenomena. Some of his statements appear to attack the fundamental principles of physics, as taught in the books. If any of our readers or exchanges disagree with his treatment of any topic, please address our correspondence bureau.—Ed.]

No universal obligation rests on men to be Biblical scholars any more than to be electricians; but if, being no electricians, they touch a live wire ignorantly, they are dead men. And when a student, never so profound in any or all other departments, would set a careless foot upon the science of sciences, Theology, as if it could be disposed of with a hop, skip, and jump, he must be gently and promptly set aside with rubber gloves, just to save his own life.—*Gail Hamilton.*

EDUCATION does not mean teaching people to know what they do not know. It means teaching them to behave as they do not behave. It is painful, continual, and difficult work; to be done by kindness, by watching, by warning, by precept, and praises; but above all by example.—*Ruskin.*

PROFESSIONAL STUDY

BIBLE PSYCHOLOGY.—II

BY THE EDITOR.

THE former article closed with the question — “What is the body; the soul; and the spirit?” The answer is not on the surface, and must be sought by careful study. From the consideration already given we may be certain, however, that these elements together constitute the whole man; no one or two of them is independent or self-existent as *the man*. Each implies the other two as complements.

This may be further illustrated by repeating the list of analogous terms previously considered, viz. :—

Corporal,	Mental,	Moral.
Physical,	Psychical,	Ethical.
Hand,	Head,	Heart.
Person,	Life,	Character.

Each term in each set overlaps and depends upon the preceding one or two. Thus the mental presupposes the physical, and the moral presupposes both the mental and the physical. The mind can be reached only through the nerves and brain of the body. God himself can not act upon our minds through any other medium. So the moral or spiritual nature is inconceivable except as superimposed upon the mental. Nor can the moral exist, dynamically, without the physical also. There can be no execution of a moral act except through the brain-cells, nerves, and muscles of the body; that is, there can be no moral act that is not mediately a physical act, even though the act is a *thought* and does not go outside the brain of the thinker.

So we might discuss the interrelations of the things represented by all the terms in the list. We may even suggest an additional set of terms,—Executive, Judicial, Legislative—by way of illustrating the facts. The legislative, executive, and judicial functions of government ought to be and are, theoretically distinct; but in the practise of every existing human government they are more or less blended. So in every human being there is a blending of the physical, mental, and moral; the physical is the executive agency, the mental is judicial, and the moral is legislative—laying down the law of right action. Each acts for itself and the other two; the three in combination make up the entire human organism.

One further illustration may assist in securing exact discrimination between the elements of man's

being. I may take the terms already considered and treat them as a mathematical problem. Thus, conceding that man is made up of the elements indicated below, I may “draw a line, and add them up;” as follows:—

Corporal	+	Mental	+	Moral	=	Man.
Physical	+	Psychical	+	Ethical	=	Man.
Body	+	Soul	+	Spirit	=	Man.
Person	+	Life	+	Character	=	Man.

Material	+	Vital	+	Spiritual	=	Man.
----------	---	-------	---	-----------	---	------

The last set must be the philosophical sum of the terms above, because it = “man” and they all = “man;” and it is an axiom in mathematics and logic that “things equal to the same thing are equal to each other.” If the sum and each of its constituent sets of terms are equivalent to the unit “man,” we may also provisionally affirm an equality between any two of the sets taken term by term. Thus we may say at once that the Body is Material, that the Soul is the Life, or Vital element, and that the Spirit is the Ethical element. But this statement would be true only when we see a comprehensive and definite meaning in each of the terms considered. Thus, we must see that the Soul is not only Vital but Mental; that the Spirit includes *all* that makes up the Moral or Ethical content of character; while the Body is made up of *all* the Physical or Material elements.

We must constantly remember, however, that these triple factors overlap and are inter-dependent; but the overlapping is indicated by the + sign *between* the terms, not by the *terms themselves*. Only by observing this distinction can I isolate each term and give it a definite, intrinsic meaning. Treated otherwise, the terms become ambiguous. Thus, we may speak loosely, figuratively, or even scientifically, of “life” in several different senses: we have the cell life of the tissues; the somatic life of the body as a whole; the sentient, intelligent, or mental life; the moral, or spiritual life; the physical life, vegetable life, animal life, human life, divine life, etc. But all life is *life*, wherever found, however manifested. And *all* life is divine, in the sense that it comes from God. So we have also two spirits, or wills, the human will and the divine will,—the “enmity” against the law of God and the “enmity” against this enmity. In a sense, both of these are also divine, as the gift—perverted or unperverted—of God to man.

It is only when we confine our understanding to one definite, comprehensive meaning in these terms, Body, Soul, and Spirit, that we can make progress in reaching a full comprehension of their significance and relations. The illustration last given is intended to assist in clarifying our common ideas of the subject. If I, as a student of this subject, can isolate each term used in the series,—including in it its own full meaning and excluding from it the meaning that belongs to other terms,—and then can sum up and re-unite all of these terms into the total unit, “man,” this sum and all the terms in it and above it, must then *mean much more* to me than could possibly be the case if I had not gone through the rational process of separating and then recombining the elements studied.

This is always the advantage of philosophical analysis and synthesis. It is true that at the end of the process we have only the same *words* with which we began; but the process of illustration, discrimination, and comparison, enlarges not only the conception, but the *power* of still larger conception. Philosophical analysis and synthesis—not always in this order, however—is the true method of all right pedagogy. Such a process is in itself a study in Bible psychology, as may be seen further on.

Probably all students of Bible psychology will agree that man's body is wholly material. Man was made of the “dust of the ground.” His body returns to the dust in its dissolution. It is all capable of chemical analysis, and in life it always acts in conformity with the laws of physics. The food which it assimilates or eliminates, whether as solid, fluid, or gaseous, is all material. The air it breathes is a material substance; it belongs to the *body*, if the body includes *all* that is *material* in man. Food, drink, and air, are simply potential elements of the body; just as other solids, fluids, and gases are its rejected wastes. The body is merely a material machine—a divinely and elaborately organized machine—for transmuting the energy of food into the energy of thought and action.

Viewed from this point, “the breath of life” which was breathed into man at his creation (Gen. 2:7), was *material* only—unless it differed from the breath of all other men since then. With it came life; but life is not breath, nor *in* the breath,—according to other scriptures, to be noticed later. But breath is a necessary *condition* for all life, vegetable, animal, or spiritual. So it may be figuratively called the “breath of life” in the same sense that bread is called the “bread of life,”

and water is called the “water of life,”—because all life is directly dependent upon them for its continuance,—physical life on physical food, mental on mental, spiritual on spiritual. We are, in fact, unable to speak of mental and spiritual sustenance and growth except in figures borrowed from the physical. Hence, the fundamental importance of physiology in all educational effort.

The body with its belongings is the material part of man. What is the soul and the spirit? Is the soul the life? Is the spirit the aggregate moral character? These questions must wait for answer in the next article in this series.

The Reading Circle

“HORACE MANN.”

CHAPTER IV. SECRETARY OF STATE BOARD OF EDUCATION.

Topics.—“An Act Relating to Common Schools;” The Massachusetts Board of Education; Recommendation of the American Institute of Instruction; Arguments *pro* and *con*; Personnel of the Board; Reasons for Choosing Mann as Secretary; His Self-Distrust; The Question of Compensation.

CHAPTER V. OUTLINE OF THE SECRETARYSHIP.

Topics.—Six Important Conditions of Education in Massachusetts Previous to 1837; Mann's Personal Course of Reading; His Program of Educational Conventions; “The Means and Objects of Common School Education;” Incidents and Results of “The Great Circuit;” First Report; Teachers' Meetings in Boston; Normal School Fund; “Special Preparation a Prerequisite for Teaching;” The Hanover Convention; *The Common School Journal*; The Edgartown Incident and Its Consequences; Various Charges; Political Attack and Repulse; District Circulating Libraries; Optional Taxes; Report of 1839; Library Premium; Dr. Barnard's Connecticut Institute; The New York Institute System; Mann's Second Marriage, and European Trip; His Seventh Report; Correspondence; Salary; Private Expenditures; Privations; Partial Repayment by the State; Mann's Self-Sacrifice.

“JESUS AS A TEACHER.”

CHAPTER VII. HIS HISTORICAL ANTECEDENTS.

Topics.—“The Most Original of Teachers;” Comments of Parker and Renan; The World's Preparation for Christianity—Three Factors; Jesus “Made under the Law;” Functions of the Priests, Prophets, and Rabbis; The Talmuds; Influence of the Captivity; Distinction between Precepts and Principles; The Messianic Expectation.

CHAPTER VIII. HIS INSTITUTIONS.

Topics.—The Synagogue the Model of the Church; Meaning of Elder or Presbyter, Bishop, and Pastor; Elastic Organization of the Church; Origin of the Sermon; Baptism; Lord's Supper.

CHAPTER IX. HIS AUTHORITY.

Topics.—“Moses' Seat;” The Authority of Testimony, of Opinion or Judgment, of Position or Station, of Intuition and Inspiration; Contrast between the Rabbinical Method and that of Jesus; The New Prophet.

TEN PRINCIPLES OF EDUCATION.

1. IN education, culture is worth more than knowledge.
 2. Exercise is the great law of culture.
 3. The teacher should aim to give careful culture to the perceptive powers of the child.
 4. The teacher should aim to furnish the memory of the child with facts and words.
 5. The memory should be trained to operate by the laws of association and suggestion.
 6. The power of forming ideal creations should be carefully cultivated.
 7. The mind should be gradually led from concrete to abstract ideas.
 8. The child should be gradually led from particular ideas to general ideas.
 9. The child should be taught to think inductively and then deductively.
 10. A child should be gradually led to attain clear conceptions of the intuitive ideas and truths.
- *Brooks.*

A HUNDRED YEARS AGO.

A NEW arrival in a jail was set upon by his fellow prisoners and robbed of everything he had.

The prisoners were in a condition of indescribable filth, and jail fever was known in every town.

Travel up and down the Hudson was generally suspended in winter time on account of the ice.

When a man had enough tea, he placed his spoon across his cup to indicate that he wanted no more.

Mails traveled at the rate of thirty or forty miles a day in summer, and half that rate in winter.

The windows were filled with diminutive panes of glass, generally not more than four inches square.

Leather breeches, a checked shirt, a red flannel jacket, and a cocked hat formed the dress of an artisan.

The letter and the envelope were a single sheet of paper, so folded as to bring a blank page on the outside.

Postage was paid in money, and the amount was endorsed on the outside of the letter by the postmaster.

The fireplaces were adorned with tiles brought from Holland, and ornamented with Scripture subjects.

The first American geography, by Morse, had just appeared. It was full of errors and soon became unpopular.

Cravats were unknown, their places being supplied by huge stocks that reached from the shoulders to the ears.

A GRAMMAR TEST.

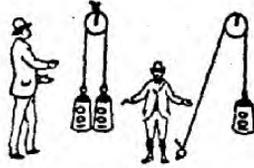
THE following exercise in practical grammar is adapted from a well-known text-book. It may appear quite simple at first view, but is worth careful study. Fill the blanks in each sentence with some form of the personal pronoun of the first or third person.

1. Mary and — are going.
2. It was — they wanted.
3. Mother brought Jennie and — a kitten.
4. There was nobody there but —.
5. She is no wiser than you or —.
6. Its being — should make no difference.
7. She was happy, and —, too.
8. You have often seen my cousin and — together.
9. Between you and —, I have lost confidence in him.
10. Who is it you want, Nancy or —?
11. Would you favor — studying latin?
12. He thought it was —.
13. Which is the better player, Lucy or —?
14. Let you and — go to-morrow.
15. All enjoyed themselves, — excepted.
16. Except —, nobody was forgotten.
17. — boys are going to ride.
18. May John and — have the horse?
19. Who is it? Only —.
20. Will you let Alice and — sit together?
21. Would you do this if you were —?
22. You sing better than —.
23. The truant was supposed to be —.
24. Every one knew except you and —.
25. How can you treat me so, — who have done so much for you?
26. Mother said you and — might have a party.
27. Father sends word for you and — to meet him at the train.
28. She knew it to be —.
29. She knew that it was —.
30. Father will take my friend and — with him.
31. They, as well as —, were invited.
32. Please let Mary and — have a holiday.

No teacher can truly promote the cause of education until he knows the conditions of the life for which that education is to prepare his pupil.—
Ruskin.

FOR THE PHYSICS CLASS.

In a mill there was a pulley, and a rope passed over it with a hundred-pound weight at each end of the rope. A boy came and said that one of the weights was wanted in another part of the mill, but the man in charge said he could not spare the weight, as he had to have the two hundred



pounds weight on the pulley. The boy said it would be the same to take off a weight and tie the end of the rope to a ring in the floor. "Certainly not," said the man. "I'm sure it would," said the boy. Now which was right?—From "Mental Nuts."

NOTES ON ENGLISH.—NO. 4.

USE AND MISUSE OF "IF."—"I don't know if I shall go," is an incorrect expression sometimes heard. "If" always implies a condition or supposition, when properly used. So this sentence ought to mean, "I don't know supposing I go." But what it was intended to mean is this, "I don't know whether I shall go." "Whether" expresses uncertainty of choice between two or more propositions: so it is not necessary to say, "I don't know whether I shall go, or not." The "or not" is already implied in "whether," and need not be otherwise expressed.

"If" should be used in such cases as this, "He looks as though he were sick." "Though" in its best use is equivalent to "although," and implies an adversative "yet;" as, "Though he slay me, yet will I trust in him." But the first sentence does not mean, "He looks as although he were sick." The "as" and "though" can not possibly be explained when standing together thus. What the sentence means is, "He looks as he would if he were sick;" so in its elliptical form the sentence should be, "He looks as if he were sick."

Another and more peculiar use of "if" is illustrated in certain passages of Scripture; as, "I have sworn in my wrath, if they shall enter into my rest." This does not mean, "I will swear if they enter in," but, "I have sworn that they shall not enter in, as the context clearly shows. The supposition or possibility that any should enter in when God has sworn otherwise, is so impossible to conceive, that the "if" becomes equal to "not." This use of "if" is idiomatic and peculiar to the Hebrew language.

? Queries for Students ?

[This is a standing subdepartment for the benefit of all who are students. It should enable every one to read the EDUCATOR and every other paper more intelligently. All these "Queries" are taken from the articles in this number of the paper, or directly suggested by them. They are excellent for general information exercises in the school and home. The EDUCATOR will be glad to credit the best set of answers to these questions, sent each month, by school or individuals.]

1. What is?—pantheism, paternalism, laboratory method, hemoglobin, cannel-coal, Tsung li Yamun, systemic capillaries.
2. Where is?—Breslau, Darmstadt, Vanderbilt University, Oberlin College.
3. Who was?—Polyphemus, Victor Hugo, Matthew Arnold, the "Cynic Philosopher," Locker, Guizot, Comenius, President of Oberlin College (now), Li Hung Chang.
4. Pronounce—acumen, apparatus, acetylene, "majestatsbeleidigung."
5. Meaning of?—homogeneous, *ex officio*, firmament, mediately, idiomatic, "approximate each other," "majestatsbeleidigung," "lèse majesté," [*sic*], *mm*.

RECENT INVENTIONS.

ACETYLENE gas is now used for the headlights on locomotives of the Canada Atlantic express trains from Ottawa to Montreal.

A NEW alarm-clock has a phonographic attachment that can be set at a fixed hour to shout, "Time to get up; don't go to sleep again,"—continuing the command until turned off by hand.

A GERMAN has designed a candle-holder which will not drop grease, the candlestick carrying a tube with a spring at the bottom and a cap at the top, with a conical aperture through which the top of the candle is forced as it burns.

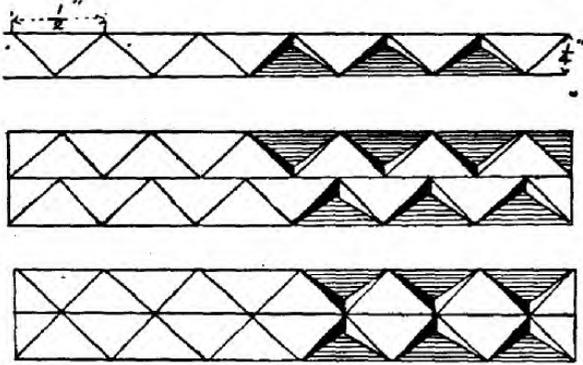
EGGS can be quickly beaten with a new kitchen utensil, which has a number of wire fingers, carried on two reciprocating frames, driven by a crank, to cause the wires to slide past each other rapidly, and churn the contents of the dish in which it is suspended.

A FLORIDA inventor has designed a steamboat to run on the ice in winter, runners being mounted on the under side at the proper depth to bring the ends of the paddle blades to the level of the ice, each blade being tipped with a steel point, which sticks into the ice and propels the boat.

Conducted by A. J. BRISTOL, A. B.

EDUCATIONAL HAND WORK.—NO. 6.

WE sometimes hear it urged that there is no time for ornament, but that only the essentials should be considered. Without question there is much truth in the statement, but it will all turn on what is truly essential. How few stop to consider how profusely in creation are scattered the evidences of the Lord's care for the beautiful. Could



not the plants have reproduced their kind without the gay parts displayed in the flowers? And the essential elements of the food might have been supplied without the almost infinite variety seen in the fruits and grains. So in the work of our hands; it surely is not departing from the great example set us if we endeavor harmoniously to blend artistic beauty with utility of design.

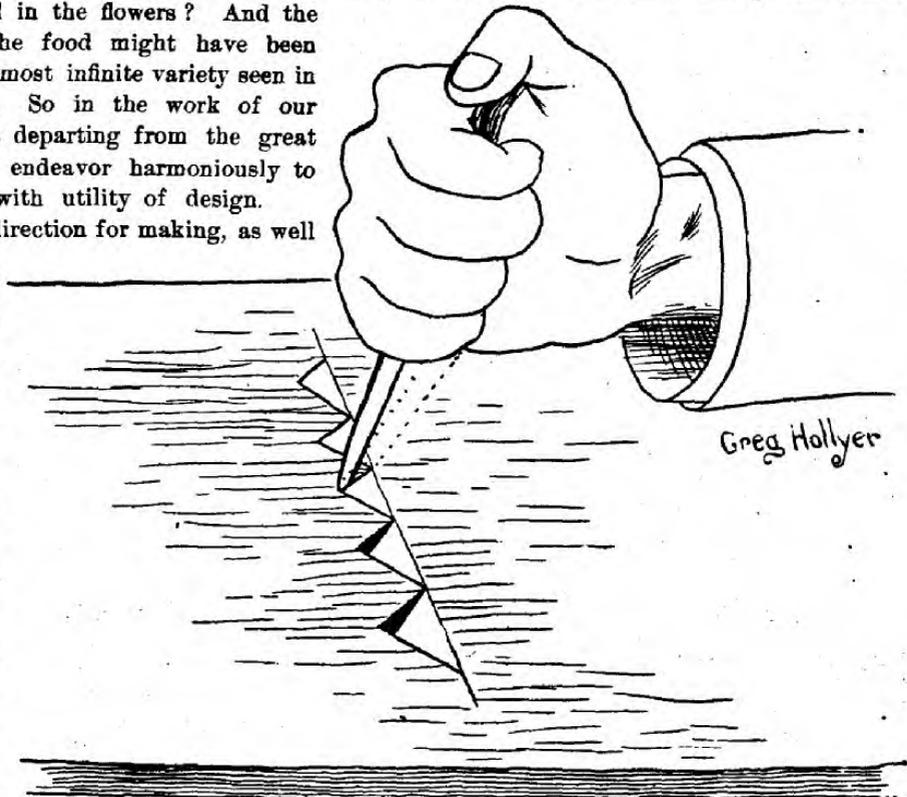
In our last we gave direction for making, as well as ornamenting with line cuts, the little holder; but now we shall only introduce a new method of cutting known as "chip-carving." This name is not derived as might be supposed, from the fact that small "chips" are removed, but is corrupted from the name of the Scandinavian, Mr. Shipman, who first employed it in ornament.

Before cutting in any of this first group

of designs, the lines indicated should all be marked in pencil, care having been exercised to lay out the work accurately. At the apex of the triangle the point of the knife should be inserted to a depth of at least one sixteenth of an inch, while the edge of the blade is kept in line of one side. Without removing, gradually tip the hand till the knife reaches the position indicated by the dotted lines of the cut, when the cut should exactly reach the base line.

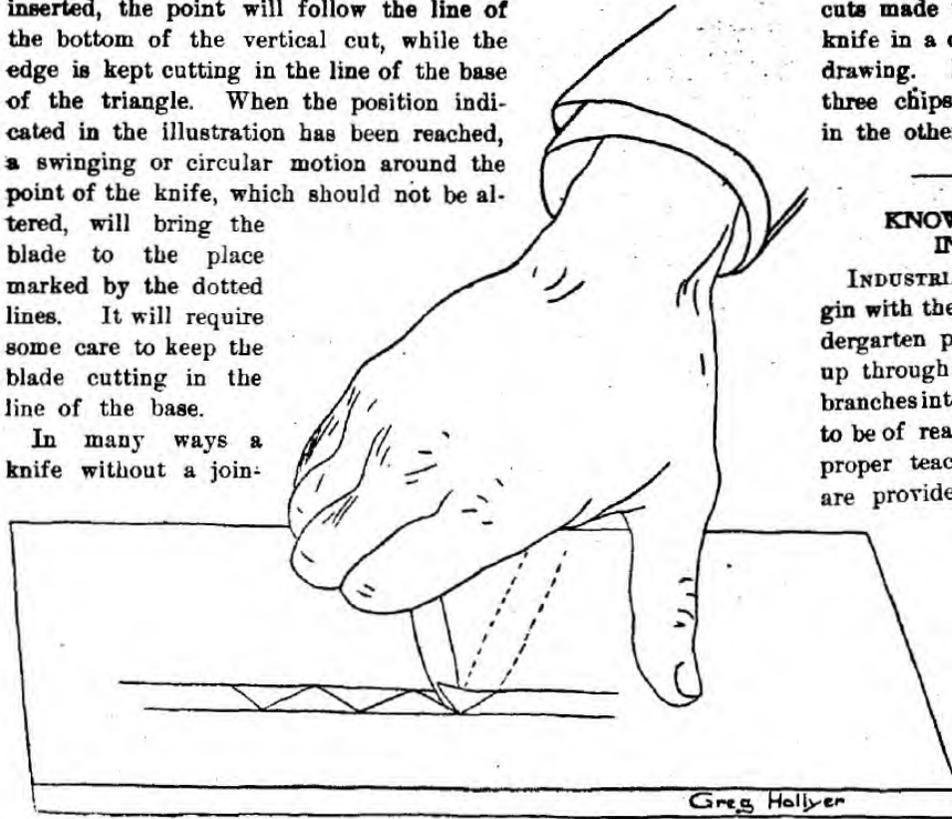
The thoughtful teacher will draw from the pupils the best method of cutting a series of these triangles. A great saving of time in turning the piece will result from making the vertical cuts for the corresponding sides of the series before the stock is reversed. And by exerting as nearly as possible the same force in each cut, they will be of more uniform depth.

The illustration on the next page shows the manner of removing the chip. If possible, this should be done with a single cut, as it leaves the surface much smoother. In the first part of this cut, the knife is held at such an angle that, as it is



inserted, the point will follow the line of the bottom of the vertical cut, while the edge is kept cutting in the line of the base of the triangle. When the position indicated in the illustration has been reached, a swinging or circular motion around the point of the knife, which should not be altered, will bring the blade to the place marked by the dotted lines. It will require some care to keep the blade cutting in the line of the base.

In many ways a knife without a join-



cuts made with the point of the knife in a common point of the drawing. In the first pattern three chips are removed, while in the other, but two.

KNOWLEDGE WITH INDUSTRY.

INDUSTRIAL training must begin with the children on the kindergarten plan, and be carried up through the common-school branches into the scientific courses to be of real advantage. When proper teachers and text-books are provided, capable of supplying the demand, there will be no loss of time in obtaining the theories of a literary and intellectual education while acquiring the more practical needs. Present systems are turning out a puny,

ted blade, and ground at the point as indicated below, would be better for the work of this exercise. There would be no danger of its shutting in the vertical cutting — a word of caution will surely be given by the careful teacher if the others are used. The acute-angled point would enable the pupils to do

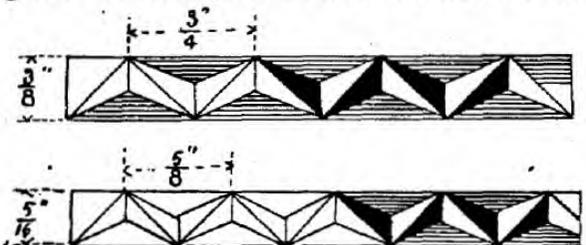
inefficient, and worthless class of citizens, as far as practical requirements for good citizenship are concerned. This criticism applies more directly to the people of towns and cities than to the farmers. Farmers' sons mix industry or manual labor with their studies, though the schools should furnish instruction to suit the needs of the labor which the home duties of the farmers'



smoother work; but as few would likely be able to have such a knife, we have given the illustrations to suit the ordinary knife. But it is essential that he knives shall be sharp.

sons require. No man can be truly educated until he is fitted to apply his talents in the best possible manner to the duties of every-day life, and thus be able to fill his mission for good and self-reliant citizenship. An education which does not aim toward these things is more likely to make criminals than good men and women. — *Farmers' Union.*

Although the last designs are a little more complicated, the teacher will have no difficulty in working them out with the directions already given. In both patterns there are three vertical



EDUCATION is not what is put into a man, it is what he is capable of putting out. To gather the knowledge of others and place it in our memory, no more makes it ours than putting stones in the stomach makes it a part of our food. Like food, knowledge must be made over, digested, assimilated, before it becomes our own. — *School Record.*

TEN "DON'TS" FOR WINTER.

Don't sleep with your bedroom window closed because it is cold. Cold fresh air is not unwholesome, but foul air is, whether warm or cold.

Don't fail to wear rubbers in damp weather. Don't fail to remove them when you come in the house.

Don't sit in a cold room. The unheated "best room" is a woeful death-trap.

Don't neglect the chest protector; it is an important safeguard against lung and bronchial troubles, and when you once put it on, don't take it off till spring.

Don't outrage your stomach because it happens to be Thanksgiving or Christmas. Nature's ordinances are not suspended on holidays.

Don't allow the lamps to keep the air of your rooms impure. Remember that one lamp vitiates as much air as five persons.

Don't poison your living rooms by heating them with the deadly coal-oil stove, even though they "don't smell." The less they "smell" the more dangerous they are.

Don't live over an unventilated cellar filled with decaying vegetables. Rotting cabbages, potatoes, etc., have caused many a death which has been piously attributed to a "mysterious dispensation of providence." — *Learning by Doing.*

EDUCATION FOR HOME-MAKING.

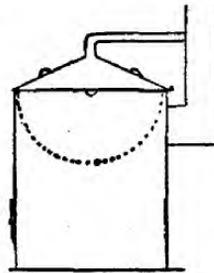
It was Gen. Francis A. Walker who once said, "America is suffering from two great curses, indigestion and alcoholism, both due to one and the same cause — the inability of women in the middle and lower classes to prepare wholesome and nourishing food." If this be true, and few can doubt it, shall instruction in cooking and food values be given in our schools only for purely pedagogic reasons, or shall not the sociological factor that such instruction must necessarily produce, be allowed its fullest weight?

What matter if the future wife of the working-man fail in her attempt to draw type solids in groups from the objects; fail to recall the bewildering rules and exceptions in technical grammar; fail to extract a cube root of a number, which root must be carried to three decimal places, etc., *ad nauseam*? What matter? But how grave a mat-

ter if she fail to make and keep a home for her young husband; fail when expending his hard-earned wages, to purchase with prudence and judgment; fail to prepare for him a wholesome and inexpensive meal; fail to rear children with proper care for their physical and moral welfare! — *Julia Richman, in the Outlook.*

A STOCK-FOOD COOKER.

THE following diagram appears in the *Rural New Yorker*. It illustrates an inexpensive and



unpatented apparatus for cooking potatoes, grains, or root crops for fowls and stock. A large kettle is supported by a heavy sheet-iron screen which serves as a furnace. A close fitting cover is connected with the smokestack, so that all vapors and odors are carried off with the

smoke, the cooking being done indoors, where escaping steam would be a nuisance. The apparatus operates very successfully, and can easily be made by any tinsmith.

PROSPEROUS FARMERS.

THE prosperity of American farmers was never more evident than during the last three years. It is said that in the two years preceding 1898 the farmers of this country have paid up more than one hundred million dollars of mortgages. This has resulted in such an increase in bank deposits throughout many of the Western States that interest rates on farm loans are much lower than formerly. The two wheat crops of 1896 and 1897 showed a gain of more than four hundred million dollars over 1894 and 1895.

And yet there are farmers who grumble instead of giving thanks. It is true that there are "good years" and "bad years" now as there was in Egypt; but industry, economy, and foresight may enable every farmer to maintain a satisfactory average of returns for his toil. The farmer certainly has a more permanent and independent basis of prosperity than is enjoyed by any other class of laborers.

DO YOU DO IT?

T. B. TERRY presents the following case, with his advice, in the *Practical Farmer*. It is a good subject for consideration:—

A certain farmer, over seventy years old, who owns a large, good farm and is well-to-do, has a son at home who is nearly thirty years old. This son is treated by his father just the same now as when he was a boy. He has never had any regular wages paid him, or any arrangements made so that he ever would get any pay for his work, except his board and clothes. When he wants a little money he has to ask his father for it, the same as when he was a boy. And still he has done a full man's work on the farm for a good many years. When he asks that some fixed wages be paid him, the father says, 'O, all I have will belong to you children soon now.'

The son wants my advice. I want to say to this father that in all justice he ought at once to pay the son fair wages for his work since he was of age, less what money he has had for clothes, etc. Or, if this is not convenient, he ought to give him his note for the amount, so that the son can sometime get what is due him. This is right, and there is no question about it. I do not see how a good man dare to go before his Maker with such an injustice to his son not made right. From this time on, pay the son regularly all he is worth, or could get elsewhere, and, better, a little more than this. Then your conscience will be clear, and your son will stay at home and be contented and happy. If you were poor and unable to take care of yourself well, that would be another matter. But when you own a good, large farm, and are comfortably fixed, you should not be so selfish as not to give your son a chance to do something for himself.

Under such circumstances I should advise the son, and any other sons, to leave home and go where they can get fair wages, if the father will not pay them. But I should try first every way in the world to get my father to do what is right by me. And I would not leave in anger, but quietly, telling him plainly that it was because he would not deal justly by me. Somehow, fathers sometimes seem to forget that they ever wanted to 'get a-going' for themselves when they were young. I hope there is not a father reading this who will fail to pay his son, after he is of age, as much at least as he would have to pay any one else for the same work, unless he is entirely unable to. And be honest about deciding this point."

SCHOOL AGRICULTURE.

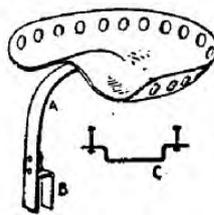
A THOROUGH knowledge of the soil is obtained now much easier than when the present generation of farmers were boys. The successful agriculturist must understand mineralogy, vegetable physiology, botany, entomology, bacteriology, etc., and their relations to his business. We believe all these could be taught in our rural schools, beginning at the beginning, and thus get children interested in the pages of nature's books. Every boy who intends to be a farmer should acquire such knowledge, and thus prepare himself for the emergencies likely to arise on the farm. Knowledge is power. The farmer ought to be a wiser man than the doctor, lawyer, or preacher, and if he is acquainted with all the peculiarities of the soil, he is their intellectual peer.—*Agricultural Epitomist*.

CARE OF FARM TOOLS.

It is not an uncommon thing to see valuable farm tools—at least valuable once—left in the field or fence corner during the winter. A little care and expense in properly housing the farm implements will save many dollars. A half hour spent in carefully wiping and scraping the points of plows and cultivators will make them "scour" next spring and save them from rusting out. If exposure of such tools can not be avoided, the wood-work should be painted and the iron or steel covered with a coating of oil or grease, to protect them against the natural action of the weather.

A HANDY WAGON SEAT.

THE farmer often finds it necessary to use a wagon without the box. Here is a device suggested by the *Agricultural Epitomist* for enabling him to do it comfortably:—



A very handy seat for use in hauling without the wagon-box is made as follows: *A* is an old mower seat with the stem bent in the proper shape to fit on the front side of the front bolster and reach down to the coupling-pole. *B* is a piece of flat steel bent to fit over the bolster and down behind, and is fastened to the spring of the seat with two bolts as shown, and *C* is another piece of iron or steel bent in the proper shape for the seat spring to fit in, and is fastened to the sand-board with two bolts. This must be fitted up close so as to hold the seat in the right place. When you want to put on a load, just raise the seat up, and take it off; and when load is on, throw it on top, and you will have a comfortable seat.

CARBON.

L. ZELLA STARKS,
Normal Training School Ypsilanti.

NOTHING can be of more interest, especially at this season of the year, than a study of carbon, leading children to see that the coal which we use in such vast quantities to-day, consists very largely of carbon.

To prepare children's minds for this study, a little preliminary work on burning will be found very helpful. Let the teacher prepare certain substances, a spirit lamp, and a pair of small tongs. She is then ready for a simple but very useful experiment.

After the children name the substances, which may be calico, string, silk, wool, paper, leather, whalebone, hay, coal, coke or charcoal, chalk, rock-salt, and small stones,—the teacher may take her tongs, telling the children to watch carefully to see what takes place when she burns these articles. Be sure that the children notice which ones burn with a flame, which glow red-hot, which send out smoke and odors while burning.

Step to the blackboard and write out a list as the children give it to you, which will be something like the following:—

1. Calico, String, Paper, Hay, Coal, Charcoal, Coke.
2. Silk, Wool, Leather, Whalebone.
3. Chalk, Rock-salt, Stone.

Then get the children to tell you that all substances which burn are *combustible*. If they do not know this term, give it to them, making sure that they can use it and fully understand its meaning.

Question then as to which list contains the substances which burn with a bright flame. Get another sentence; viz., that all those substances which burn with a flame are called *inflammable*. Tell them also that the other list contains minerals, and are said to be *incombustible*.

Next, look your lists over carefully to see where these substances come from, and it will soon be discovered by the children that those substances which are highly inflammable are derived from plants, while those which burn more slowly come from animals.

Children will be very ready to increase these lists from their own observations, and the wise teacher can leave a little lesson in their minds of the care to be exercised when near fire,—but without preaching a sermon upon it.

Next, lead children to understand that the black part which is so often seen in these and other substances is called carbon. Recall to their minds toast which has been *toasted* a little too long, or meat which has stayed too long over a hot fire; tell them that it has been charred or that the carbon has been made visible, so that we can see it. Draw from them that coke, charcoal, and coal contain a vast amount of *carbon*. Next ask them what substances we use for fuel, and tell them that we will study about the most useful of these.

Let them discuss freely which they consider the most useful, but lead them to see that coal certainly is. Bring before the class a lump of coal,—anthracite can usually be the most easily obtained,—and study it as to its properties:—

Smoothness, Color, Brittleness, Luster, Hardness, Weight, Manner of breaking, Solubility.

NOTE.—Do not *tell* children these things, but use any or all little devices which suggest themselves, so that these properties may be actually discovered by the children. For instance, show brittleness by trying to break a piece of beeswax and some coal with a hammer. Some child will then be ready to tell you that coal is brittle.

Next study the *kinds* of coal. Be sure to have specimens of—

Bituminous; Anthracite; Cannel, or candle.

Tell the children these names, also the common names; as soft, for bituminous; hard, or stone, for anthracite; and tell them why cannel-coal is so called. Then make a thorough comparison of the properties of each, for what each kind is used and why, the price per ton, and any other practical questions.

This subject will be continued, the uses of carbon discussed, and how gas is made,—with a short study of mines. For references, let me suggest—

- Object Lessons in Elementary Science. Vols. I and II.—*Vincent T. Murché*.
Object Lessons. Vols. I and II.—*Rich*.
Coal and Coal Mines.—*Homer Greene*.
Fairy Land of Science.—*Buckley*.
All the Year Round. Part II.—*Strong*.
Stories for Children. Coal.—*Hale*.
Story of a Piece of Coal.—*Edward A. Martin*.
How Coal is Made.—*Stickney's Third Reader*.
In the Coal Country.—*Harper's Third Reader*.
A Peep into One of God's Storehouses.—*Jane Andrews*.

Conducted by A. B. OLSEN, M. D., M. S.

HUMAN PHYSIOLOGY.

RESPIRATION.—THE INTERCHANGE OF O AND CO₂; HYGIENE OF THE LUNGS.

ALL the blood of the body is purified in its passage through the lungs. From the various organs and tissues it is collected by two large veins and carried to the heart. Leaving this important organ by the right ventricle, the blood enters the lesser or pulmonary circulation. This blood is impure. It contains little oxygen, but is saturated with carbonic-acid gas and various poisonous organic substances, which latter give the disagreeable, musty odor to a "close" room. In the lungs this venous blood, which is characterized by a dark bluish-red, or purplish color, enters myriads of pulmonary capillaries, where a brisk interchange of gases is constantly taking place. Spread out on a flat surface, these minute, delicate vessels would cover an area of more than one hundred and fifty square yards.

After the blood has been purified by the escape of CO₂ (carbonic-acid gas) and organic poisons, and the absorption of O (oxygen), it has a bright red or scarlet color, and is now called arterial or pure blood. In this condition it is again returned to the heart, from which it is forced by the contraction of the left ventricle to all parts of the body. It is now in the systemic or greater circulation, and soon enters the systemic capillaries, where another vigorous interchange, the reverse of that in the lungs, is constantly going on. Here the O escapes, and the blood is rapidly loaded with CO₂ and numerous tissue wastes.

As we have stated in a previous lesson, the interchange of gases in the lungs may be called external respiration, and that in the tissues internal respiration.

We must now proceed to study the factors concerned in this interchange of gases. It is an established law in physics that whenever two gases of different composition are brought together, a varying amount of mixing of the two substances results, that is, each is altered in composition by the contact. This interchange is termed diffusion. The extent and rapidity of the diffusion varies with the partial pressure of the several gases. The partial pressure of any gas, O for example, is determined by its percentage of the whole mixture. Thus, if

the air contains 20.81 volumes per cent. of O, the O gas will exert a pressure of—

$$(20.81 \times 760) + 100 = 158.15$$

millimeters of Hg (mercury), provided the atmospheric pressure is 760 mm. of Hg.

Now the amount of any gas absorbed by a given fluid depends upon three factors: (1) the solubility of the gas; that is, the amount absorbed at the standard temperature, and standard atmospheric pressure; (2) the temperature; and (3) the atmospheric pressure. Water at 0° C. (32° F.) and 760 mm. pressure absorbs 0.0489 volumes of O. In other words, 10,000 liters of water would under these conditions absorb 489 liters of O. Hence the absorption coefficient of water for O is 0.0489. Either diminishing the pressure or raising the temperature would cause some of the O to escape, while a reverse of the conditions would increase the amount of O held in solution.

The pressure required to keep the O in solution is known as the *tension* of solution of water for O. This tension of solution is always equal to the partial pressure of the particular gas.

It is this difference of tension of the gases in the tissues, blood, and air-cells of the lungs that explains to a large extent their interchange. The partial pressures of O and CO₂ in the alveoli of the lungs are not accurately known. They have been estimated at 122 and 38 mm., respectively. The results of experimentation show the following tensions in venous blood: O, 22.04 mm. and CO₂, 41.04 mm. of Hg.

We must bear in mind that in the body there is no direct mixture of the gases, but that diffusion takes place through a moist animal membrane. In the lungs this consists of the thin walls of the alveoli and blood capillaries. The interchange in the lungs has been illustrated as follows¹:—

	O	CO ₂
Tensions in alveolar air	122	38
Animal membrane		
Tensions in venous blood	22.04	41.04

It will be seen that the partial pressure of O in the alveolar air is higher than the tension in the venous blood, hence the interchange takes place in the direction indicated by the arrow. The reverse is true of the CO₂, and so it escapes from the blood. In this way the venous blood coming to the lungs

¹See "American Text-book of Physiology," page 526.

is purified and oxygenated, and made fit again to nourish the tissues.

Internal respiration takes place through a single membrane, the delicate wall of the systemic capillaries, and the direction of the interchange is reversed, thus :—

Tensions in arterial blood	O	CO ₂
	29.64	21.28
Animal membrane	—	
Tensions in tissues	.0	58.25

The tissues take up the O with avidity, and chemical combination immediately takes place. The high pressure of CO₂ in the tissues causes it to be absorbed by the arterial blood in large quantities. The vitiated blood is now carried back to the lungs for a new supply of oxygen, and thus the cycle of changes goes on continuously while life lasts.

But the law of diffusion by no means fully explains all of the phenomena connected with the interchange of gases, for a much greater amount of O is taken up by the blood than could be held in simple solution. Careful observation shows that the additional O enters into a loose chemical combination with *hemoglobin*. This substance is an albuminous body that contains iron. It is the essential constituent of the red blood cell. Hence the red blood cells are often called oxygen-carriers. Hemoglobin having a great affinity for O, the union takes place readily even under low pressure. For this reason, breathing pure O possesses little or no advantage over fresh air containing as much as 20 volumes per cent. of O.

These remarks also hold true for CO₂, except that but little of this gas unites with the hemoglobin, the greater part entering into a loose, chemical combination with the *plasma*, or fluid portion of the blood.

So far we have considered the problem of diffusion from a physical and chemical standpoint. We must not forget that we deal with living tissues, and it would not be strange if this fact altered the results, to a certain extent at least. That such is the case is believed by many investigators, and certain experiments that want of space forbids mentioning, appear to sustain this view.

In our previous study of respiration we have mentioned only the pulmonary vessels, which bring the blood to the lungs to be purified. The lung tissues are nourished by a special set of arteries which follow the bronchi, and are consequently known as the bronchial vessels. They carry arterial blood

to the structures composing the lungs, and return the venous blood to the heart. Thus the lungs possess a double blood supply, one for the oxygenation of the blood, and the other for the nutrition of the pulmonary tissues.

Each lung is enclosed in a blind sack called the *pleura*, which consists of two layers, parietal and visceral. The parietal layer is closely adherent to the chest wall. It is composed of strong, fibrous tissue, lined internally by a single layer of thin, flattened, endothelial cells. The visceral layer, on the other hand, is intimately connected with the lung tissue, and could not be removed without tearing the lung. Its structure is similar to that of the outer layer, except that the endothelial cells cover the external surface, so that the two layers of endothelium face each other. The blind space between the two layers is called the pleural cavity. Normally it contains a small amount of serous fluid which serves as a lubricant, and assists the surfaces in gliding smoothly over each other during expansion and contraction of the lungs. But it should not be understood that the pleural cavity is an open space, for this is by no means the case under normal conditions. The two layers constantly approximate each other, and the fluid is only sufficient in amount to keep the membranes moist and prevent an injurious rubbing of the surfaces.

The dimensions of the chest are many, but we shall stop to consider only those most important and significant. The following table gives the girths of the chest, both high and low, for the average man and woman:—

Girth, under arms, man.....	34½ inches.
Girth, under arms, woman.....	32½ "
Girth, lower end sternum, man.....	32 "
Girth, lower end sternum, woman.....	30 "

The amount of chest expansion varies much, from 1½ to 5 inches. As a rule the dimensions of the chest are proportional to the height of the individual.

Ordinarily the movements of respiration are involuntary, and their control by the will is always limited. We may, of course, increase the rate or depth of breathing at pleasure, and even hold the breath for brief periods of time; but no one can voluntarily strangle himself by suspending respiration.

The lungs are passive in their action. Enlargement of the chest leads to expansion of the lungs, and the air rushes in on account of the negative pressure. In expiration the great natural elasticity of the lungs is an important factor in bring-

ing about the return of the tissues to their normal position.

To breathe properly the chest must be entirely free from all restrictions such as corsets, belts, or tight bands of any kind. "Corset lacing" can not be too severely condemned, for it directly interferes with one of the most important of the vital processes of the body. Of all fashionable deformities it is the most vicious, because it not only injures the mother but also the children she bears, by interfering with their normal development and thus giving them a weakened constitution.

Further, corset-wearing not only hinders respiration but also displaces to a greater or less extent the abdominal organs, thus interfering with digestion. The effects upon the nervous system are also deleterious, and tend to produce hyper-sensitiveness. This is partly due to the stretching of the nerves caused by the displacement of the organs, but more largely to mal-nutrition which is brought on by imperfect oxygenation of the nerve tissues and the retarded elimination of the poisonous wastes. The long-continued pressure upon the muscles of the chest and abdomen interferes with their nutrition, and atrophy or wasting results. Still another important point is that deficient or imperfect respiration interferes with the throwing off of CO_2 and other tissue wastes, so that there is a heaping up of these poisons throughout the body. On account of this the proper nutrition of all the organs and tissues of the body is disturbed, and a general state of lowered vitality results.

The following paragraph on "Corset Choking" is quoted from Dr. J. H. Kellogg's "Home-Hand-Book of Domestic Hygiene," page 242:—

Choking is keeping air out of the lungs; at least that is a practical definition of the word. . . . A man who ties a rope around his neck and kills himself by choking is called a suicide. A young lady who does essentially the same thing by lacing her waist, only taking a little longer time for it, is considered extremely fashionable. Pure

air is the first and last desideratum of human life. Independent life begins with the first breath, and ends with the last act of respiration. A human being lives in proportion as he breathes.

Correct position either standing or sitting is another important consideration in connection with the hygiene of respiration. "In standing, the position should be such that a line drawn just in front of the ear will fall over the point of the shoulder, and strike the foot at the root of the toes."¹ This will cause the weight of the body to fall upon the balls of the feet. The heels should touch, and the feet form an angle of about sixty degrees. The head should be erect, the shoulders thrown back, and the chest brought forward. (Fig. 12.) The position is active, not passive; that is, activity of the muscles is required to maintain it.

Most persons stand in a semi-relaxed position, a sort of "falling together." (See Fig. 13.) Here the head is bent forward, and the chest is flat and sunken. When told to straighten up, they usually throw the head back, and protrude the abdomen, a position which is also incorrect as well as awkward. (Fig. 14.)

"In sitting, the seat of the chair should be at such a height that the soles of the feet can rest squarely upon the floor, and it should also be of proper width, so that the hips can touch the back. The shoulders should rest against the upper part of the chair, but the center of the back should not touch the chair, unless the chair-back has a strong forward curve. The chest should be held well forward, with the chin drawn in, and the legs should not be crossed."²

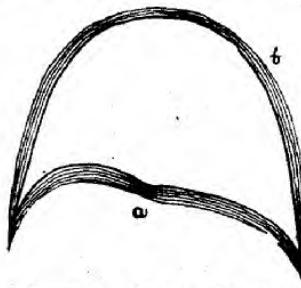


Diagram showing enlargement of thoracic cavity in costo-abdominal breathing. a. shows flattening of the diaphragm; b. increase in the lateral diameters of cavity.

An error occurred in Dr. Olsen's article in the November EDUCATOR, due to the fact that he did not have opportunity of seeing proofs of the matter before publication. In the third paragraph of the second column of page 85, the word "ratio" should read rate, except in the last sentence. This is a distinction with a difference that is keenly appreciated by a scientist.— Ed.]

¹ "The Art of Massage," by J. H. Kellogg. M. D., page 165.

² Id.



FIG. 12.



FIG. 13.



FIG. 14.

"*Porto Rico*" and the "*Porto Ricans*" is preferable to the present Spanish spelling of "*Puerto Rico*" and "*Puerto Riquenos*." The former is older and truer Spanish than the latter, and in the English-speaking world it has the advantage of established usage.—*The Pathfinder*.

Senator Hoar recently pronounced this opinion concerning the government of the Philippines: "I think we should set the people on their feet, and let them govern themselves. My opinion is that if the United States acquires the Philippine Islands to govern them as a subject or vassal state, the destruction of the American Republic will be dated from the administration of *William McKinley*."

"*Majestatsbeleidigung*."—*Herr Harden*, the brilliant young editor of the Berlin weekly, *Die Zukunft*, has been sentenced to six months' fortress imprisonment for the crime which in German is called *majestatsbeleidigung*, in French, *lèse majesté*, and in plain English, being disrespectful in word or manner toward the national ruler. He had been in trouble before for his bold attacks on the existing order in Germany.—*The Pathfinder*.

The Spanish Peace Commissioners have accepted the ultimatum of the American commissioners demanding the cession of the entire Philippine group to the United States in return for a money compensation for all of Spain's peace expenditures in the Islands. An extensive treaty between the two governments has been signed, but the horizon is not yet free from diplomatic clouds. Nearly all the continental nations regard American occupation of the Philippines as a menace to European interests.

"*The United States of Central America*" have dissolved partnership, according to recent despatches. The proposed new government never went into actual operation, owing to the opposition of a revolutionary faction in Salvador. Their leader, *General Regalado*, has captured the local government and proclaimed himself chief executive. The object of the proposed union was to prevent just such uprisings. Its collapse, if it be such in

reality, is a pitiful comment on the fickleness of Central American politics.

The Capitol Fire in Washington, by which many of the Supreme Court records were destroyed, was the most disastrous event since the burning of the capitol by the British in the war of 1812. It was caused by an explosion due to gas leakage in the sub-basement of the old central portion of the building. The loss of records can not be estimated, because it is absolutely impossible to replace them. One result of the accident will probably be to hasten the erection of a grand separate building for the Supreme Court and Department of Justice.

Li Hung Chang has experienced another taste of the mutations of Chinese civil service. A few weeks ago it was rumored that he was to become the consort of the empress dowager. Now he has been ordered to a distant province to consult with its viceroy concerning a plan to prevent losses by the overflowing of the Yellow River. This necessitates his resignation from the *Tsung Li Yamen*, and is considered by diplomats to signify his political death-warrant. The empress was obdurate in her refusal to grant him any excuse from the assignment on the ground of his age and infirmity.

Some Recent Events.—Twenty cases of small-pox are reported from Bedford, Pa.—A vein of gold said to assay \$500 a ton has been discovered in Auburndale, O.—Secretary Bliss, of the Department of the Interior, will resign January 1.—The new torpedo boat "*Farragut*" has recorded a speed of 30.6 knots, about 35 miles, an hour.—The battle-ship "*Massachusetts*" has been seriously injured by grounding in New York harbor.—General Garcia died of pneumonia in Washington, D. C.—The House of Representatives has passed a strong "*Anti-scalping Bill*."—The battle-ships "*Oregon*" and "*Iowa*" have been despatched to the Philippine Islands via Cape Horn. A third bridge, to cost \$15,000,000, is to be built across the East River.—The worst storm in years visited the New England States and coast on November 26 and 27. The steamer "*Portland*" was lost with 117 persons on board.—A native Cuban has been appointed mayor of Santiago.

CORRESPONDENCE NOTES.

We are still surprised at those answers to the questions on *ing*-forms. We made a proposition in the October EDUCATOR to send the magazine free for six months to the first teacher who would send "the most accurate and concise grammatical description of each italicized word in the four sentences given" below:—

He heard a *moaning*.

He spoke in a *ringing* tone.

Whistling a tune, he went to his work.

Splitting wood is a healthful exercise.

This offer was repeated in our November number. We have received a number of responses, one from a county examiner, but they do not hit the mark. Our proposition was *bona fide*, and we shall certainly satisfy the claims of any who feel that they have earned the subscription promised; but we wish also to satisfy our own mind in the matter. We have decided to publish the essential part of two of the best answers received, and submit them to the criticism of EDUCATOR readers, with some comments of our own. For this reason, names are withheld. There was a third answer, about on an equality with the two given, and open to the same objections—in our judgment.

Here is an epitome of the examiner's letter:—

1. "*Moaning* is a simple, present participle, derived from the verb *moan*. It is used here as a noun,—common, verbal, neuter gender, third person, singular number, and in the objective case,—object of the verb *heard*."

2. "*Ringing* is a simple, present participle, derived from *ring*; like 'moaning,' it has lost its verbal significance, and is here used as an adjective, common, participial, descriptive, modifying the noun *tone*."

3. "*Whistling* is a simple, present participle, derived from *whistle*. It is here used both as an adjective and a verb. With the words, 'a tune,' it modifies *he*. As a verb, *whistling* is regular, transitive, in the active voice, and has 'tune' for its object."

4. "*Splitting* is a simple, present participle, from *split*. It is here used as a verb; and with its object, 'wood,' it is used [*sic*] as a noun. As a verb, *splitting* is irregular, transitive, in the active voice, and has 'wood' for its object. The phrase, 'splitting wood,' is the subject of the sentence."

J. W. B.

The following is the essential part of the other response:—

1. "*Moaning* is a verb, regular, intransitive, active, participial mode, present tense, with the construction of a noun in the objective case—object of verb *heard*."

2. "*Ringing* is an adjective, descriptive, and belongs to 'tone.' Of course there are sentences in which such words are *verbs* with the construction of an adjective; but in all such cases the word has in it the element of *time*. Ex.:—I hear the singing bird. 'Singing' is used here as 'ringing' is above—a pure adjective. But in this sentence—I heard the bird singing—'Singing' is a verb with the construction of an adjective; it has in it the idea of time."

3. "*Whistling* is a verb, regular, transitive, active, participial mode, present tense, with the construction of an adjective, and belongs to 'he.'"

4. "*Splitting* is a verb, irregular, transitive, active, participial mode, present tense, with the construction of a noun, in the nominative case,—subject of the sentence."

E. B. S.

Now there are things we do not approve in either of these sets of answers; they seem inconsistent, unscientific, confusing. We fear that any student taught in accordance with the phraseology employed in them would always be hazy and uncertain in his command of the *ing*-forms. It ought not so to be. We think it need not. And so we offer our answer to the queries proposed, submitting it to the fullest criticism that may be offered by any of our readers. Such criticism is solicited in the interest of making the EDUCATOR more valuable to teachers and students.

But before we are prepared to submit our formal answer, we propose a preliminary consideration that seems fundamental,—*The part of speech must be determined by its use or construction in any particular instance.* We can not say, for example, that *saw* is a noun, but is sometimes used as, or "in the construction of," a verb. It is either a *noun* or a *verb*, in the particular instance cited, and that is all. We can not say that *but* is a conjunction, but is sometimes used as a preposition. It is one or the other, but one only,—*according to its use.* If a word is a participle, that is *what it is* under those circumstances; it can not at the same time be also an adjective, a noun, or a verb. So any *ing*-form is *either* a "pure adjective," a pure participle, a pure noun, a pure verbal noun, or else a pure verb when combined with some finite form of 'be.'"

In addition to the foregoing we wish, further, to submit some definitions of these forms. A verb is a word that *affirms* action, condition, or being, as predicated of some subject. A participle is a word (derived originally from a verb or noun) that *implies* or *assumes* action without affirming it, while *participating* in the nature of the verb and adjective. It is a mongrel, but highly respectable, kind of word. It may take an object or adverbial modifier, like the verb; it can not take an adjective modifier, but itself modifies like an adjective. A verbal noun is another mongrel, participating in the nature both of the verb and noun. Like a noun it may take a possessive or an adjective modifier (but not the article), be the logical subject of a verb, or be the immediate object of a verb or preposition. Like the verb it may take an object or be modified adverbially.

Now as a clincher to the foregoing answers and definitions, we are glad to present the authority of Swinton's Grammar (*Harper's Language Series*), which gives the clearest and most rational distinction that we are acquainted with between the *ing*-forms. On pages 62-64 (Edition of 1889) may be found the data for the following comparative table:—

WORDS IN -ING.	MAY BE	MAY TAKE	CAN NOT
Verbal Noun.....	Subject or object, and governed by a possessive.	An object or other complement.	Take the article.
Common Noun.....	Governed by a possessive or by an adjective, and be subject or object.	The article.	Take any complement.
Present Participle....	Modifier of noun or pronoun, by expressing action and time.	Any complement.	Be compared or take the article.
Descriptive Adjective.	Modifier of noun or pronoun, by expressing quality, only.	Comparison.	Take a complement or the article.

(See lower half of next column.)

Scare Heads

ARE useful only in *arresting* attention; the attention must be *held* by the actual merits of the proposition itself. As we said in our "Plain Talk" inside the first page of cover, we have made a special arrangement to furnish the **Teachers' World** to all-readers of the **Educator**.

The **Teachers' World** is a live, bright, original, well-known teachers' journal, filled with practicable, usable material for the public-school teacher. Its one object is to aid the teacher in meeting the many problems and difficulties of the daily work through the school year, not forgetting the teacher's self and her individual life. The table of contents in each number is large and varied, including many purely original features, such as the large Natural History Charts (ten given free with each subscription), double-page Language Pictures, the "Cut-up" work in various departments, the Reading Leaflet, the Song Leaflet, the Teachers' Self department, the Drawing Cards, etc. Every number contains forty-eight large quarto pages and an eight-page supplement, with extra pages from time to time.

It is the one aim of the editors and publishers to make it the *best*, that is, the most usable and the most helpful paper ever published for public-school teachers. No journal is in closer touch with the modern schoolroom. The list of contributors represents the best teaching ability of the various sections of the country, and the methods and devices presented, and the counsel given, is the result of experience and not of imagination. In short, the **Teachers' World** is one of the very best papers published, always excepting the **Christian Educator**; and the **Educator** is *the very best* in certain lines, not excepting the **Teachers' World**. Each is strong in its own field; the two together make a unique and unsurpassable combination for the teacher and parent. ☐

OUR OFFER.

The regular price of the **Teachers' World** (10 numbers yearly) is \$1.00. The regular price of the **Educator** for the same period is \$.50.

NOW

We will send the **Teachers' World** one year from date, with the **Christian Educator** from *October, 1898, to January, 1900*, for only \$1.00.

SEND AT ONCE.

Special Terms to Agents on Application. Address,

CHRISTIAN EDUCATOR,

Battle Creek, Mich.

"Dep't. C."