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A SCHOOL AND HOME MAGAZINE

OCTOBER

PROFESSOR B. A. HINSDALE, LL. D.

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Edited by FRANK WILLIAM HOWE.

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PRINCIPAL CONTENTS.

OUR DEPARTMENTS FOR 1898-99.

DURING the present school year the EDUCATOR will maintain the following general departments:—

General Articles.—From our contributors in the United States and abroad. Each number will have an illustrated description of the work of some school that is devoted to normal or industrial education. These articles are alone worth the year's subscription.

True Education.—Deals with the fundamental principles of education for the heart as well as the head and hand. It recommends a scope of work much in advance of common school practise, and which can be fully carried out only in home or independent schools; but is very suggestive as to the teacher's personal and moral responsibility in every school.

Professional Study.—For teachers and parents, looking to the fullest understanding and discharge of their mutual duties. Simple discussions of standard educational doctrines. "The Reading Circle" is a subdepartment devoted to independent or co-operative study of some standard educational masterpiece.

The Schoolroom.—The teacher's treasury of useful information and timely class-room aids. "Queries for Students" is a subdepartment designed to stimulate investigative thought.

Industrial Education.—Progressive lessons and practical suggestions to be used by teachers and parents for both boys and girls. No expensive tools or equipment required; adapted to the rural school and home, as well as the city or town.

Farm and Home.—The fathers' and mothers' home-school department of intelligent co-operation with teachers and pupils.

Nature's Laboratory.—A year's study of nature. These lessons are a guide to actual observation,—not to be adopted, or adapted, from the paper.

Physiology and Hygiene.—A most interesting and valuable course of original lessons on this important subject, conducted on a new plan.

Current Interests.—Timely topics related to education and general information.

Editorial Bulletin.—Notes, comments, and educational subjects of special interest.

NOTICE

Our special propositions that appear on pages 45, 46, 59, and in our advertisement of Professor Hinsdale's two books to be used in our Reading-Circle study. These are of special interest and value to every teacher. The object of these offers is to extend the circulation of the EDUCATOR as rapidly as possible. We heartily appreciate *your* assistance.

Our readers are always our friends, and we wish them to introduce the EDUCATOR to all their other friends. We offer a standing cash commission to agents, and are always glad to receive names and addresses for free sample copies. Can you use a few for this purpose? Remember that the EDUCATOR can help *you* in every *home* in your school district, and the *Youth's Instructor* will be a great advantage to you if in the hands of every one of your pupils. See our special club rates.

The EDUCATOR has recently received so many encouraging letters that we are constrained to reproduce a few of the shortest here and there. Please read these, and our special offers, and then—

Let us hear from you.

THE CHRISTIAN EDUCATOR

A School and Home Magazine

Edited by FRANK WILLIAM HOWE.

VOL. III. OCTOBER, 1898. No. 2.

GEMS FOR STUDY.

[From the Author of "Christian Education."]

GOD holds us responsible for what we might be if we would improve our talents.

THOSE who would make a success in the education of the youth must take them as they are, not as they ought to be, nor as they will be when they come from under their training.

A SENSE of their own imperfections should constantly lead educators to cherish feelings of tender sympathy and forbearance for those who are struggling with the same difficulties.

THE work that bears the divine credentials is that which manifests the spirit of Jesus, which reveals his love, his carefulness, his tenderness in dealing with the minds of men.

REST is not quitting
The busy career:
Rest is the fitting
Of self to its sphere.

— *Selected.*

THE schoolroom is where character is trained, the home is where it is formed.

YOU do not know what God will do with the boys and girls before you: deal with them reverently.

THE ideal school regards the child as an individual rather than a block to be chipped and ground to the same pattern as his neighbor.

HOLD the resolution steadily on better things, and the wicked will fade. If we treat the things that should be forgotten as unwelcome guests, they will soon leave. If we act as if they were welcome, they will come again. — *J. P. Mc Caskey.*

THE estimate of any educational system must be based upon its success in bringing young people through the period of adolescence with the greatest perfection of development; with the fewest indications of arrested development; with the best proportions of height and breadth, physically, mentally, morally, and religiously. — *G. Stanley Hall.*

SOME OBSERVATIONS.

SOME teachers and superintendents are more desirous to "show you around the building" than to show you a recitation that is conducted on a better plan than was ever seen before. More attention is often given to the outside than to the inside of the schoolroom.

WHAT a burden the ordinary recitation is — or was — to the teacher, the visitor, and the dull student, and the bright student, and the mediocre student! The bright student always feels himself held back by the mediocrity of the class, unless the teacher uses his brightness as a display for the visitor. Then the mediocre student wishes there were no such things as visitors, the teacher and visitor both concur in the wish, and the dull student wishes there were no schools at all. And the recitation was a failure.

THE ideal recitation is a genial, informal conference between teacher and students. It serves as an opportunity for reporting progress made in individual study, for illuminating — not dazzling — the minds of the backward, and for formulating and recording the facts and principles learned by all. The ideal recitation accommodates and develops the individual powers of each student, and makes the easy learner a conscious helper of his weaker brother so long as both can travel in the same class without injustice to either. It makes the student a teacher and the teacher a student.

THE best recitation wastes no time for anybody. It *moves* from beginning to end. It is directed by the teacher, but the motive power is furnished by the students. Instead of reproducing an old lesson *ad nauseam*, it gives matter and inspiration for a new lesson. In fact, the recitation period would nearly always be most profitably spent in outlining the next lesson, showing the class what to study and how to study, and then studying with them individually. The next lesson should always receive more attention than the last lesson, especially if the last lesson becomes the next lesson. The plan is worth trying occasionally, at least, for variety's sake.

WHAT is thoroughness in teaching? Is it to teach a child everything there is to be known, or supposed, about a given subject at one sitting? Or is it to everlastingly keep at the child and the subject as long as may be necessary, and never "let up" on the pressure until he can reproduce all he has been told about it? Is it to "exhaust" the child-subject? If this is thoroughness, some schools and teachers are undoubtedly thorough. "They squeeze the common branches until they are as juiceless as a cork." And so when the boy or girl graduates he naturally believes that he has *received* "a finished education." Better save some interest for the future; better not begin to saturate the infants with sucked-out juices that should be taken in the natural way later on.

PRINCIPLES VERSUS "METHODS."

THE *Western Teacher* makes the following observations concerning a contemporary: —

The Public-School Journal, with the September number, changes its name and character. It will hereafter be known as *Home and School Education*, and will be an educational magazine for advanced students of pedagogy and for those citizens, other than teachers, who are interested in the discussion of educational philosophy. The space formerly given to schoolroom methods and devices will now be assigned to the woman's club movement and matter pertaining to home-study reading circles. These changes mean, of course, that the journal now retires from the field as a magazine for the common-school teachers, especially those in the country schools. . . .

The field for the new magazine will be the whole United States, and there ought to be enough people in this country interested in women's educational and literary clubs, and in the higher phases of pedagogic philosophy and metaphysics, to afford a large and reliable constituency for this kind of a magazine.

We had noted these changes and concur in the wisdom of the new plans for *Home and School Education*; but one sentence in the extract quoted furnishes the EDUCATOR an excellent text for a few remarks. It is this: "These changes mean, of course, that the journal now retires from the field as a magazine for the common-school teachers, especially those in the country schools." Is that "of course" necessarily true? It may be true with respect to the intentions of the paper mentioned; but is it true that the common-school teacher has no interest and no conception of benefit to come from a thorough study of the inter-relations of home and school. If so, *ought* it to be so?

We are persuaded that the best teachers — the teachers of the future — will be those who make the most careful study of the fundamental relations of the home and the school, and how these two institutions can best perform their respective work in view of these relations. Hundreds of school papers can be had that are filled with columns of "methods" and routine grade work; and doubtless hundreds of teachers "want" just such a "shop paper" that will furnish ready-made instructions on how to measure out and tie up so many yards of knowledge to-day and take it back to-morrow. But The EDUCATOR believes there is plenty of room for another kind of paper that would still be good even for the country-school teacher, by helping her and her rural patrons to understand the simple, universal principles that underlie all education of permanent value.

The common-school teacher needs far less of fine-spun "pedagogic philosophy and metaphysics," than of an intelligent grasp of her practical relations and the immediate duties that spring from them. And the study of these immediate relations and responsibilities should lead to the highest kind of practical educational philosophy. It is probably easier to make and sell a "shop paper" than one which requires original thought from editor and reader; but there certainly ought to be enough people in the world, if not in the United States, to support a magazine devoted to basic interests.

THIBODEAUX, LA., Sept. 26, 1898.

To the Editor:

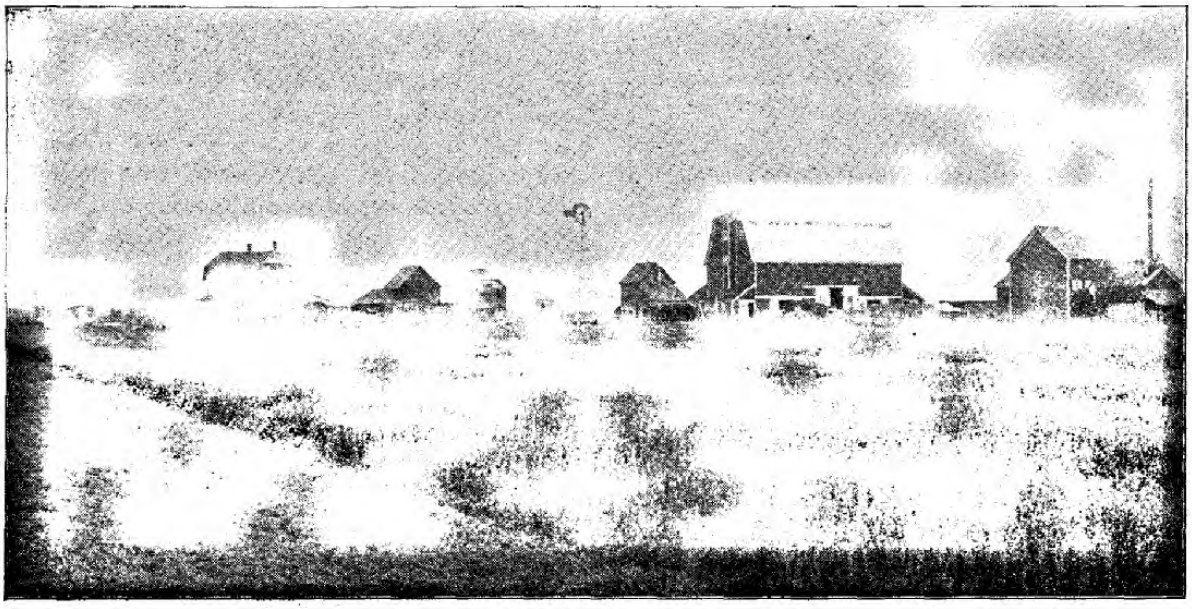
I take great pleasure in, and derive much benefit from, a study of your journal, as it is so different and in many respects so much superior to other school papers. I wish you much success. Please send me the directions for disinfecting schoolrooms.

LILY B. GOODWIN.

THE LARGEST MINT FARM.

[In our general article for this number we depart somewhat from our usual practise of describing an educational institution. But this article describes a farm and its equipment that admirably illustrate the value of mixing brains with labor, and thus may well serve to show the EDUCATOR's interest in industrial and agricultural education. A well-conducted farm may be one of the best educational institutions in the world.— ED.]

IN the southwestern part of the southern peninsula of Michigan,— more definitely, in the township of Ganges, Allegan County,— lies the largest mint farm in the world. To the initiated, a mint farm is a farm devoted to the production of the various kinds of mint,— spearmint, peppermint, horsemint, catmint, etc. This particular farm is the property of Congressman A. M. Todd, and is chiefly used for the raising of peppermint, with a smaller amount of spearmint, for which there is now comparatively little commercial demand.

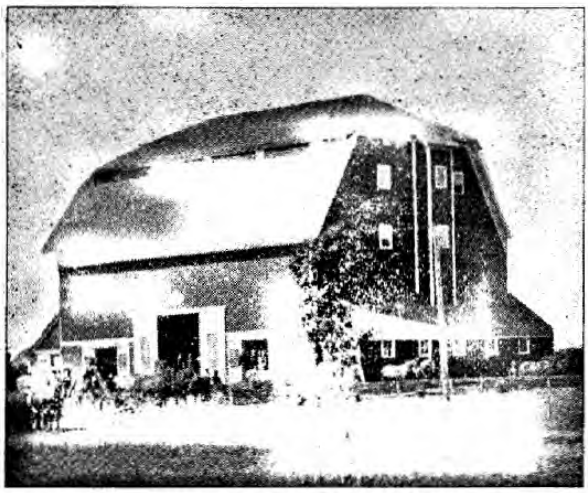


CAMPANIA FARM AND BUILDINGS.

The soil of this farm is a deep, black muck, evidently the residuum of an ancient lake. In some places this black soil goes down twenty feet to a substratum of sand. Throughout the year, and especially in the spring when saturated with water, this soil is very loose and "shaky." The tread of a horse is distinctly felt at a distance of several rods, and to protect them against sinking, the horses used on this farm — about forty are kept — are provided with broad, wooden shoes about twelve inches in diameter. The calks ("corks") of the ordinary iron shoe are set into the rounded piece of plank, and an iron strap over the top of the hoof holds the wooden shoe securely in place. It is an interesting sight to see a dozen teams — as the writer did on a recent visit to this farm — in procession over the loose ground with hoofs extended by these broad plates that look like rounded snow-shoes. With a little practise the horses never trip or injure themselves. There is no patent on these shoes, and they might be used to great advantage by many farmers who do not raise mint.

The larger buildings on this farm rest on foundations that are sunk down to the hard sand. They are made on the same plan followed in building the "sky-scrapers" in Chicago, a layer of close piling, covered with cross ties of timber, all embedded in solid concrete. The mammoth barn which surmounts one of these foundations is the highest in the United States, if not in the world. It shelters all the horses and their provender for the year, and even at its summit, shows no trace of vibration under the strongest winds. The wind pressure on the roof, and likewise of all the other buildings, is lessened by truncated instead of upright gables.

Besides the barn, "stills," and residence, there is a large dormitory and boarding-house for the employees,—varying from fifty to one hundred and twenty-five, according to the season,—a black-

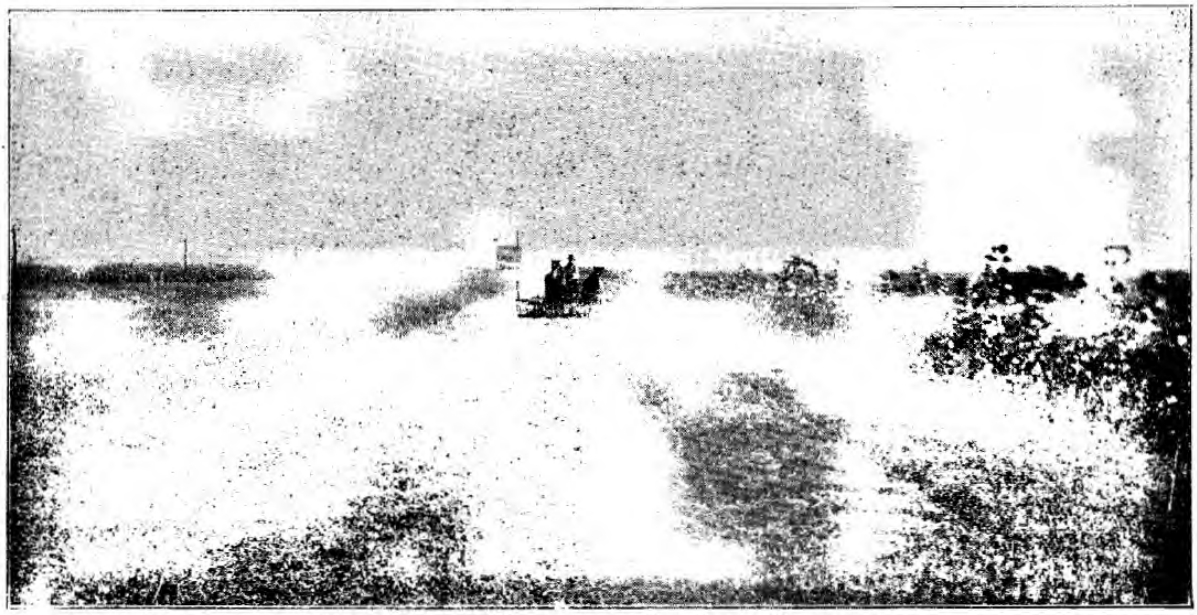


THE BIG BARN.

smithing and tinner's shop, a supply room, store-room, the office, a bath-house, and a reading hall for the men. The farm itself is two miles long by one and one-quarter miles in width, containing fourteen hundred acres. It is thoroughly drained by a system of canals and branches, which are used for irrigation in dry times. The main canals are bordered by six miles of Carolina poplars that have been set as "windbreaks," and about seven miles more will soon be set to complete the system. The main roads over which the mint is drawn to the stills are re-enforced with sand and gravel for supporting the heavy loads that are drawn on broad-tired iron wagons. No fences are needed on this farm, and its whole expanse of growing mint looks like a sea of green clover.

The mint root is perennial, but is renewed once in two or three years in order to freshen the crop. In the intervening years it is plowed under and comes up apparently as a new crop. When a field is to be set anew it is first plowed and harrowed as if for wheat. It is then drilled or furrowed with a special form of marker, which makes a narrow, shallow trench for the roots. The root-stalks are carried in a gunny sack by the planter, who draws them one by one from the sack and throws them with a sort of overhand movement into the drill, covering with his feet. The feet have a sort of bear-like swing that makes a ludicrous combination with the arm movement, but experience has proved that this simultaneous movement of feet and hands is the most economical of time and effort. A good man can in this way plant from half an acre to one acre and a quarter of the roots in a day.

PLANTING MINT.



RAKING THE MOWN MINT. THE YOUNG WINDBREAK.

When the mint is fully grown and blossomed,

it is cut, cured, and distilled. With a new crop it is Mr. Todd's practise to straighten out the growing, matted mint by raking each field in one direction with a strong two-horse rake. Then the mowers, of which he has fifteen, are run over the field in the opposite direction, thus reaching and cutting all the stems. When cured about eight or ten hours, the cut mint is raked into windrows, bunched, and drawn to the stills.

There are three stills on this farm, and a description of the process in one will serve for all the others. The cured mint is unloaded into one of four large, stave-built vats, and each vat is carefully packed from bottom to top, and then sealed with a strong cover. A large boiler furnishes "live" steam to these vats, entering by a valve in the bottom of each. The steam softens and expands the oil glands on the under side of the mint leaves until they burst and the oil is vaporized. From the top of each vat the oil-laden steam is conducted to a condenser, or "worm" of pipes that are bathed in a falling current of cold water. The "water of condensation," with the oil in suspension, is discharged into a separating tank, where the oil rises to the surface and overflows into the storage tanks. The water acts, however, as a solvent of a small percentage of the oil, which does not rise. Usually this water and oil is allowed to run to waste with the heat it contains, while other water is pumped into the boiler for making steam. Mr. Todd's practical instinct led him to provide for conducting this hot water and oil back into the boiler. The heat is thus recovered, the inside of the boiler does not "scale," and the oil is evaporated and goes out on the next trip, thus keeping up a continuous circulation "like Grover Cleveland's endless greenback chain."

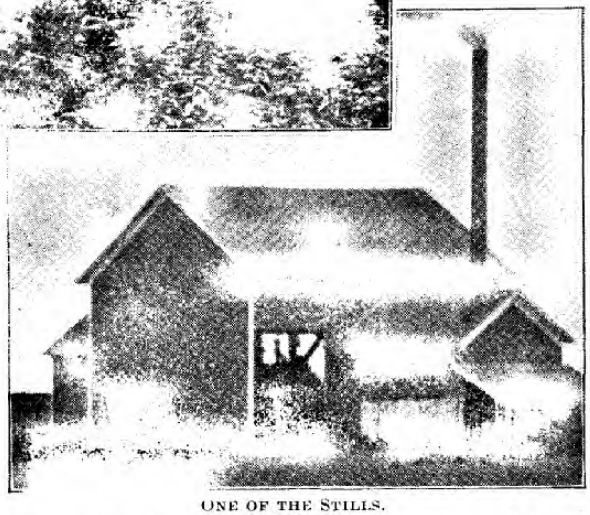
The mint is exposed to the steam in the vats about one hour. The spent straw in the form of a large cylindrical cake is then lifted from the vat by a steam winch, swung to a truck, and dumped on a plot of ground where in two or three years it forms an excellent compost and is returned to the field as fertilizer. When thoroughly dry this straw is eaten with great relish by horses and cattle.

MR. TODD AND HIS REFINERY (IN KALAMAZOO).

When each of the three stills is running at full capacity the average daily product is about 2,500 pounds of the crude oil. This is temporarily stored in cans that are of the size of the large

cans used by milk-peddlers, and hold about seventy pounds of the oil. Twenty-five years ago each of these cans of oil was worth four hundred dollars; now they are worth only about one eighth of that price. The oil is used chiefly in medicine, pharmaceutical chemistry, confectionery, and chewing-gum. Fully one half of the product of this farm is exported directly to foreign dealers.

The stills are connected with each other and with the city of Kalamazoo by a complete telephone system, and by means of this quotations have been cabled direct from the farm to Europe, and orders returned within two hours. Mr. Todd operates a large oil refinery in Kalamazoo, and some years ago his investigative disposition and chemical knowledge led to the discovery of a process for isolating the essential solids or "cream" of peppermint oil, commonly used in crystalline form in menthol inhalers.



ONE OF THE STILLS.

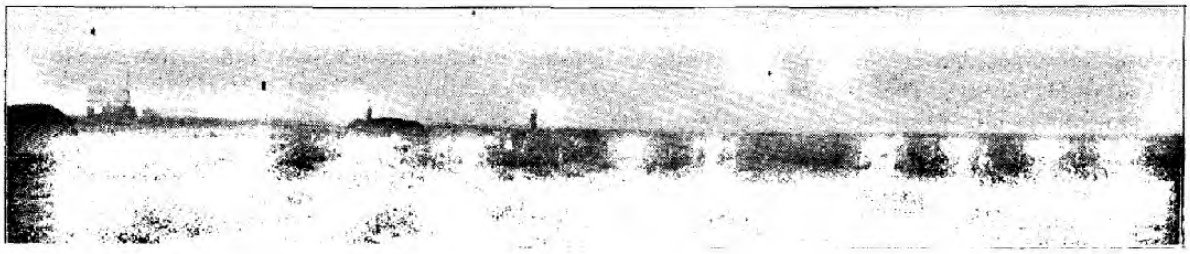
This large mint farm and its equipment is evidently managed on the principle of avoiding every unnecessary waste. And this principle is extended to the management and welfare of the employees. They are paid something higher than the usual wages, and a higher standard of efficiency is accordingly expected and realized from them.

THE MEN'S HOME.

Their employer evidently believes it is good economy to greet his men cordially whenever he meets them at their work or elsewhere. They are treated as *men*, not merely as "hands," and consequently have every inducement to improve their efficiency in the work. An attractive reading hall, soon to be furnished, and an occasional entertainment conduce to the cultivation of the higher interests of mind and morals. That men appreciate, or at least can learn to appreciate, such an interest shown by their employer, is very evident on the Campania Farm.

As was said at the beginning, brains and work are an excellent combination; a well-conducted farm is one of the best educational institutions in the world; and "the largest mint farm in the world" is one of the most admirable examples of such a farm.

FRANK WILLIAM HOWE.



SCIENTIFIC STUDY.—II.

In our last study[1] in physics we learned (1) that sound is one of the forms or manifestations of vibration; (2) that vibration within the range of 32 to 24,000 per second is recognized by the human ear as sound; (3) that with some animals a still higher range of vibration is recognized as sound; (4) that the greater the number of vibrations per second, the higher the pitch of tone; (5) that sound requires something more dense than a vacuum in which to travel; (6) that, other things being equal, the more dense the medium, the more rapid the velocity; (7) that the rapidity with which sound travels in the atmosphere is increased by a rise of temperature at the ratio of one and one-tenth feet for every rising degree Fahr. of temperature; (8) that the velocity with which the report of an electrical discharge travels is much greater than the report of any other known discharge; (9) that a sudden crash of thunder reaches one at a distance of some miles as a long-drawn-out roll of thunder; and (10) that there is an accompanying element in the lower forms of sound affecting the senses of man and animals and producing the feeling of fear and dread.

Sound is reflected, as in the case of the echo; and it will be noticed by a careful study of this property of sound, that there is a slight lowering of the pitch by having been thus reflected. It is well known that a ball, in its flight through the air, is lowered in its velocity by being similarly reflected; and the rougher the surface against which it strikes and the greater the angle at which it is reflected, the greater will be the reduction in its speed.

It is through this loss of sound vigor, or sound life, by being reflected from many surfaces, that ground cork, or bark, or sawdust, placed between the walls of a building, so completely deadens the sound. The law of elasticity also comes in for its share of this deadening process; but from the known laws of elasticity we find that it does not fully account for the loss of sound resulting from compelling it to travel through such a medium.

The pitch of tone, or the rapidity of vibration, is lowered by meeting with resistance. This is found true by noting that the tone of a distant-sounding bell reaches one slightly lower than the real pitch is known to be. Perhaps the most common illustration of this phenomenon is the noticeable change in the pitch of the whistle on a rapidly approaching locomotive. If carefully observed, it will be noticed that as the engine approaches there is a *continual rise* in the pitch of the tone, and that the moment it passes, there begins a *gradual lowering* of the tone that continues as long as the sound reaches the ear.

Now why is this so? Our school-books offer an explanation; but did you notice that as the engine approached there was a *continual* raising of the tone, and that when it had passed us there was a *continued lowering* of the tone? Our books tell us, and they are correct so far, that as the engine rapidly approaches us the sound-waves are crowded upon each other in such a way that the distance between each vibration is shortened, and in that manner more reach the ear during a given time; and that as the engine passes us the sound-waves become drawn out longer, or in other words are farther apart, so that a smaller number reach the ear during a given time, thus lowering the tone. This truly explains the sudden change of pitch noticed the moment it passes the place where we are standing; but it in nowise explains the *continued* rise in pitch of the approaching whistle and the *continued* lowering of the pitch when departing; for if the engine sustains the same rate of speed, we would hear but two tones,—one as it approaches and a slightly different one as it leaves us. But the fact is, in the distance we hear a certain pitch which *continually* rises until it passes us, then we hear a slightly lower tone which *continues* to lower until, in the distance we hear a slightly lower tone than first reached our ears in the distance as the train approached us.

As we said before, sound-waves become lowered, or slowed up, by meeting with resistance. Upon no other grounds can this peculiarity of sound be properly explained. We would be glad to have all notice the truthfulness of these points herein brought out, for it is along these very lines that we hope to make clear the correct answers to the ten questions proposed in the June number of the CHRISTIAN EDUCATOR. We also hope to open up a field of thought that will show that the simple statements found in the Scriptures as to the creation and peopling of this and other worlds are true; and though other books may tell us that these things of Holy Writ can not possibly be true, the fault lies in the fact that the authors of such books took a superficial view of the subject, and did not

[1] This is the second article in a series by Dr. Godsmark on some new considerations in science study. These articles will be of special value to teachers, but are written in a simple, untechnical style, that should be easily followed by parents and home students. We are pleased with the interest shown in these studies, and trust that all may make a profitable use of each as it appears monthly in the EDUCATOR.—ED.

study it from a higher standpoint. The object of these studies is not merely to collect together some interesting facts regarding sound, heat, light, and electricity, but rather to show to the thinking student of science, who may have been led into bewilderment by the vagaries of "science falsely so called," that real truth, as distinguished from mere hypothesis, is always simple, self-consistent, and beautiful.

Our next topic might be called the "compositeness of music." What I wish to express is that in music we have a composite form or collection of sounds. I use the following illustration to point out that while all musical tones will travel a given medium with the same velocity, yet all tones will not travel the same distance. If you are standing quite near to a band of musicians, you will notice, and perhaps with some degree of unpleasantness, how loud the shrill notes of the cornets, piccolos, and other higher-toned instruments sound. If you will step away a few rods you will be pleased with the general balance that seems to be in the volume of the different pieces ; but if you were to go some distance away you would fail to hear the sharp tones that seemed to be so loud before, and by going still farther away nothing but the low, heavy tones of the bass horns and drum would be heard at all. What does this prove ? Plainly this, that the higher tones lose their vitality and cease to be sound sooner than do the lower and heavier tones. While the music starts out as a composite whole, much of it is lost or overcome by the resistance of the air, and only a small portion reaches the distant ear as music.

Having considered this much of the nature of sound, I shall leave the subject temporarily, and in the next study will take up some of the aspects of heat, the next higher order of vibration. Frequent reference, however, will be made to all the points already discussed.

Otho C. Godsmark, M. D.

AN AWAKENED LIFE.

(Concluded from the September number.)

I hold it to be a truth that no one should live for utilitarian purposes, nor should any one be educated for utilitarian ends. Now let me guard a little here against being misunderstood, by saying that I do not use the word utilitarian in its broadest and most comprehensive sense. I use it as it is commonly understood, as distinguished from the esthetic, the prescient, etc. But our Creator built not these minds, I take it, with their keen enjoyment of the beautiful and their ability to discern future contingencies, for us to exercise them only on our present needs. He who educates himself simply for present demands and takes no thought of future emergencies, allows to degenerate and die an inestimable portion of his mind. He has failed to learn what all nature teaches, — the significant lesson of reserve force. I am informed by physiologists that Nature has endowed man with a reserve amount of nerve and physical power ; the brain, the heart, the lungs, all the organs of greater importance, she carefully conserves by holding in reserve for them an unused store. To illustrate, — a man in his perfectly healthy condition has a thicker thumb nail than one who is ill. Now should disease fasten itself upon this healthy man and a waste in the system occur, Nature skilfully withdraws from the thumb nail a portion of its material and transfers it to the organs of greater importance. So continuing, the last portion of the body to yield to the demands of death is the inestimable and irreparable brain. So it costs but a very little more to add to our present possessions another valuable acquirement upon which we may fall if our first support gives way. And this acquirement of the broadest kind of reserve power is the true utilitarianism. Many men have failed because they have built themselves up like a high column that falls from very disproportion to its narrow base. I commend to your inspection the pyramid. Its base is broad, and the structure covers a correspondingly broad area, — but it does not lack point. The columns and pillars of Greece and Rome have already largely fallen into decay, but forty centuries have not effaced the pyramids of Egypt. So he who has learned well the lesson of reserve force will stand while others around him are falling before the changing blasts of time. An awakened life is one that has been aroused to an adequate conception of the infinity of our human needs and possibilities. — *Address by Prof. B. G. Wilkinson.*

Every aid should be sought to deepen and strengthen moral conviction. A wise word, timely spoken, has saved men from the convict's cell. Sound advice is the rope thrown to those in the mire of doubt and despair. It is the stairway leading from danger. Appropriate sayings, smiles, bits of wisdom here and there, are the golden nails that fasten facts in the memory forever. Philosophers have dropped them all the way along. Yet all wise precepts are valueless unless practically carried into use, not for one day alone, but for every day. — *Susan H. Wixon.*

INTRODUCTORY NOTE.

As we introduce this new department in the EDUCATOR, it is proper to call attention to some particular reasons for it. In the September number it was said that the EDUCATOR "is not a stereotyped imitation of any other paper," that the classification and arrangement of its contents is a matter of convenience only, and that "we are free to modify it whenever we choose." It was also said that this journal is named "the *Christian* EDUCATOR because only a Christian education provides for *all* the educational needs of the individual and of society." This thought might have been extended and stated in a still more forcible way; but the EDUCATOR has sought to move only so fast as it could "carry all the people with it." In our announcement for the year, however, we have promised a consideration of "Educational Foundations in the Bible," the "Principles and Methods of Moral Education," "The Relations of Parochial and Public Schools," "Christian Education vs. Pagan Education," and other topics that will develop the fundamental principles and methods of all true education. We are convinced that the presentation of these subjects should begin at once. And we are also convinced that on reflection every reader of the EDUCATOR will assent to one or two fundamental propositions: First, the highest ideal of education is to develop unselfishness in the individual. In other words, the highest education is for *service*, rather than *self*. And the highest and most unselfish service is the service of God—through service to fellow man. Every Christian understands, then, that the highest motive for education is to qualify one's self for the best service of humanity. And this motive will suggest and shape the *kind* of education best adapted to the end sought in home and Christain schools.

These considerations may introduce the article which follows, and which we are glad to use as the first in this new department. The schools referred to in the article are home, private, or parochial schools, wherein the greatest freedom can be used in giving full effect to facts and principles drawn from the Bible. The article itself is written as a message of personal instruction to the teachers of these schools. The public schools can not, of course, teach or exemplify these principles as a regular part of their work, and this department should not be regarded as dealing with the public-school system. EDITOR CHRISTIAN EDUCATOR.

PRACTICAL MISSIONARY WORK, A BRANCH OF TRUE EDUCATION.

BIBLE study is to lie at the foundation of all true education, but more, far more, than a mere theoretical knowledge of Bible truth is required. It is not enough to fill the minds of our students with precious lessons of the deepest importance, and then leave lesson after lesson unused. Missionary work should be done by suitable ones, that they may learn to impart that which they have received. Those to whom light has been given are not to seal up the precious ointment, but are to break the bottle and let the fragrance be shared by all around. There are those among our students who have precious talents. Our Counselor says, "Let the talents be put out to usury."

It is necessary to the best education that we give the students time to do missionary work, time to become acquainted with the families among whom they live. They should not be loaded down with all the studies they can carry, but should be given time to use the knowledge they have acquired. They should be encouraged to do faithful missionary work, by becoming interested in those who are in the darkness of error, taking to them the truth where they are. With all humility of heart, seeking knowledge from Christ, praying, and watching unto prayer, they may make known to others the truth that is placed before them day by day.

Those who do this work will find many, both old and young, who are full of hereditary prejudice, who hate the truth because of a misconception of its character. As these become acquainted with those who know and practise the truth, they will see their own errors, and though wrath and spiteful passions may appear to be cherished, friendly intercourse will change these feelings. A thick veil of prejudice blinds many minds. They need love and pity and the holiness of truth.

The teachers and students in our schools need the divine touch. God can do more for them than he has done, but in the past his way has been restricted. If a missionary spirit were encouraged, even though it took some hours from the program of study, if there were more faith and spiritual zeal, more of a realization of what God will do, much of heaven's blessing would be given them. There are holy chords yet to be touched. Teachers as well as students need to show greater teachableness. Just in proportion to the true missionary

spirit that is brought into the education and training of the youth, will be the blessing bestowed. Students should begin to work in missionary lines, they should learn to take hold of Christ, while connected with persons of broad experience, with whom they may counsel and advise. As they do this, they will not only advance in knowledge and intellectual power, but will learn how to work, so that when the school term is ended, and they are separated from teachers and experienced advisers, they will be prepared to engage in earnest missionary labor, working under the direction of the greatest Teacher the world has ever known. It is as essential that they should know how to communicate, as that they should receive, a knowledge of the truth. The practise of telling others about Christ, of reading and explaining his word, will stamp that word on the mind, and make the truth their own.

"Thou shalt love the Lord thy God with all thy heart . . . and thy neighbor as thyself." This is God's command. Jesus has given an additional requirement. "A new commandment I give unto you, That ye love one another; *as I have loved you*, that ye also love one another." Man never knew the strength of that love until Christ came to this earth and gave his life for sinners. "Greater love hath no man than this, That a man lay down his life for his friends." We are not merely to love our neighbor as ourselves; we are to love one another as Christ has loved us. "As the father hath loved me, so have I loved you," he declared, "continue ye in my love. If ye keep my commandments, ye shall abide in my love, even as I have kept my Father's commandments, and abide in his love. These things have I spoken unto you, that my joy might remain in you, and that your joy might be full. This is my commandment, That ye love one another as I have loved you."

The students and also the teachers in our schools need to take time to become acquainted with the members of the community in which they live. The love that Christ has manifested toward us, we must cultivate for others. The truth will not long remain in the heart unless it works by love to save souls that are ready to perish.

God does not want our schools to be conducted on stereotyped, human plans, as many are now being conducted. He would have us beware of human precision, of making a line on which every one must tread. A different element must be brought into our schools. Wrong maxims and methods of teaching, which have been looked upon as wholly essential, have been followed. Those who are connected with our schools must penetrate deeper than their own habits or opinions, which have been esteemed as good authority. There must not be so many studies and duties placed on the students that they will neglect to talk with the great Teacher, the Lord Jesus Christ, and let into their hearts the softening, subduing influence that dwelt in him. It is essential that students be taught, not only by pen and voice, how to do missionary work, but also by working with them in various missionary lines. All about us there are persons who need to be taught how to cook and how to treat the sick. By engaging in these lines of work, we practise the truth as it is in Jesus. Teachers and students need to study how to engage in this work. The teachers should take students to places where help is needed, giving them practical instruction in how to care for the sick.

The teachers must draw from the deep, central source of all moral and intellectual power, asking the Lord to give them the mind that was in Christ Jesus, that every case that calls for sympathy and help, in physical as well as spiritual lines, may receive their attention. Teach the students to make a practical application of the lessons they have received. As they witness human woe, and the deep poverty of those whom they are trying to help, they will be stirred with compassion. Their hearts will be softened and subdued by the deep, holy principles of the word of God.

The great Physician co-operates with every effort made in behalf of suffering humanity, to give light to the body, and life and restoration to the soul. And why is this? Satan came into our world, and led men into temptation. With sin came sickness and suffering, for we reap that which we sow. Satan afterward caused man to charge upon God the suffering which is but the sure result of the transgression of physical law. God is thus falsely accused, and his character misrepresented. He is charged with doing that which Satan himself has done. God would have his people expose this falsehood of the enemy. To them he has given the light of the gospel of health, and as his representatives they are to give the light to others. As they work to relieve suffering humanity, they are to point out the origin of all suffering, and direct the mind to Jesus, the great Healer of both soul and body. His heart of sympathy goes out to all earth's sufferers, and with every one who works for their relief, he co-operates. As with his blessing health returns, the character of God will be vindicated, and the lie thrown back upon Satan, its originator.

We must give the Lord a chance to do his work, his great work for the soul. Christ is our sufficiency. Each one of us must understand what it means to have the word of God fulfilled in us. As Christ was in this world, so we are to be. If in this life we are like him in character, we shall in heaven have his likeness. If there is no likeness between Christ and us in this world, there can be no fellowship between us when he shall come in his glory and all the holy angels with him As religious teachers, we are under obligation to teach our students how to engage in medical missionary work. Those who do this work have many opportunities to sow the seeds of truth in a way that will be successful. A heart full of gratitude to God can pray, "Teach me thy way, O God, lead me in a plain path because of mine observers."

There is a work to be done all about our schools. If we are light-bearers to the world, we are pledged to teach the students how to communicate light, and to give them an opportunity to work. We are to give the invitation to the supper, for it is glad tidings for all people. Let all who are qualifying themselves for this work spend much time in prayer. Let them contemplate their duty in the light of the word of God. We must now see what can be done to educate the students in practical missionary work, so that they can impart to others that which they have received. Who will devote a portion of his time to this work? Remember, Christ is the Prince of life, the rightful Sovereign of all the byways and hedges, and he knows what they need.

God has placed on us a burden of responsibility that we do not recognize. We must learn deeper lessons in the school of Christ. We can do much in his strength. He would have us teach the students how to take up the work he has left them to do, that they may not lose the spirit of the work by too close an application to the theory of the truth. It is an intelligent knowledge made perfect by practise that makes an efficient worker.

"This gospel of the kingdom must be preached in all the world for a witness to all nations: and then shall the end come." "All power is given unto me in heaven and in earth," Christ declares. This power he is ready to transfer to those who will co-operate with him in self-denial and self-sacrifice. We must without delay open a way that this branch of education may be developed. The students must be given special opportunities to do missionary work, that they may place themselves in the channel to receive and impart light. They must make known the truth that has made them children of God.

If we believe the word of God, our greatest aim and object should be to educate and train young men and women to go forth and do missionary work. Thus they can use the truth that has been so faithfully presented to them. As they visit families, the precious truths they have heard, the drill they have had on Bible themes, will be brought to their minds. As they read and explain the word, "the Comforter, which is the Holy Ghost, whom the Father will send in my name, he shall teach you all things, and bring all things to your remembrance whatsoever I have said unto you." In this way not only will those who know not the truth be encouraged, but those who are telling the preciousness of Christ will be greatly blessed.

ELLEN G. WHITE.

AN AGNOSTIC ON THE BIBLE.

MY belief is that no human being, and no society composed of human beings, ever did, or ever will, come to much unless their conduct is governed and guided by the love of some ethical ideal. And if I were compelled to choose for one of my own children, between a school in which real religious instruction is given and one without it, I should prefer the former, even though the child might have to take a great deal of theology with it. I have always been strongly in favor of secular education, in the sense of education without theology; but I must confess I have been no less seriously perplexed to know by what practical measures the religious feeling, which is the essential basis of conduct, was to be kept up, in the present utterly chaotic state of opinion in these matters, without the use of the Bible. Take the Bible as a whole, make the severest deductions which fair criticism can dictate . . . and there still remains in this old literature a vast residuum of moral beauty and grandeur. And then consider the great historical fact that for three centuries this book has been woven into the life of all that is best and noblest in English history; that it is written in the noblest and purest English, and abounds in exquisite beauties of mere literary form; and finally that it forbids the veriest hind who never left his village, to be ignorant of the existence of other countries and other civilizations, and of a great past.—*Thomas H. Huxley.*

THE MOTIVE AND SOURCE OF EDUCATION.

In the preceding article in this series it was said that "through the mind we gain our conceptions of moral responsibility, and are able to use all the powers of a trained body and a cultivated intellect in the discharge of our broadest and highest obligations." If this proposition is true, then the constitution and proper use of the mind is the most important concern in education. What the mind is, and what are the laws of its development and operation, become the most important questions for the student and the teacher. "Modern psychology" undertakes to answer these questions; but its most ardent devotees are compelled to admit that little or no certainty has been reached in their final conclusions. It is unnecessary to cite quotations in proof of this statement; they abound in all the latest and most candid works on the subject. Any one who is familiar with these books can readily select these admissions; any one who is not familiar with them would probably not be benefited by short quotations taken away from their context.

A more promising study, then, may possibly be found in approaching this subject from a different point of view. The object, or the result to be reached, in education must determine the kind of education to be given. The beginning, and the whole course, is to be guided and illuminated by the beacon set at the end. If the object of mind-study, of education as a whole, is better to discharge our broadest and highest obligations, we must first know what these are.

We are pointed to this same conclusion by an authoritative definition of education that appeared in the same number of the EDUCATOR already referred to: "Education is but a preparation of the physical, intellectual, and moral powers for the best performance of all the duties of life." What are the *duties* of life, — that is, What is the highest object of education?

The professional man, the politician, the merchant, the scholar, would each read his answer through the glasses of his own personal point of view; probably the majority would agree that the main object of education is to make the most of one's self and one's opportunities. Perhaps some would rise to a higher conception. But the Christian must answer that the highest object of education is *service* — service of the Supreme Upholder and Ruler of all men. God does not *need* any service, even the highest, to be rendered directly by us to him; but *we* need to be animated by the spirit of highest service that can be rendered to God, through service for our fellow man. When we can rise to this conception, and this experience, then we can understand the highest object of human education. When we have the mind of God we can understand all we need to know concerning the human mind and its right relation to our physical and moral powers "for the best performance of all the duties of life."

In the light of this conception it would be one of the most important duties of the educator to become informed upon the nature of the human mind, as it is; in order to be of the highest service in the right development and training of his pupil's mind. The laws of mind, like the laws of physiology or any other branch of science, are natural laws, universal in their operation. For example, it is a law of the mind, universally operative, that it tends to become like that on which it dwells most. A mind that is continually occupied with base and evil subjects will become evil; a mind occupied with pure and elevated themes becomes ennobled. When we have discovered and studied this and all the other laws of mind, we shall have learned, perhaps, all that can be known about the mind itself. At least, the full understanding of the ultimate nature of mind must be approached through previous study of the known laws in accordance with which it grows and acts.

Nearly all psychological study has been introspective; the mind has sought to look in upon itself and thereby to discover its own nature and phenomena; but, as so many psychologists have pointed out, the instant the mind begins to study the natural progression of its own phenomena, that instant the natural progress of the phenomena ceases, and the attempt is as unproductive as trying to lift one's self by his own boot-straps. Yet the most recent efforts of current psychology to make progress in the science by studying the mind-operations of lower animals, of children, and of other men, must all come back to this same baffling act of introspection in order that the things observed may illustrate, or be identified with, our own individual mental experience.

It would seem to be self-evident, however, that the mind can not separate itself from itself, as subject from object,—stand off from itself and look at itself,—and at the same time continue its own normal activity beneath the focus of its own attention. What the mind needs for its own study is *another mind* with which to do the studying. And the best possible mind for this is the mind of God who made our minds what they are. For a Christian, for any one who believes in a God eternally wise and eternally good, to ignore what God may have revealed concerning the nature and workings of man's mind, is to shut himself off from the Source of highest wisdom, and practically to deny the existence of any power above his own intellect. To the Christian educator the Bible is the revelation of all that is needful to guide man in the study of what he needs to study. If it is important to study psychology as a better preparation for the best performance of all the duties of life, then we may expect to find in the Bible some general principles and facts belonging to this subject. And all should be willing to concede that it is at least possible through a study of these to learn some things that are not to be discovered from other books.

This article may be considered merely as an introduction to others that will follow on the subject of "Bible Psychology." It is hoped that they may be of great value to every reader of the CHRISTIAN EDUCATOR. F. W. H.

EDUCATIONAL REFORM.

UNDER this title, which is perhaps not the very most appropriate, the *Youth's Companion* makes some excellent suggestions concerning the hearing and eyesight of students. Books should be printed on heavy unglazed paper, in clear type, with plenty of white space between the lines. This, with the proper seating of students suffering from defective hearing or vision, will do much to relieve and prevent injurious strain.

But the most satisfactory arrangement is to submit every scholar at entrance to a rigid examination as to his seeing and hearing abilities, and to prescribe the proper and most favorable conditions under which he may pursue his studies. And since defects may arise at any time during the course, it would not be amiss to offer the benefit of an examination also at the close of each term or of each year's work, before the pupil is allowed to enter a new class.

SALEM, ARK., Sept. 25, 1898.

To the Editor:

I think your paper is a grand success. Shall be glad to use sample copies.

PLEASANT OLIVER.

The Reading Circle

[THIS subdepartment is maintained as a guide to independent or reading-circle study for parents and teachers. This year the work is based on Professor Hinsdale's "Jesus as a Teacher" and "Horace Mann and the Common School Revival in the United States." The first must be of positive value to every teacher who agrees in the world's judgment that Jesus was the greatest teacher that has ever appeared in history; and the second should be of particular value to every teacher in American schools; both are among the latest and best products of the author's long-continued service in public educational work. See special notice on last cover.]

"HORACE MANN."

CHAPTER II. HORACE MANN'S FORERUNNERS.

1. *Pioneer Writers and Topics.*— Elisha Ticknor; Denison Olmstead; "Connecticut School Fund;" "Suggestions on Education;" Samuel R. Hall; "Plan of a Seminary for the Instruction of Youth;" James G. Carter: "Outlines of an Institute for the Education of Teachers:"—its four essentials: "Letters to Prescott;" "Essays upon Popular Education:" Walter R. Johnson; President Junkin: Dr. Philip Lindsley; Governor Clinton; Bell and Lancaster's Plan; Maclure's Study of Pestalozzi; Joseph Neef; "A Year in Europe;" Murray's "Germany;" Professor Stowe's Report.

2. *Educational Organizations.*— The Middlesex County Association: The American Institute of Instruction; The Academic Institute; The College of Professional Teachers.

3. *Educational Journals.*— The Academician; The American Journal of Education; The American Annals of Education and Instruction.

4. *Educational Inventions.*— The cotton-gin, weaving and spinning machines, steam-engine, steamboat, locomotive, telegraph: popular literature.

"JESUS AS A TEACHER."

THE EDUCATION OF JESUS. II.

1. *Topics.*— "The House of the Book;" The Law of Moses; First Hebrew Writing; Parents as Teachers; Ecclesiastical Discipline; The Kings and Prophets; The Babylonian Captivity: Ezra—the New Order; The Mother's School; The Yearly Feasts; The Father's Duty: The *Shema;* The *Gnome;* The *Chazzan;* The *Mishna;* The Pentateuch, Prophets, Hagiography, and the Talmud; Jewish Education Intensive: The Synagogue Service: The Septuagint and Targums: Josephus; Philo; High Position of Teachers. Jesus' Familiarity with Reading, Writing, Aramaic, All the Scriptures, Tradition, Rabbinical Exegesis, possibly with the Greek Language.

2. *Special Quotations.*— "The Hebrew race is the strongest, the most steadfast, the most persistent race; and the causes are found not so much in its original qualities as in the character of its legislation and the course of its history. . . . Looking merely to strength and permanency of results, better educational material than lay at the hand of the Jewish teachers can neither be found nor imagined. . . . Considered as instruction the Jewish system strongly appealed to every faculty of the soul at every stage of its development. . . . Jewish education began with the mother."

(See questions on page 46.)

THE SCHOOLROOM

MAXIMS.

It requires the best talent to teach children.

If you would succeed, be a student yourself.

If your school is not a success, it is your own fault.

School-teachers should never be merely school keepers.

Attention is a result of good teaching, and not a means.

Keep a clear conscience, and remember the Golden Rule.

LETTER COMPOSITION.

The following questions on letter writing are suggested in *The School News*. Get them answered correctly.

1. When do you end a letter "Very truly yours"? When "Very respectfully yours"?

2. When may we use abbreviations in the date and address, and when not?

3. How do you punctuate the place and date of a letter?

4. When should the date come at the end, and how should it then be written?

5. In what sort of a letter is the address of the one to whom it is written placed at the head of the letter?

6. What are the advantages to the reader [and writer] of good mechanical form?

7. How are paragraphs indicated to the eye?

SOME FACTS ABOUT THE PHILIPPINES.

Oiled rags are used for brooms.

Cattle are no larger than goats.

Women exceed men in numbers.

Hats are worn only by foreigners.

All the women smoke large cigars.

The natives bathe three times a day.

Water buffaloes are used for plowing.

Manila was founded by Legaspi in 1571.

All the inhabitants fall asleep at midday.

Electricity is used for lighting in Manila.

Knives and forks are unknown among the natives.

The common laborer receives about ten cents a day.

Manila is pronounced "Mah-nee'-lah" by the natives.

A fashionable delicacy for the menu is the grasshopper.

The poorer classes robe themselves in one yard of cloth.

The streets of the capital city are under water much of the time.

Manila is considered commercially equal to Calcutta and Batavia.

ANOTHER ILLUSTRATION.

Here is another illustration of the wrong notions children frequently get from a formal study of physiology; it comes from the examination papers of a Western school student recently: —

"The human body is divided into three parts — the head, the chest, and the stomach. The head contains the eyes and brains, if any. The chest contains the lungs and a piece of the liver. The stomach is devoted to the bowels, of which there are five — a, e, i, o, u, and sometimes w and y."

A PUPILS' READING CIRCLE.

Most teachers understand the value of professional and general reading for themselves; fewer appreciate their responsibility to influence and direct the reading of their pupils in the best channels. We copy the following excellent suggestion from the *School Record:* —

Have the whole school, some evening, put away their books about ten minutes earlier than usual and then pass each pupil a slip of paper, and after he has written his name have him answer these questions: —

1. What book or books have you read?
2. If you have read any books, which do you like best?
3. What papers do you read?
4. What magazines do you read?
5. Do you know of any book that you would like to read?

Give plenty of time to answer these and then take up the papers, classify the answers carefully and form your resolutions as to what is your duty in regard to those children. Do not stop at resolutions, go on to some action and do your duty. Provide good, wholesome interesting reading-matter for those children, even if you have to get up an evening's entertainment to raise the needed funds.

Try this plan, and after securing this data, if you are still in doubt what to do, let the Educator send you a few suggestions by letter.

THE ART OF ATTENTION.

THERE is always a good reason for the pupils being more attentive in one school than in another.

President Garfield, while a teacher in Hiram College, was once asked by a young teacher the secret of the art of holding the attention of pupils; and his answer was: "See to it that you do not feed your pupils on cold victuals. Take the lesson into your mind anew, rethink it, and then serve it hot and steaming, and your pupils will have an appetite for your instruction and you will have their attention." — *Northwest School Journal.*

AN OBSERVATION - MEMORY LESSON.

PROBABLY no object seems more familiar to the children in the public schools than the American flag; and yet we doubt whether many of them have ever *studied* the "Stars and Stripes" very carefully. Here is a good test on the accuracy of observation and memory: Sometime when the children are tired with study, have all the books laid aside, and provide each with a blank slip of paper. Have them write across the tops their names and grades; then dictate the following questions, having each answer neatly written without consulting any book, picture, or person during the exercise or just before: —

How many stripes are in the flag?

How many are red? White?

How many short stripes opposite the blue field?

How many of these are red? White?

Is the uppermost stripe of the flag red, or white? The lowest stripe?

Is the first stripe below the blue field red, or white?

Is the field longer up and down, or horizontally?

How long is the field compared with the long stripes? How wide?

How wide is the whole flag compared with its length?

How many stars in the field?

How many horizontal rows of stars?

How many stars in each row?

[In order to increase interest in the exercise above, which is original with the EDUCATOR, we will send the CHRISTIAN EDUCATOR and the *Youth's Instructor* free for six months to the first school that sends us the best set of answers to these questions,— the *Instructor* for the pupils' library and the EDUCATOR for the teacher. The school must be below the high-school grades, and the teacher must certify to the accuracy of the test. Enclose one or two stamps for any necessary correspondence. Try this plan for getting two excellent magazines for your school. Send for sample copies. Address EDITOR CHRISTIAN EDUCATOR.]

AN ATTRACTIVE SCHOOLROOM.

1. A clean floor.
2. Clean windows.
3. Clean blackboards.
4. Clean crayon racks.
5. Good mottoes well hung.
9. A well-kept teacher's desk.
7. A well-filled bookcase, well kept.
8. A room well dusted every morning.
9. Whole, neat curtains, evenly drawn.
10. A well-covered and adorned "mantel."
11. As good a "center table" as at home.
12. Whitened, papered, or frescoed ceiling.
13. Tidy walls, whitened, tinted, or papered.
14. Good pictures of great men, well hung.

— *School Record.*

NOTES ON ENGLISH.— NO. 2.

"INDEBITEDNESS."— This is a new word that recently appeared in a Michigan school paper. Perhaps it was only a typographical error; at least, it is not recognized by any of the standard American dictionaries. We have *debit*, *indebtedness*, and even *indebtment;* but not "indebitedness." Such forms should not be encouraged.

NUMBER IN COLLECTIVE NOUNS. — "The wages of sin is death," is a Biblical expression that has doubtless struck many as ungrammatical; perhaps it has even been used by objectors as an illustration of the ignorance of Bible writers; but the expression is strictly legitimate, even when judged by the most accepted rules of modern grammar. "Wages" is a collective noun equivalent to pay, compensation, or reward; and the reward of sin is death. Notice that we say "wages is a collective noun," — no one would insist that we ought to say instead that "wages *are* a collective noun," In all such cases the words "money," "wages," etc., are collective terms signifying a *unity* of parts rather than the *parts* — dollars or sheckels — separately. Their grammatical number, as indicated in the predicate-verb, depends entirely upon the point of view. We may say, "The congregation was seated," or "The congregation were seated," according as we mean to indicate the company collectively or individually. On the same principle, *The Inland Printer* affirms the correctness of this sentence: "A body of poems has come from her pen." The reference is to the collection as a whole, rather than to the individual poems. If we substitute *volume* for "body," or *poetry* for "poems," this becomes self-evident. Yet if the reference were primarily to the separate poems, it

would be entirely proper to say, "A great number of poems have come from her pen."

ANOTHER APPLICATION of this principle is illustrated in such cases as this: "Intensity and force are what is needed." The "what" sums up the "intensity and force" into the *one* thing that "is needed." It is possible to make a fine discrimination between *intensity* and *force*, but they may be considered as one thing in this light: "What is needed is intensity and force." And when we have attained that particular point of view, that is, when we regard "intensity" and "force" as synonymous terms used not to *duplicate* but to *intensify* each other, then it is grammatical to go right to the point with,—"Intensity and force is needed." In a similar sense we say, "Bread and butter is good," not "are good."

In short, grammar is the art of correctly using words to express the meaning intended. The science of it is merely knowing the uses, names, and relations, of the various kinds of words that must be employed in accurate expression. Grammar is simply "common sense" — *after* you *know how;* the *knowing* is the science, the *how* is the art.

WORDS ENDING IN ING.—There are four kinds of words that end in *ing*. They are exemplified in the following four sentences:—

He heard a *moaning*.

He spoke in a *ringing* tone.

Whistling a tune, he went to his work.

Splitting wood is a healthful exercise.

[We will send the EDUCATOR free for six months to the first teacher who sends the most accurate and concise grammatical description of each of the italicized words in the four sentences above, making clear the characteristics that distinguish each word from the others. This will be published in our next issue with the name of the writer. Along with the responses to this proposition the EDUCATOR would be glad to receive any notes or suggestions on arithmetic, introductory geometry, geography, history, and other studies commonly connected with the work in the English. Items from the personal experience of successful teachers are always refreshing and interesting to other teachers who read the EDUCATOR. We repeat one standing invitation, Let us hear from you. Address EDITOR CHRISTIAN EDUCATOR.]

BOYD INDUSTRIAL SCHOOL. ASHVILLE, N. C.

To the Editor:

PIease send us instructions for disinfecting the schoolroom (September EDUCATOR, page 13). We find the CHRISTIAN EDUCATOR a most valuable help in our work.

BERTHA S. CHANEY.

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 schools or individuals.]

1. What is?—pharmaceutical chemistry, a "moonlight" still, an agnostic, oxygenation, external and internal respiration, the value of a sheckel, franc, crown, florin, shilling.

2. Who is?—your Congressman, State senator and representative, U. S. senators, superintendent of the Chicago public schools, ruler of China, Li Hung Chang, Wilhelmina.

3. Distinguish between—germ, spore, fungus, bacteria, microbe, bacillus, and infusoria; between captain, colonel, brigadier-general, and major-general; between gender and sex.

4. Pronounce—vagaries, respiratory, psychology.

5. Derivation of?—dormitory, introspection, epidermis, epiglottis, mediocrity, pandemonium, bedlam, case (grammatical).

6. Meaning of?—utilitarianism, valetudinarianism, mandibles, racemose, infundibulum, dowager empress, adolescence. Is a "personal pronoun" one that signifies persons only? Does a "common noun" mean the name of common, familiar objects only?

For Teachers.—(Continued from page 43.)

ON "HORACE MANN."

5. *Questions.*—Who was the first American to attack the classics? Who conducted the first American school for normal instruction? What was the first book on the subject? Who was the "Father of Normal Schools"? How does he describe the three grades of teachers? Who were the first examiners? What was the "Monitorial System"? Whose husband was Professor Stowe? Under what influence did the teachers' institute originate? What is the meaning of "comeouterism," Brook Farm, Fourierite phalanxes, and "the yeasty condition of the times"?

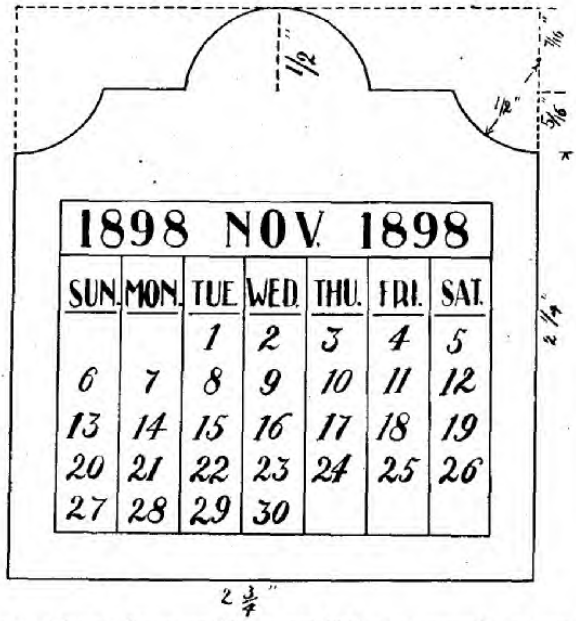
ON "JESUS AS A TEACHER."

3. *Questions.*—When did Jewish history begin? When was the Babylonian Captivity? What was a "Taph"? The "Feast of Esther"? The Hagiography? The Talmud? "The LXX"? Who was Josephus? Philo? Timothy? Show that Jesus was familiar with reading and writing; that "The whole [national history] formed the very best body of material for the purposes of child-nurture fonnd in any language;" that "The home, the school, and the synagogue reinforced one another;" that "In no other country has teaching ever been so much magnified as in Judea."

Conducted by A. J. Bristol, A. B.

EDUCATIONAL HANDWORK.—NO. 4.

In order that handwork may be truly educational, it must proceed upon sound principles of mind development. And now, having given direction for several exercises, involving the work of cutting to straight lines and convex curves, we may next consider the rather more difficult work of cutting to a concave curve, preparatory to some



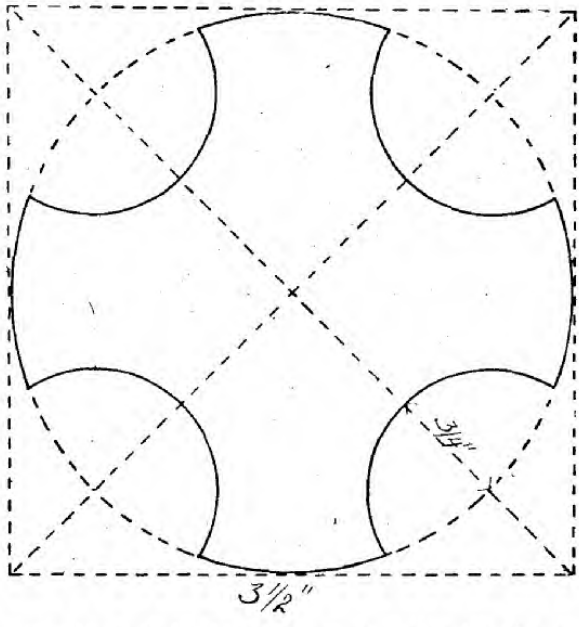
exercises whose outlines exhibit compound curves. Of the four models shown this month, I have selected the little calendar back for the first, as it involves the greatest repetition of preceding exercises, with but a slight concave curve,—the new step thus being easy to take.

By this time, the pupils will have become somewhat wiser by their experience with knife and wood, so the teacher will have no difficulty, by a few wisely put questions, in getting them to see whether to follow the same plan as before in drawing the complete outline at once on wood when making their mechanical drawings from the freehand sketch. Liability to error in the first attempt at cutting to a straight line, should indicate that only one be marked out before whittling to it.

The piece of wood should be at least three and one-half inches each way. Let the pupils cut lengthwise of the grain to a straight line, as near the edge as practicable. They are ready now to use the paring cut to a straight line, two and one-quarter inches long, drawn at right angles to the first side. In the same way have them make the other end two and three-fourths inches distant, and parallel to the first. A few suggestions as to how the pupils may mark out upon wood the outline of the top, may be helpful.

With a sharp pencil continue the end lines at least an inch, and midway between them draw another short line parallel to these two. Now with the pencil draw two lines parallel with the first edge obtained, and respectively two and nine-sixteenths inches, and three inches, from it. With the compass set at one-half inch, draw the arcs of the circles whose centers are in the lines indicated. When whittled to the outline, it is ready for the calendar to be tacked on.

This exercise of making a calendar for some month, can be made an excellent one in careful measurement. And the question of which way the grain of the wood should run to produce the greatest strength in the weak place, and at the

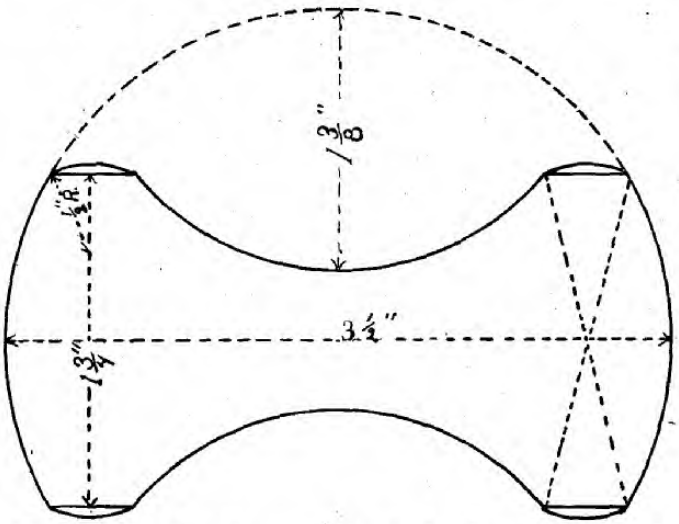


same time not be too difficult to cut, will, if propounded long enough beforehand, furnish considerable food for thought.

To make the twine-winder, it will be necessary to have it entirely marked out before beginning to

cut. First mark off a square on the wood three and one-half inches in diameter, and between opposite corners draw the diagonals. The center of a three-and-one-half-inch circle will be where these cross, and where its circumference cuts the diagonal lines will be the centers of four three-quarter-inch circles, whose arcs form part of the outline. In cutting to these inner, or concave curves, it will be necessary to use a small blade of the knife, or to cut near the point of a larger blade.

The next winder shown is in some ways a simpler model than the preceding, and is designed as supplementary work for fast-working pupils rather than work required of all. The exercise may be varied according to the needs of the individual pupil. For those needing to develop painstaking effort, it will be best to use it as drawn; but for some who might become discouraged in trying to make the drawing come right, it will be wise to let them have the winder only one and three-fourths inches broad at the ends, and cut there to a straight line. Just a suggestion or two is offered as to drawing this, which like the preceding will need to be all outlined before whittling.

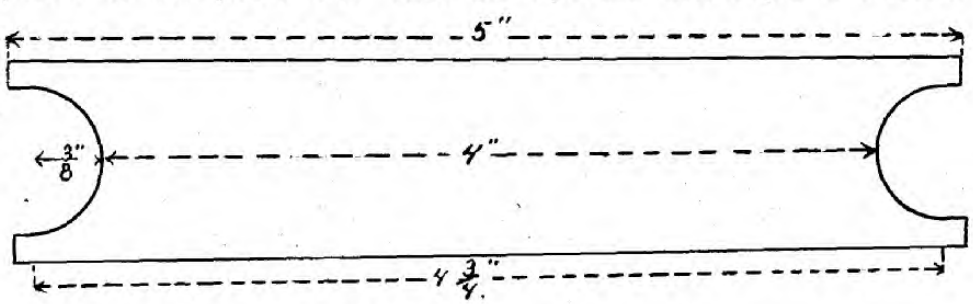


After drawing the circle three and one-half inches in diameter, make the short parallel lines one and three-fourths inches apart. Then draw the intersecting arcs with a radius of one and three-eighths inches. Diagonal lines drawn from these points of intersection will cross in the diameter of the large arc, and will assist in locating the centers of the small circles whose arcs complete the outline.

The last model shown is so simple that it will be necessary to say but little about the work. The reason for putting it last is solely because of the difficulty in cutting smoothly to these small concave curves. It will take a sharp knife and some care to do it well. To be able to give direction to the children that will be of most service to them, it will be best for the teacher in this case, as in all others, to make one or more of the models himself. From my own experience I would suggest that the end be notched in as far as convenient, then cut down as far only as the line is straight, removing the shavings by a cut at right angles to the grain. The curved portion would best be cut by working from the center of the piece around toward each edge instead of attempting to cut the whole curve. Query: why does it work best this way.

In whittling work some difference of interest may be manifested on the part of boys and girls, according as the things made pertain to the characteristic work or sport of the respective pupils. One way to equalize the interest is by encouraging a spirit of helpfulness on the part of all. Let the boys see that it is a good thing to make a yarn winder for sister or mother, and the girls may make the fishline winder for a brother who may not have the chance to make such a thing under direction.

These simple exercises will not furnish work enough for a month's mechanical work, unless there is only one lesson or two a week. But it is hoped that they will furnish suggestion sufficient to develop abundant simple exercises. Any who may be following this series of articles, either practically or in your minds only, will please send in drawings or descriptions of exercises you have used in addition to these already suggested. Due credit will be given for any such received. We wish to make this department more helpful each month.



BEST SOIL CONDITIONS.

In connection with the sowing of the winter wheat it is a good time to study what conditions of the soil are most favorable for the germination and rapid growth of the seed. Conditions that are good for wheat are also favorable for many other seeds. The secret of successful preparation is in the proper "fining" and "firming" of the soil.

The middle of a roadbed is sufficiently firm, but permanent cohesion between the particles of earth prevents the spreading of the rootlets from the seed. On the other hand, a soil may be so loose and mellow as to lack the adhesion between the particles that would conduct moisture by capillary attraction. The best condition is that which gives sufficient mellowness to be easily traversed by the smallest rootlets, and yet firmness enough to conduct water readily without too rapid evaporation from the surface. The philosophy of the whole subject may be easily understood by considering the following illustrations which we borrow from *Vick's Magazine*.

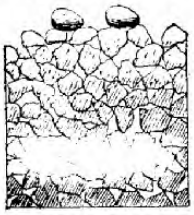


FIG. 1.

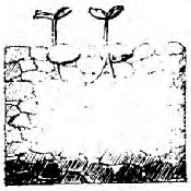


FIG. 2.

Figure 1 shows two seeds lying on the surface of a soil that is too porous to conduct moisture from below and is readily dried out at the top. Figure 2 shows the same seeds trodden down by the foot. The soil is now compact enough to conduct moisture and prevent rapid evaporation. This kind of surface sowing is much the best for many kinds of small and delicate seeds that would almost certainly fail to germinate if covered with the soil; but surface sowing is, of course, not proper for all kinds of seeds.

Figure 3 shows the seeds sown at the right depth, for most kinds, but the soil is too loose. Figure 4 shows the right conditions of soil, depth, and firmness. One writer suggests that on the average, the best depth for such sowing is probably in a layer of soil equaling in thickness twice the diameter of the seed. Figure 5 shows the soil

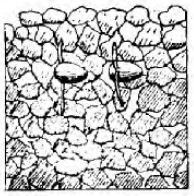


FIG. 3.

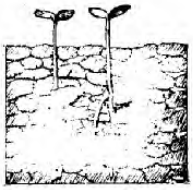


FIG. 4.

properly pulverized and compacted, but the seed embedded too deeply. Figure 6 shows the seeds at the right depth, and the soil compact enough, but unpulverized and almost impenetrable to heat and moisture. Figure 7 shows the disadvantage of a surface crust caused by a heavy rain, or too free

FIG. 5.

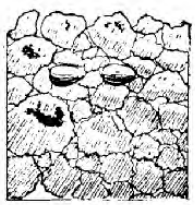


FIG. 6.

use of the water-pot, afterward baked down by the sun. The breath of the seed is cut off and unless the crust is speedily broken up, the chances are small that the plant will ever see the light. Figure 8 shows the advantage of a light mulching, which prevents baking and rapid evaporation while freely conducting the air. Figure 9 shows the folly of sowing seeds to rot in a saturated soil that can not be properly drained.

FIG. 7.

FIG. 8.

FIG. 9.

These illustrations show the importance of little things in seed sowing and soil preparation. Attention to such little things makes the difference between intelligent, successful farming and "bad luck;" and the fundamental principles of soil and seeding can be easily illustrated and taught by wide-awake teachers to growing boys and girls in every school in the land. Try it. F. W. H.

THE SCHOOL AND THE HOME.

THE school has a purpose of which all pupils are more or less conscious. Each individual child has a right to what the school can give him. Justice demands that he shall not be deprived of this right, and that he shall not deprive others of their rights. The deepest principle of the government of the school is justice. In order that each shall get what is due, there are certain laws of punctuality and regularity of attendance, of order, of decorum, of non-interference, of industry, and the like that must be obeyed. They are the laws that belong to a school in its very nature, and are not imposed from without. Home life would be intolerable if regulated by the laws of the school. And so, too, would the school become intolerable if the wide range of impulse and caprice proper to the home were extended to the school. The child first learns in the school the "thou-shalts" and "thou-shalt-nots" which social order imposes upon its members in order that the purposes of society may be realized.

It is because parents and teachers do not clearly see this distinction between the purposes and methods of school-life and of family-life, that most of the conflicts between parents and teachers arise. The teacher often exalts a non-essential rule of order into an essential law of the school, and subjects himself to just censure without being able to see that it is just. The parent often demands for his child in school the same freedom from restraint that the home allows, and thus invites just censure without being able to see that it is just. What all good people desire is to have justice prevail. If the home and the school shall form a closer union, all conflicts arising between them will soon disappear through a fuller knowledge by each of the other.—*School and Home Education.*

WHERE THE BEE SLEEPS.

OBSERVE on a summer's evening how the bees act, and then go and do likewise. Wearied by the heat and labor of the day, they slumber peacefully in the calyx of the flowers. The latter inclose them with their tender petals, and the gentle whispers of the evening zephyr rock the reposing and well-secured insect on its balmy couch. How sweet the rest!

So do thou also slumber in the calyx of the Rose of Sharon. Forget thyself in thinking of Jesus. Be he thy all, and his promises and merits the covering over thee and the pillow beneath thy head. O then, what does it matter if the tempest howls without, and croaking night birds flutter round thee? Soft is thy couch, and the banner over thee is love.—*Bishop Wilberforce.*

MOTHERHOOD.

THE training for motherhood must include more than a knowledge of housekeeping. Home making is housekeeping and a great deal more, and since man is more than body, the parents of children must be prepared to care for and educate more than body.

The mother's work has sometimes been thought to consist of care for the material comfort and welfare of the child, the teacher's work has sometimes been thought to consist of care for an intangible something called the child's mind. Modern science and modern education insist upon regarding the child as a whole to be developed in his whole nature, physical, mental, and moral. Hence it is absolutely necessary for both mother and teacher to broaden the scope of their work and the preparation for it.—*Cora S. Brown.*

MAKE THE CHILDREN HAPPY.

RIGHT feeling is necessary for true thinking; it is only when the heart is joyous that the intellect does its best work.

The child depressed by discouragement, burdened with fear, wounded by injustice, or hungry for love, does not thrive either intellectually or spiritually, and the first aim of the parent or teacher must be to *see that the child is happy.* J. N. D.

A GOOD investment on a farm is a five-gallon can of boiled linseed oil, twenty pounds of Venetian red, and two or three paint brushes of different sizes. With these the sleighs, the running gear of the wagon, the plows, and the harrows may be kept repainted as fast as the old paint wears off. This will not be pretty, but it will save the implements.

IN the "Horticultural" column of a contemporary farm journal we notice directions for sprinkling and rinsing linen, ironing towels, cleaning black lace, washing silk handkerchiefs, making "chicken roly-poly," and using sprays of green peppermint for keeping ants out of the pantry. Verily, these "printers' errors" are sometimes very puzzling.

A STUDY IN FRUIT CANNING.

IT is always encouraging to find any school work being done that has a direct relation to practical life. Recently a graduate of the Michigan Agricultural College, Miss Amy B. Vaughn, after spending a year in special bacteriological studies, produced for her master's degree a thesis on domestic fruit canning. Here are the most essential directions in it: —

Look over your jars and see that the tops fit perfectly. Very often there is a dent in the lid, or some imperfection with the jar, which prevents a perfect fit. Be sure that there are no cracks in the lid, either in the metal or porcelain part, for if there are they furnish passage for mold spores and other living forms. After thoroughly washing the cans and tops, lay the cans sidewise in a pan of cold water, also place in this pan the tops and whatever other utensils you are to use. Place this pan on the stove and let the water come to a boil. This is to kill any life that may be present.

While this is boiling you can prepare the fruit. Whatever recipe is used, the general rules and method should be strictly followed. Have the best fruit possible, for then you will have fewer organisms to kill. Observe the utmost cleanliness in every part of the work. Clean your finger nails, wash the hands with soap and water, rinse them in water which has been boiled. Do not wipe them. This may seem a little thing, but it is important, for the cleaner the hands the fewer micro-organisms on them. Do the same with the utensils. Wash the outside of the fruit. After paring do not allow it to stand exposed to the air for any length of time, as the floating matter in the air is very likely to find a lodging place there. Exposure to the air also changes the color of the fruit. Cook only enough fruit to fill one or two jars at a time. In this way all can be thoroughly cooked. Bring the fruit to a boil; this will kill any living forms present.

When you are ready to fill the jar, draw the preserving kettle close to the pan of jars, empty the boiling water from the jars, and with the funnel taken from the boiling water pour in the fruit. Do not touch the inside of the funnel with the hands. It avails little even if you are particular about the jars but neglect to have all utensils thoroughly scalded. Now dip the rubber in the hot water, thus killing any life which may be on it, slip this over the jar, being sure that your hands are clean. Fill the jar to overflowing with boiling syrup. Run the handle of the spoon, which has been kept in the boiling water, around the inside of the jar to break any air bubbles which may be present. While the few germs in one or two bubbles of air would, in all probability, be killed in coming in contact with the hot syrup, yet it is best to take all precautions. After the rubber is on, pick up the lid from the boiling water. It will have a few drops of water clinging to it, but do not wipe this off. The water will not hurt the fruit. If you use a cloth to wipe it off you will contaminate the lid. Never allow fruit to stand a second in the jar without the cover. Invert the jar on the table and let it stand overnight. You will then be able to tell whether there is any leakage in the can. The next morning wipe off the outside of the can to remove any remains of the fruit. If any is left on, it serves as food for the growth of mold spores, and also for micro-organisms. As mold develops on the outside of the can, its fine filaments will run in under the lid and penetrate down to the fruit.

Wrap the jar of fruit in paper so as to exclude the light, which will fade the fruit and perhaps cause some chemical change in it. It does not matter where the fruit is stored, if it has been put up properly; dampness will have no effect on it. A cool place is more desirable from the fact that if any living forms are present they will not grow so abundantly as when stored in a warm place.

TREAT THE COW GENTLY.

THE most progressive farmers now understand that the best results in the dairy can be secured only when cows are carefully treated. But there are probably some yet who do not understand the importance of keeping cows quiet at milking time. A writer in the *Agricultural Epitomist* gives his experience on this point as follows: —

I had heard a good deal about the bad effect of excitement upon the cow, and I made up my mind I would know whether there was anything in it or whether it was like a good many other fine-spun theories. So one night I deliberately planned an attack upon my cows. I told the hired man to get him a cudgel and I got one myself. We took the dog and went out into the cow-yard just before milking. We shouted and yelled and flourished our sticks, but did not strike a blow. The dog barked loudly, and for a time pandemonium prevailed. Then we let the cows into the barn and milked them.

I was dumfounded at the result. The falling off in the amount of milk given was not so very much, though there was a marked difference; the most striking loss was in the quality of the milk. I have a reliable test myself and know I can not be mistaken when I say that at least two-fifths of the butter-fat had disappeared — been burned up by the excitement of the few minutes' abuse just before milking.

I told the hired man then that thereafter if he felt as if he must strike somebody, to strike me, and that if he spoke at all in the stable I wanted it to be in a tone of voice such as he would use in speaking to me.

Now, this is not theory; it is not fancy; it is plain, matter-of-fact business. Every time a man kicks, pounds, shouts, or otherwise has a "tantrum" with his cows, he takes money out of his own pocket. He would better stand it if the cow thumps him now and then with her tail, or stands around a step or two while being milked, than to make a bigger fool of himself than the cow does by getting into a rage and turning the stable into bedlam.

QUINCY, MICH.

To the Editor:

Please send sample copies of the EDUCATOR to the enclosed addresses. We have had the paper ever since it was first published, and think it is the best paper of its kind. ELIZA WARNER.

NATURE'S LABORATORY

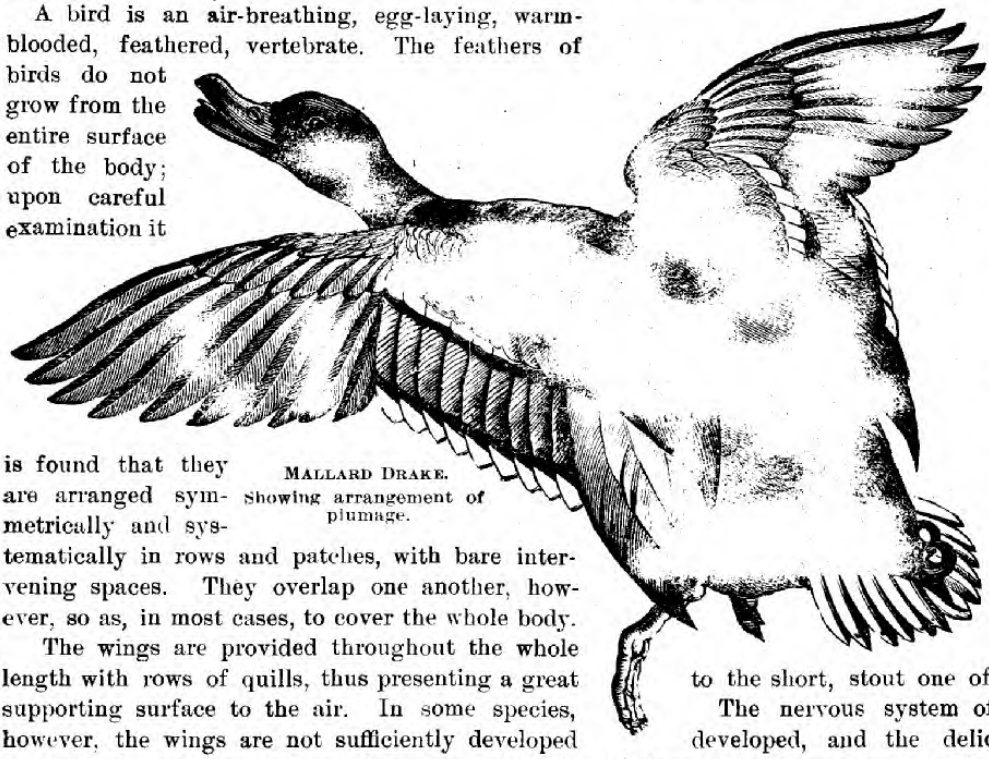
Conducted by A. W. KELLEY, PH. D., M. D.

NATURE STUDY.—NO. 4.

BIRDS.

BIRDS form the most clearly defined class in the whole animal kingdom. The giant ostrich and tiny humming-bird, widely as they seem to differ in size, form, and habit, still exhibit one common type of structure. It will be observed, however, that on the whole birds more closely resemble reptiles than mammals; and this resemblance is a most interesting subject of study to the student of natural history.

A bird is an air-breathing, egg-laying, warm-blooded, feathered, vertebrate. The feathers of birds do not grow from the entire surface of the body; upon careful examination it is found that they are arranged symmetrically and systematically in rows and patches, with bare intervening spaces. They overlap one another, however, so as, in most cases, to cover the whole body.



MALLARD DRAKE.
Showing arrangement of plumage.

The wings are provided throughout the whole length with rows of quills, thus presenting a great supporting surface to the air. In some species, however, the wings are not sufficiently developed to serve the purpose of true flight; yet even in these cases the bird is greatly aided in locomotion by beating the air with its rudimentary wings. This is particularly exemplified in the ostrich. The wings of the apteryx are so diminutive that it was at first considered wingless. The plumage of birds is rendered waterproof by the oil with which they dress the feathers, and which is furnished by a gland situated on the back near the tail. Birds molt, or shed their feathers twice a year. In some, the summer plumage differs in color from that worn in the winter.

HUMMING-BIRD.

In most cases the colors of the male bird are more brilliant than those of the female; and in these cases the young of both sexes resemble the adult female. When the adult male and female are of the same color their young have colors peculiar to themselves.

The legs of most birds are destitute of feathers, the naked portions being covered with a more or less hard integument, varying from the smooth epidermis of the water birds to the hard, horny scales of the land birds.

The horny coverings upon the mandibles of birds serve the purpose of teeth. Here again, we find great variety in the form of beak, from the long, needle-like beak of the humming-bird to the short, stout one of the parrot.

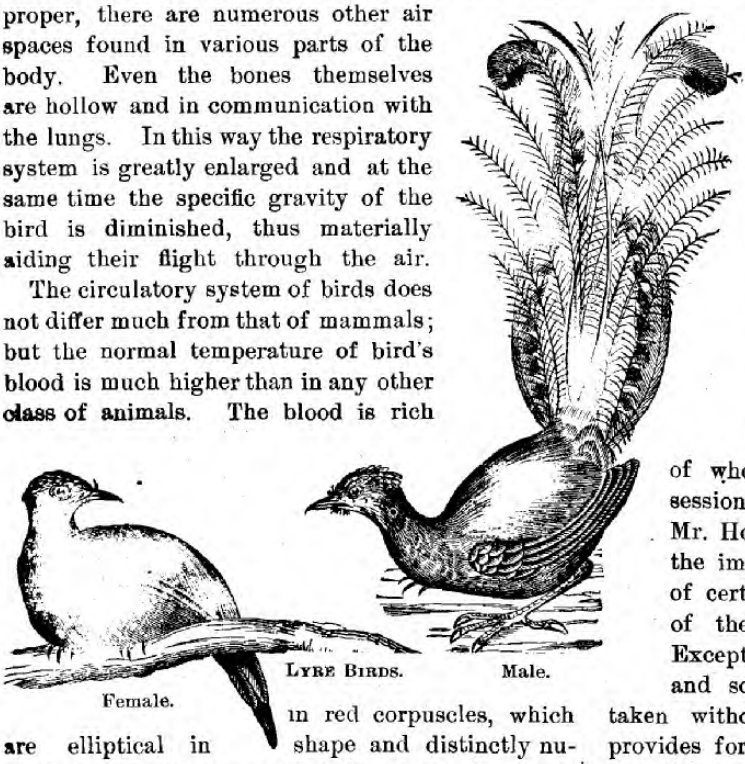
The nervous system of birds is highly developed, and the delicacy of some of their special senses is remarkable. They have the most piercing and distinct power of sight, and seem to distinguish objects near or remote with nearly equal facility.

While birds have no ears visible, they have an external tube leading to a tympanic cavity or middle ear, which in turn is connected with an internal ear. It is in the bird that we can study the action of the tympanic membrane with ease, as it is located very near the surface, and being transparent can be easily studied while in action.

The respiratory system of birds is very extensive and peculiar. The body cavity is not divided by a

diaphragm as in mammals. The lungs, in the form of flattened spongy masses, are attached to the posterior wall of the thorax and extend the entire length of the body cavity. In addition to the lungs proper, there are numerous other air spaces found in various parts of the body. Even the bones themselves are hollow and in communication with the lungs. In this way the respiratory system is greatly enlarged and at the same time the specific gravity of the bird is diminished, thus materially aiding their flight through the air.

The circulatory system of birds does not differ much from that of mammals; but the normal temperature of bird's blood is much higher than in any other class of animals. The blood is rich in red corpuscles, which are elliptical in shape and distinctly nucleated. In this respect their blood closely resembles that of reptiles.



LYRE BIRDS. Male. Female.

The eggs of most birds are hatched by the heat of the mothers bird's body which keeps them at a temperature of about 103° F. By a beautiful arrangement in the mechanical relation of the egg contents, the yolk and its germ are always kept in the right position, no matter which side up the egg may be placed.

At the end of its period of incubation, the young bird is provided with a small horny point at the upper extremity of its beak with which it breaks the shell and escapes. Most birds build nests in which to lay their eggs, each species having its own peculiarity of nest construction.

In our next study in this line we expect to consider the subject of "Birds and Their Nests." In the meantime we would ask all who are interested in the study of birds to make a collection of birds' nests. In early autumn the nests will be found in a good state of preservation and can be studied with profit during the winter. Some of the most striking evidences of animal intelligence are to be seen in the use of appropriate materials and mechanical principles in nest building.

SAVE THE BIRDS.

THE destruction of the birds has become so serious a matter that many of the most thoughtful minds of the country have anxiously considered means by which this wanton slaughter may be stayed. The testimony of the leading scientists of the United States shows that, unless the killing of birds soon ceases, only a brief time will elapse before the feathered tribe will become extinct. In such an event the evil consequences to our agricultural interests are past all computation.

Among the statesmen who have become interested in this matter are Senator Hoar, of Massachusetts, and Representative Lacey, of Iowa, both of whom have introduced bills in the last session of Congress relating to this question. Mr. Hoar's bill provides for restrictions upon the importation of the bodies or plumage of certain birds, and upon the transportation of the same between the several States. Exception is made in the case of the ostrich, and some other birds whose plumes can be taken without loss of life. Mr. Lacey's bill provides for extending the powers and duties of the Commission of Fish and Fisheries so as to include game birds and other wild birds useful to man, "by the propagation, distribution, transportation, introduction and restoration" of such birds.

If you are in favor of such legislation as this, write a letter to your Congressman and tell him so. Prevention is better and easier than "restoration," and legislators who take up the championship of the birds need all the encouragement and support possible. — *Adapted.*

"THE foxes have holes, and the birds of the air have nests; but the Son of Man hath not where to lay his head."

"HE shall cover thee with his pinions, and under his wings shalt thou take refuge."

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

HUMAN PHYSIOLOGY.

RESPIRATION. — BREATHING; THE RESPIRATORY ORGANS.

All living organisms require food. It is used to supply material for growth, for the repair of tissue waste, and to furnish needed energy. The bulk of the food taken is burned as fuel for giving heat to the body. But in order that combustion may take place, oxygen must be present. Oxygen supports combustion or burning of all kinds, and so the process is called by the general term, oxidation, because the oxygen continues to combine with carbon to form carbonic acid gas or CO_2 (carbon-dioxide) as long as there is any carbon present. From this fact it is evident that oxygen is necessary to the combustion that accompanies life, and so it may be regarded as a gaseous food. Thus we have three kinds of food: gaseous, represented by the oxygen; liquid, by water; and solid, or the substances commonly called foods, such as bread, etc. Of the three varieties, oxygen is by far the most important. One can do without solid food for two weeks, and without water for several days, but life becomes extinct in a few minutes if oxygen is withheld.

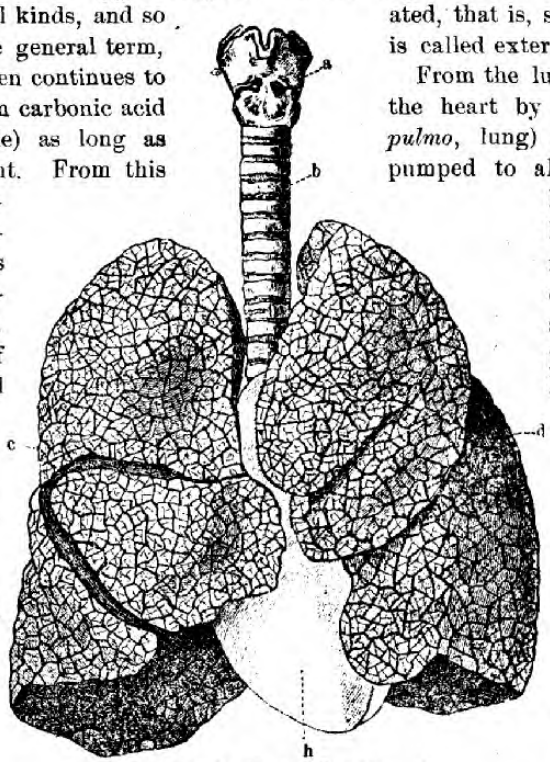


Fig. 5. Human Lungs.
(After Ranke.)
a, larynx; *b*, trachea; *c*, right, *d*, left lung; *h*, heart.

All forms of life, including plants, require oxygen. It is derived from the air, and the process by which it is obtained is called respiration, or breathing. In the simplest animal forms, as the ameba, there is no special mechanism, and the gas is absorbed directly from the air. But in the higher forms there are special and more or less complicated organs to perform this important duty of respiration. They are most perfectly developed in man, and taken together form the respiratory system. They consist of the lungs, which are of primary importance, the chest or thorax, and the air passages.

What is ordinarily termed breathing is merely the interchange of gases between the lungs and the air. By this means the oxygen is brought to the numberless small blood-vessels of the lungs. The smallest vessels are called capillaries, from Latin *capillus*, hair. Here a second interchange takes place. Owing to a difference in partial pressure which will be explained later, oxygen passes from the air cells of the lungs to the blood, and carbonic acid gas passes from the blood to the air in the lungs. Thus the blood is purified or oxygenated, that is, supplied with oxygen. This is called external respiration.

From the lungs the blood is carried to the heart by the pulmonary (from Latin *pulmo*, lung) veins, from which it is pumped to all parts of the body. The large vessels diminish rapidly in size while increasing in number, until the systemic capillaries are reached. Here a third interchange takes place. Now the oxygen leaves the blood and is quickly taken up by the tissue elements, while carbonic acid gas is taken up by the blood. This process is just the reverse of the preceding, and is called internal respiration. It is the essential step in the whole complicated process; for by this means the ultimate tissue cells of the body are supplied with the all-important oxygen. Should any one of the three steps fail, the consequences would be quickly fatal. It is also of great importance that the air breathed should be pure, that is, contain the proper amount of oxygen (about twenty volumes in a hundred), and also a minimum amount of CO_2 (not more than four hundredths of one volume in the hundred).

Next, the anatomy of the organs of respiration will be considered. As above mentioned, they consist of the lungs, thorax, and air passages. The thorax is the cavity included between the neck and abdomen. It is enclosed by the sternum (breast-

bone), ribs, and the vertebræ of the spine, and is separated from the abdomen by the diaphragm, a flattened, dome-shaped muscle. This cavity contains the heart and esophagus, or gullet, as well as the lungs.

There are two lungs, one on each side of the chest. They are separated from each other by the mediastinum (from Latin *medius*, middle), a space enclosed by connective tissue and containing the heart and other structures. (Fig. 5.)

Beginning externally the air passages consist of the two nostrils, the mouth (back part), pharynx, larynx, trachea, and the large and small bronchi. Breathing should always take place through the nose. The mouth was never intended to be used as a respiratory passage, and mouth-breathing is very improper, and often harmful. When breathed

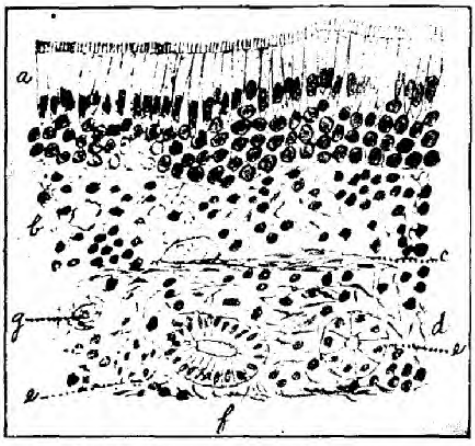


FIG. 6. SECTION OF CAT'S TRACHEA.
(Magnified 302 diameters.)

a, ciliated columnal ephithelium; *b*, stroma of mucosa; *c*, involuntary muscle layer; *d*, submucosa; *e*, mucous glands; *f*, duct cut obliquely; *g*, blood-vessels.

through the nose, the air is purified and properly warmed and moistened. This is imperfectly done when the mouth is used. Consequently one is more liable to take disease, especially miasmatic disease, when mouth-breathing is practised.

From the winding nasal passages the air passes through the back of the mouth to the pharynx, a chamber situated in the rear of the mouth behind the root of the tongue. The pharynx connects the mouth cavity with the esophagus or gullet, and is really the expanded entrance to the latter. It communicates with the larynx by an opening called the glottis. This orifice is furnished with a door, or lid, which opens into the pharynx to allow the air to pass back and forth. This door is called the epiglottis (from Greek *epi*, upon, and glottis). During the act of swallowing it is closed, thus preventing the passage of food into the windpipe and lungs, which might be fatal. It sometimes happens that a small particle passes through when one is laughing or talking and swallowing at the same time. The violent coughing which immediately results is nature's spasmodic effort for the purpose of expelling the intruder.

The larynx is the chief organ of speech, hence it is frequently called the voice-box. The shape of the cavity is like that of an hour-glass, the vocal cords forming the constriction. Its walls contain cartilage (gristle), which gives support and keeps the chamber open. There are two large cartilages, and several smaller pieces. The thyroid cartilage is the largest, and has the shape of a shield. It forms the prominence of the neck called Adam's apple. Below it is the cricoid cartilage, which has the shape of a signet ring. Then come the cartilaginous C-shaped rings of the trachea, sixteen to twenty in number. The open part of the incomplete rings lies against the gullet behind, and is bridged over by involuntary muscle and connective tissue. Thus the larynx and trachea form a cartilaginous open tube about six inches long and nearly one inch in diameter. Finally the trachea divides into two branches called bronchi, one for each lung. These branches divide again and again until the ultimate air-cells are reached.

The air passages are lined by a delicate mucous membrane which is kept moist by the secretion of numerous glands found in their walls. Outside are layers of epithelial cells, some flattened, others column-shaped. The trachea and bronchi, also the larger part of the larynx, are lined with ciliated columnar cells. (See *a*, Fig. 6.) The *cilia* on these are very delicate, short, slender hairs, which are attached to the free surface of the cells. They are constantly moving, and this motion is called ciliary movement. It is by means of this movement that mucus and other matter is raised from the lungs and throat. The stream, so to speak, is always outward to the external surface. The forward movement of these cilia is sudden and rapid, the backward movement slow, a sort of relaxation. Were it not for the ciliary movement, the lungs would soon fill up and become useless.

The general structure of the lungs is that of a compound racemose gland, and its function is that of separating impurities from the blood and supplying it with oxygen. The bronchi divide rapidly and decrease in size until they are called *bronchioles* (diminutive for bronchi). These latter terminate in a so-called alveolar duct, and this enlarges

a little to form a narrow space, or chamber, into which a number of air-cells open. (Fig. 7.) The air-cells are delicate microscopic chambers with very thin walls. The latter are composed of a single layer of thin, very much flattened cells, and are strengthened and rendered elastic by an irregular, incomplete network of yellow elastic fibers. Outside lie the pulmonary capillaries which cover about three fourths of the wall. If all the air-cells of the lungs were spread out flat, a surface of more than two hundred square yards would be covered. The capillaries alone would cover one hundred and fifty square yards. In other words, more than three pints of blood is spread out in a thin sheet about one twenty-four-hundredth of an inch in thickness, over an area of more than one hundred and fifty square yards. Here is where external respiration takes place, and the conditions are most favorable for the rapid and perfect interchanging of gases.

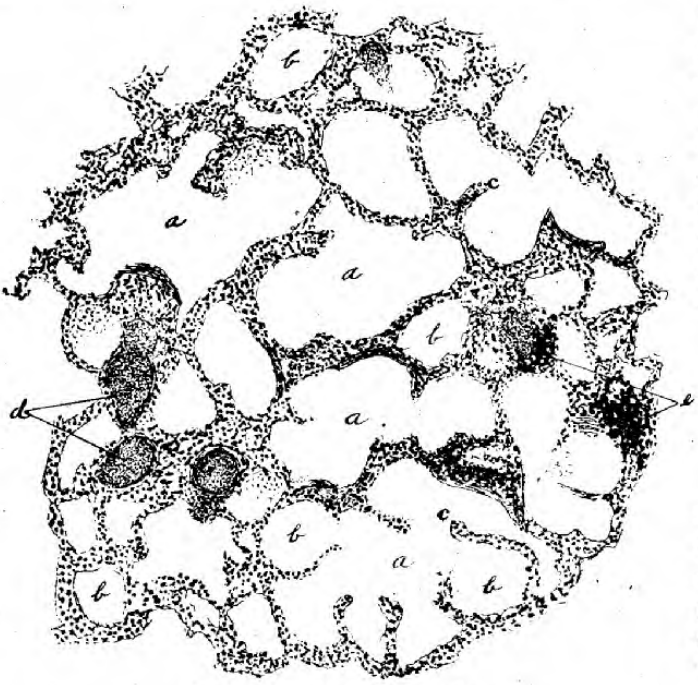


FIG. 7. SECTION OF HUMAN LUNG.
(Magnified 392 diameters.)
a, infundibula cut in various directions; *b*, alveola, or air-cells; *c*, partitions separating the alveoli; *d*, small blood-vessels; *e*, carbon deposits.

This interesting subject of respiration will be continued in the next lesson.

[We take occasion again to emphasize the value of these lessons on physiology. They are not to be read merely, but studied and digested. No text-book in common use presents the subject nearly so clearly nor so well illustrated. Use them in the school and home. — ED.]

SIT UP.

THE purist insists that we should say only "sit" and "stand," rather than "sit down" and "stand up." Strictly, *down* and *up* are probably superfluous, or sufficiently implied in *sit* and *stand*; but when we mean sit *up*, instead of down on the middle of the spine, it is very proper to insist upon the "up."

Most students, and other people, sit down — and stay down, rather than upright, while sitting. Unfortunately the chairs and desks in common use encourage the crescent posture, rather than make it feel as uncomfortable as it is unhealthful. This long continuous curve from the neck to the lower end of the spine, causes an unnatural and injurious strain on nearly every vital organ. The chest collapses, the lungs are compressed, the digestive organs are relaxed, and the circulation and nervous action greatly disturbed. And all these difficulties are aggravated if the individual is endeavoring to read or study with head thrown forward, or with the arms folded across the breast. Only dis-ease can come from such a habit long enough continued.

Sit up! The best conditions for work are had when the trunk supports itself without depending upon any external assistance. If any support is used it should rest against the "small of the back," and not at the level of the shoulders. The best chair for typewriters provides an adjustable support just at this point where it is most needed. Very few of the ordinary chairs or desks are convex enough to give this support for the middle of the back, and so the back seeks the supporting point of the chair by convexing itself until they meet. Thus the hips and shoulders are thrown forward and the unhealthful crescent profile is assumed.

The best that can be done with such chairs is to sit back as far as possible on the seat, and then fill in the interval between the chair back and your own by a firm cushion, suspended transversely across the point where support is most needed. The hips and shoulders will be thrown back, the head erect, both feet on the floor, the arms at the side, and all the vital organs maintained in their proper relation for healthy action. Cultivate this position, and insist upon it with the children under your care. Sit up!

F. W. H.

CURRENT INTERESTS

The Peace Commissioners from the United States and Spain met in Paris on September 26. Their sessions are held in secret, and little will be known of their work until it is finished by signing the treaty of peace.

The Chicago Schools are making provision for instruction in domestic science. During the coming year cooking and sewing will be taught in nineteen different schools, and so may henceforth be considered as a regular part of the system of instruction.

China has recently undergone another sudden change of government. The dowager empress has deposed the emperor aud re-instated Li Hung Chang as prime minister. It is said that the emperor was about to issue a decree abolishing the cue among government officials and requiring the wearing of European clothing. This was considered as meaning the domination of English influence in the empire, and the emperor has possibly lost his life as well as his throne in consequence. The restoration of Li Hung Chang is likewise interpreted as signifying the ascendency of Russian influence. The United States has recently ordered two warships to the Chinese coast; and this is thought to mean that America will take a slice when the China cake is cut. "**The Eastern** Question" is not a small one.

Another Commission has been appointed by President McKinley in addition to those mentioned in the September EDUCATOR. This is the Army Investigating Commission, appointed to inquire into the honesty and competency of the administration of the War Department during the conflict with Spain. It consists of Major-General Dodge, of Iowa; Major-General Mc Cook, of Ohio; Brigadier-General Wilson, Chief of Engineers, U. S. A.; ex-Governor Woodbury, of Vermont; ex-Governor Beaver, of Pennsylvania; Col. Chas. Denby, of Indiana; Col. J. A. Sexton, of Illinois, commander-in-chief of the Grand Army of the Republic; Capt. E. P. Howell, of Georgia; and Dr. Phineas S. Conner, of Ohio. Whatever report is made by this commission will probably not forestall an attempt to secure Congressional investigation later.

A Spanish Farewell.—One of the most remarkable documents ever known in ancient or modern warfare was recently issued by the surrendered Spanish soldiers in Cuba. It is addressed to the "Soldiers of the American Army," and is filled with expressions of admiration for the humanity and generosity with which the Americans treated those who had been vanquished—"as our [Spanish] generals and chiefs judged in signing the capitulation." The letter closes thus:—

> With this high sentiment of appreciation from us all, there remains but to express our farewell, and with the greatest sincerity we wish you all happiness and health in this land which will no longer belong to our dear Spain, but will be yours, who have conquered it by force and watered it with your blood, as your conscience called for, under the demand of civilization and humanity. But the descendants of the Congo and of Guinea, mingled with the blood of unscrupulous Spaniards, and of traitors and adventurers, these people are not able to enjoy their liberty, for they will find it a burden to comply with the laws which govern civilized communities.
>
> FROM ELEVEN THOUSAND SPANISH SOLDIERS.

Some Recent Events.—The Empress of Austria was assassinated at Geneva, September 10, by stabbing with a triangular file in the hands of an anarchist named Luigi Laochini.—An attempt was made to assassinate the Czar during the first week of September, by exploding a vacant house filled with gas beside the route of the imperial procession at Moscow. The explosion was premature.—The battle-ship "Illinois" is to be launched October 4.—"Teddy" Roosevelt has been nominated by the Republicans for governor of New York.—Thomas F. Bayard, ex-senator from Delaware, ex-secretary of state, and late ambassador to England, is dead.—Queen Louise of Denmark died September 28.—The ashes of Christopher Columbus were exhumed at Havana September 26, and will be sent to Spain.—Wilhelmina was crowned Queen of the Netherlands, September 1.—A commission has been organized to build a monument to the memory of Lafayette, to be unveiled on "United States Day" at the Paris Exposition in 1900. It is proposed to raise the needed funds by contributions from the public-school pupils of the United States.—Judge Cooley, the world-famed jurist of Ann Arbor, Mich., died September 12.—The *Arena*, a widely known Boston magazine, has suspended publication on account of financial difficulties.—Ten thousand Spaniards in Porto Rico refuse to live under the American flag, and demand to be returned to Spain at the expense of the United States.—Thirty per cent. of the school children of Chicago are reported to be defective in vision or hearing

EDITORIAL BULLETIN.

PARENTS AND TEACHERS.

THE EDUCATOR'S discussion of the importance of co-operation between parents and teachers, especially between those who acknowledge the obligations of Christians, is already bearing some fruit. Through correspondence and otherwise we have learned of considerable interest in certain communities, and plans are being matured for the holding of regular monthly meetings for studying the mutual interests of home and school. These associations are not to include mothers or ladies only, but fathers as well. No parental co-operation with the school is complete that does not include co-operation between father and mother, parents and children, and all with the teacher. Herein the interest of the EDUCATOR differs from that of the women's club movement that is attracting so much attention. And again, the best co-operation between the school and home can come only when the best influences of the school are supplemented by positive and continuous moral training in the home. And the best moral training in the home can result only when the parents exert by precept and example a strong religious influence over the children; and herein lies the interest of the CHRISTIAN EDUCATOR in promoting this highest and most fruitful kind of co-operation between home and school. There will be further reports and suggestions to offer on this subject. It is one of our permanent fields of interest. So we continue to present our standing

DECLARATION OF PRINCIPLES.

1. We believe that merely intellectual education, having no intended reference to the development of moral character, is as likely to be harmful as beneficial to the individual and to society.

2. We believe that the best intellectual development can never be secured except in conjunction with the highest moral development of the individual, and vice versa.

3. We believe that neither the best intellectual nor moral development can be secured except in conjunction with the best physical health and development.

4. We believe that the highest development of body, mind, and character can not be secured except in accordance with the sanctions and principles of the Bible. Hence,—

5. We believe that only in true Christian education can be found the highest type of training and culture for man's physical, mental, and moral nature.

6. We believe that Christian parents should exercise and improve their ability to educate their own children at home, up to the age of eight or ten years, before committing them to the guidance of any but Christian teachers.

7. We believe in the fullest possible measure of intelligent co-operation between all teachers and parents, and that this can be secured only by means of educational association for mutual improvement.

THE EDUCATOR requests correspondence and suggestions from all who desire to unite in the study of the best means of home and school improvement. Let us hear from you.

EDUCATIONAL VALUE OF HAND-WORK.

HAND-WORK is to be considered as a mode of studying what is already in the course, not an addition to it; therefore it should extend through the grade course. Our traditional courses of verbal instruction are critisized by the press and practical people. Teachers are conservative, but those who make courses and manage schools are responsible for the results. The demands of the reformers are in harmony with modern psychology which says that a child, by what he does during the period of brain growth, becames the architect of his own brain, as well as his fortune.

This education by doing is demanded by present American conditions. Great industrial and social changes have lowered the average of intelligence. The widening of slum areas in cities, with their low standards, benumbed powers, and clumsy fingers, make a peculiar demand for learning by doing. That hand-work as a mode of investigation shall be made an organic part of the common-school course, is indicated alike by sound pedagogy and by social and industrial needs.— *Mary F. Hall, in the Normal Instructor.*

Such views as the foregoing are very encouraging to all who advocate a threefold education that includes the hand and heart as well as the head. The term "reformer" is obnoxious to most people, and is often applied in contempt of persons who are afterward honored as the world's benefactors. Some one has said of these persons that while they live, we ridicule and persecute and even crucify them; and then our children build a monument to their memory. It pays to be such a reformer, for the sake of the children.

But the educational reform that would give a systematic manual training to the students in all our schools is already dignified and commended. There is still need, however, to urge its claims upon those who have not investigated it, and to emphasize the third element in the educational trinity — the paramount importance of personal, moral character as the highest product of educational training. Such training can be assured only when the highest Christian standard, the Bible, is held as the test and guide of all educational effort. The EDUCATOR stands for *this* reform also and for all that goes with it,— a symmetrical education of the heart, head, and hand.

We reiterate our platform for the coming year:—

Better Education for Everybody.

Moral and Industrial Education for All.

Fullest Co-operation between School and Home.

Help Us.

PUBLISHERS' DEPARTMENT.

BOOK NOTICES.

"MAKING HOME HAPPY" is the title of a handsome book just received. This was the title of a series of articles by MRS. L. D. Avery-Stuttle which was concluded some time ago in our companion magazine, the *Youth's Instructor*. With a beautiful cover design and several full-page illustrations, added to the excellent character of the matter itself, this book should do much to render thousands of homes happy. It is just the kind of a book for holiday presentation, either to parents or children; 205 pages; 50 cents in cloth, 25 cents in paper, post-paid. Review and Herald Publishing Company.

PROFESSOR B. A. HINSDALE, whose portrait appears on our cover, has long been favorably known as a practical teacher and writer on educational subjects. With an experience of twelve years as president of Hiram College, four years as superintendent of Schools in Cleveland, and ten years in his present position as head of the Department of the Science and the Art of Teaching the University of Michigan, he also many years carried on a religious ministry in connection with his educational work in Ohio. His best-known books are "Schools and Studies," "President Garfield and Education," "The Old Northwest," "How to Study and Teach History," "Teaching the Language Arts," "Studies in Education," "The History and Civil Government of Ohio," "Jesus as a Teacher," and "Horace Mann and the Common-School Revival in the United States."

The last two have been adopted by the EDUCATOR as the basis of an optional plan of reading-circle study for teachers and parents. Notices from the press and individuals on both books appear in our special offer on the outside of this page. "Jesus as a Teacher" is a thoughtful and suggestive study from the author's pedagogical point of view. Probably not everything in it would be endorsed by readers less scholarly than Professor Hinsdale; but such books are not made to be swallowed whole. This one is certainly helpful to all who see in Jesus the author of all the solid and lasting ideas of the best modern pedagogy. Concerning the "Horace Mann," there is no question that it is destined to be considered the standard history of popular education in the United States, as influenced by the life and work of the great Massachusetts educator.

"THE TEACHERS' REVIEW BOOK" is the title of a new "examiners' manual," issued by the Ellis Publishing Co., Limited, of Battle Creek, Mich. Quite a full description of it appears in the advertisement on our second cover. It is undoubtedly "the greatest question book ever published," in respect to the number of pages (645), and the plan of construction. Unlike most question books, the authors assert that "there has been absolutely no resort to compilation in any division of the book." There are many good questions that *might* be properly copied from one book to another, but a book that is constructed *a novo* is certainly more likely to be adapted to present needs. And "The Teachers' Review Book" gives abundant internal evidence of complete adaptation to the ends sought.

"ORGANIC EVOLUTION CONSIDERED" is the name of a new book by Alfred Fairhurst, A. M., Professor of Natural Science in Kentucky University. The weaknesses and contradictions of the theory of organic evolution are the chief subjects considered. It is unusual for a university professor to speak so unreservedly in opposition to evolutionary theory as Professor Fairhurst has done. We had almost reached the point where it would be considered a mark of mental unsoundness to deny or doubt the "law of evolution." Indeed, a prominent editor recently said that any one who would dispute the proposition that millions and millions of years were required for the creation of the earth, *is a fool*. Professor Fairhurst is not that kind of a fool; but he has taken evolution on its own ground and successfully disputed many of the propositions on which the theory rests. His book is exceedingly interesting, and is provided with a complete alphabetical index for students. 380 pages; price, $1.50 post-paid. Christian Publishing Co., St. Louis, Mo. (It may be ordered through the CHRISTIAN EDUCATOR.)

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When all this is considered, we believe the friends of the EDUCATOR, who wish to see its mission more widely extended will kindly accept a suggestion from the publishers: we invite all who are so disposed, to send us any amount from a dime upward, to be used solely for the purpose of extending the circulation of the EDUCATOR, and for the publication of a yearly series of pamphlets on interesting and important phases of "Christian Education," for which there is not room now in the journal itself. These pamphlets would be issued quarterly or monthly, at a subscription price of twenty-five cents a year, whenever the number of advance subscriptions is sufficient to pay the cost of printing and mailing. Here is

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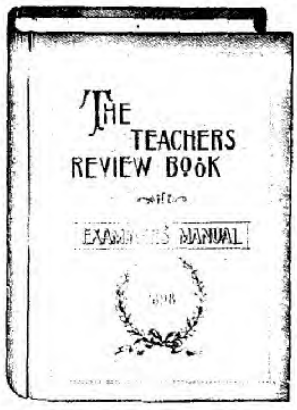

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Two New Books for Teachers,

By PROFESSOR B. A. HINSDALE.

Jesus as a Teacher.

The scope of this book may be seen from the following chapter headings:

An Introductory View; The Education of Jesus (two chapters); His Insight into Mind and Character; His Relation to Tradition and Legalism; How Jesus Used the Scriptures; His Historical Antecedents; His Institutions; His Authority; His Use of Accommodation; His Methods of Teaching (three chapters); His Recognition of Apperception; His Use of the Developing Method; His Recognition of Moral Perspective; How He Handled Cases; His Severity; Jesus and the Child; His Theory of Teaching. To these there is also added a second part, "The Making of the New Testament."

SOME NOTICES.

It seems to me praise to your book to say that it has few or no cant expressions in it, and is everywhere a translation of the light of the old into the language of the present day. What you have written is a very valuable book on the method of instruction of the Great Teacher.— *Dr. W. T. Harris.*

"Jesus as a Teacher," by Prof. B. A. Hinsdale, is a sober, substantial, well-digested book. It holds itself more aloof from the merely formal side of truth, and gives itself more freely to its vital aspects than one would expect it to do as arising in the interests of pedagogy. The volume carefully presents the circumstances which imparted character to the teachings of Christ, as well as a full consideration of his spirit and method.— *The Dial.*

Horace Mann and the Common School Revival in the United States.

This book belongs to "The Great Educators" series, and connects with the personal history of Horace Mann a running account of the development of the American system of public school education. These are its chapter headings:

Two Centuries of Common Schools; Horace Mann's Forerunners; Horace Mann's Schools and Schoolmasters; Secretary of the Massachusetts Board of Education; The Secretaryship in Outline; The Massachusetts Normal Schools; The Reports to the Board of Education; The Controversy with Religious Sectaries; Mr. Mann a Member of Congress; Horace Mann President of Antioch College; Horace Mann's Character and Work; The Progress of the Common School Revival.

PERSONAL AND PRESS NOTICES.

The volume will be welcomed not only as a study of one of the finest types of men of his time, but also as a compendium of information, touching the history of common schools in this country.— *The Outlook.*

As to the growth of secularization in the schools, we do not know a popular book which will give so good a view of it as this.— *Wisconsin Journal of Education.*

I received in due time the "Horace Mann" which you sent, and having begun it, I could not drop it until I had finished it. You have set the main events of Mann's life in their proper relations to our educational history. Your introductory and closing chapters are most happily conceived.— *Pres. J. B. Angell, from Constantinople.*

These two books are among the latest and most valuable products of Professor Hinsdale's long-continued service in educational work. Both are of the highest value to every teacher, and will be used as the basis of the EDUCATOR'S Reading Circle Study (see page 12 for first lesson). The "Jesus as a Teacher" contains 246 pages, with 77 additional in the second part. The "Horace Mann" is a book of 325 pages. Each book has a complete index, and is bound in fine cloth. The "Horace Mann" is listed by the publishers at $1.00, *plus postage.* The other book retails at $1.25, postpaid.

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