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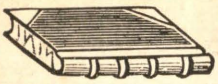

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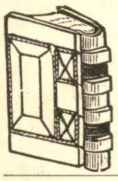

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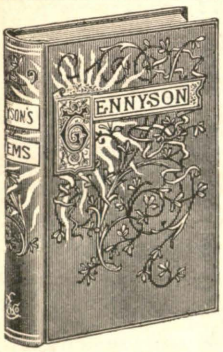

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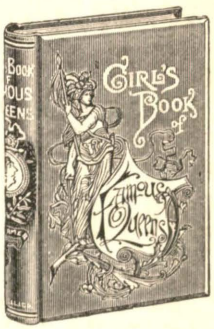

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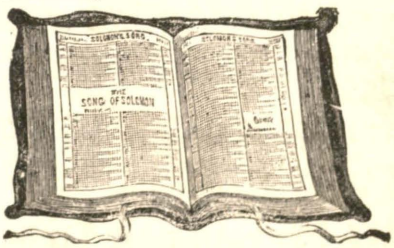

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THE STUDENT.

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SHAKESPEARE IN THE SCHOOLS. * IV.

Hamlet.

H. N. CARVER.

AND so the scene goes on. They have recovered their self possession, but their words are not intended to express their real meaning but to conceal it. Bernardo tells Francisco to get himself to bed, as if his presence would disturb the serenity of his own meditations; but immediately requests him to hasten Horatio and Marcellus, who were to stand with himself, if he should chance to meet them. Of course, we are in the secret and know why he wishes Francisco gone and Horatio and Marcellus present. He is not the only thing that seems to be keeping guard over Denmark. "Twice before and jump at that dead hour" something had gone by his watch, whose solitary companionship was not to be desired. But that little platform in front of the castle was not the only place in Elsinore haunted by spectral forms. Across the platform where every soul kept ward and watch over its own treasures, they stalked; and every soul had cried, as Hamlet cried, "Save me and hover o'er me with your wings, you Heavenly powers."

And so the contagion spreads,—the contagion of smothering every one his own thoughts. The coolest head and the bravest heart in all Elsinore fell for a time to concealing one thing in his heart and keeping another open on his tongue,—Horatio upon whose faithful and imperturbable breast Hamlet learned to lean his aching head with such absolute trust and who at last consented to absent himself from felicity awhile that a wounded name might not live behind his unhappy friend. When he first comes upon the platform with Bernardo and Marcellus and they wish to tell again the story of the apparition, he says, "Well, sit we down, and let us hear Bernardo speak of this," as if a tedious hour was to be gone through with and might as well be worn out in this way as any other. But we are not deceived. We know him, noble fellow that he is. He is "one whose blood and judgment are so well commingled,

that he is not a pipe for Fortune's finger to sound what stop she please,"—one with such solid stuff at the basis of his character that the storm-shattered bark of Hamlet's soul shall find in him an anchorage safe against wave and storm. But with all this, his indifference there upon the platform does not mislead us and did not mislead his two friends,—he is only whistling a little in his own ear to keep up his own courage. And afterwards when the apparition has come and gone, and he has "the sensible and true avouch of his own eyes" for its reality, Marcellus asks who it is that can tell him the meaning of what they have seen, and Horatio answers, "That can I," but puts in the qualification, "at least the *whisper* goes so." He then goes off into an explanation of Denmark's trouble with Norway, and embodies his explanation in a sentence so long and involved that a lawyer's clerk would grow weary reading, and so technical that it might be mistaken for part of a lawyer's brief. But we are much obliged to him; again he has not misled us. It was not his cool-headed unconcern that carried him safely through the labyrinth of his speech. We see how it is with him. He was afraid to take breath, lest the thought struggling down in his deepest breast should bubble through the slight crust of cool words which he had made over it. And when he fancies that Bernardo has been caught with the little deception, he can no longer restrain his thought completely. It breaks out in a dark hint: "A mote it is to trouble the mind's eye."

Such, then, is Denmark,—"the unweeded garden that grows to seed." And what manner of man is Prince Hamlet, when he first comes within the purview of the drama? That we must now try to make out.

When the king excuses himself to Laertes for not proceeding promptly against Hamlet for the killing of Polonius, he says one of his motives is "the great love the general gender bear him." Now, plainly Hamlet is not a great popular hero, to whom the people look for leadership in war or politics, as they looked to Napoleon, or to Caesar who filled the coffers of Rome with the ransome of captives, her granaries with corn for public distribution, and her amphitheaters with beasts and gladiators for the entertainment of their savage tastes. The qualities which have endeared him to the masses are internal and not external, like those of the Nazarene, which made the common people hear him willingly,—a power to appreciate their hard lot and to sympathize with them as they stagger on under their sore burdens; it is what Prof. Seely calls the enthusiasm for humanity, the basis of the injunction to love one's enemies and do good to them that despitefully use and persecute, the basis, in fact, of Christian ethics and the secret of the remarkable power which Christianity had in overcoming the selfish systems of the pagan world. And, so, from the beginning to the end of the drama, there is not one word said in derogation of Hamlet's character. All is praise and commendation. The king calls him a "mad young man," dangerous, a "hectic in the blood," and while he wishes Laertes to believe that Hamlet is envious of Laertes, he does not dare say so till he finds Laertes already in the trap. "The queen his mother lives almost by his looks," and when she reports the killing of Polonius to the king she says Hamlet's "madness like some ore among

a mineral of metals base, shows itself pure." The king can find no better way to inveigh Laertes into the plot of killing Hamlet in a game of sword-practice, than by declaring that he is so "remiss, so generous, and free from all contriving" that he will not "peruse the foils" and Laertes may easily choose one without a blunted point. And so Laertes does. In that touching scene in which he sums up the character of Horatio,—perhaps the most beautiful tribute one friend ever paid to another,—he has been giving the players their directions and when they and Polonius and Rosencranz and Guildenstern all go out leaving him alone, he turns and calls with such a sense of loneliness "What, ho, Horatio," and Horatio replies, "Here, sweet lord, at your service," and then, placing his hands on Horatio's shoulders and looking into the eyes of his friend he begins: "Horatio, thou art ev'n as just a man as e'er my conversation coped withal," and goes on uninterruptedly, save by Horatio's "O, my lord"—to the last words, "Give me that man who is not passion's slave, and I will wear him in my heart's core, ay, in my heart of hearts, as I do thee." We cannot listen to the calm and touching words without feeling that Hamlet has here unveiled himself, and in describing his friend has shown us the ideal of his own heart of hearts. And what a pure and lofty ideal it is.

> "Nay, do not think I flatter;
> For what advancement may I hope from thee,
> That no revenue hast but thy good spirits,
> To feed and clothe thee? Why should the poor be flattered?
> No; let the candied tongue lick absurd pomp,
> And crook the pregnant hinges of the knee
> Where thrift may follow fawning."

This may be a very impracticable sort of man, but it is Hamlet. He chooses his friend for the sake of friendship, not for social or political advancement. It is the *man*, with certain qualities of head and heart, and not the accidents of wealth, or position, or title, or influence, that this election seals for himself. It is not the choice of one who does not know what wealth and position and title and influence are worth. He has estimated them, and when "thrift must follow fawning," the price demanded is too high. This, then, is Hamlet. He is a man. He looks at anything; his judgment tells him it is such and such; and that settles the matter with him. His intellect reports the *truth* to him, not a lie; and the truth is sacred, is holy; as Plato said, he must needs worship it: a lie is profane, is unholy, he must needs hate it. And throughout all the drama, there is no single act of his inconsistent with this profession of his faith; and it is this which has drawn every one to him. He is sincere, he will not deceive you, will not fail you; you know exactly where to find him, as the astronomer knows where to find a star in the outermost abysses of space. Friend after friend is untrue to him; so great is his trust that when a doubt might wrong any one, a messenger from another world can scarcely fix the doubt in his heart. Friend after friend fails him in his need; he never fails any one. When Ophelia, at the dictation of her father, repulses him, he goes from her presence perusing her face to see whether his ears have not heard wrongly, and with his hand over his eyes lest the blare of the sunshine make him see wrongly. When convinced that it is all too true, he says nothing, does nothing, but wave his head thrice up and down in sorrowful recognition of the truth;

but he does not fail her. When those who ought to have been true to her have done their worst, and the "charitable waters have pulled her to muddy death" and away from all the wrongs of time, the accidents of place and birth; and when she can be herself in the free commonwealth of Death; then he comes back and claims what he could not claim in the rotten state of Denmark, the guardianship of her sweet and gentle name. Amid the profane gabble of the grave-diggers, how holy his presence seems; how it relieves the terrible sense of wrong which we feel. With all his keenness and coldness of intellect, we know that the grave-digger is no match for Hamlet did Hamlet care to engage in a contest with him. And in the wild stormy scene with Laertes in the grave, how plainly we see that it is only the last outbreak of the savage elements howling around their united lives; and though he goes away with the bitter words upon his lips, "Let Hercules do what he may, the cat will mew and dog will have his day," we know that Hamlet is triumphant; and that hereafter their names are to be united in a better world, the serene world of pure thought and affection.

But sincerity is not the only attribute prominent in his character. While the eyes of those around him are keen, it is only what is old and dying, the evil, that they see. They are irreverent, because their eyes are turned backward toward the flying shadows of the night, not forward to the rising lights of the morning. Hamlet too is blind, his eyes must be forcibly opened and his head turned before *he* sees the *evils* that gird him round. His intellect is as reverent as it is piercing; and when he can only be himself, the great mystery of himself and the world bathes him in an atmosphere of reverent love and trustfulness. Usually he seems to feel through a sense denied to others whatever goes on around him, and we see him only in a world which is not his own. But once he wakes up and for a brief moment is himself. He has been for a little while lost in the darkest meditations, has been making an inventory of the things which make calamity have so long life. He has been debating the question whether it is not better to die and end the heartache; the ills of the present life seem so inscrutable, so utterly different from what *he* would expect, that he concludes it is better "to bear those ills we have than fly to others that we know not of." As the darkness settles down upon his soul, he looks up suddenly and his eyes fall upon Ophelia. For a moment he is Hamlet breathing the atmosphere of his own world of loving trust, and there fall from his lips the most beautiful words ever spoken about a woman:

> "Soft you now,
> The fair Ophelia! Nymph in thy orisons
> Be all my sins remembered."

Such, then, is Prince Hamlet, who comes back from the cloistered life of Wittenberg to take part in the obsequies of his father and the seething, insincere, rotten life of Elsinore. Is not the end plain from the beginning? Given such conditions, and either spiritual death or insanity must be the end. For such a man as Hamlet, who has drunk so deeply of the pure waters of the intellectual life, there is no choice. We are not to understand that the end must be driveling idiocy. But when one cannot adjust his own thoughts into harmony with the world around him, can find nothing around which his affections may twine themselves and have life by mutually

giving and receiving life, he *is* insane. If a person could be placed in a world where the multiplication table would not always give the same results, he would become insane. This is the explanation of the remarkable fact that among the earlier peoples their prophets and poets were always regarded as insane. Sir William Hamilton quotes a Hindu legend that one of their gods once took on a glorious human form and dwelt among men, only to be regarded as a monster and insane; and we know how many times the accusation of having a devil was brought against the blameless life that "breathed beneath the Syrian blue." This is the insanity which fell so hopelessly upon Hamlet; an intellectual nausea which manifested itself in bitter words; a hesitancy and turning from one thing to another, because his intellectual predictions could come true only on the conditions of his assuming that in Denmark at least one might smile, and smile, and still be a villain. *That* he could not always do save when he was in the presence of the villains and saw them smile. When he is with Horatio, he is sane. The shadow of his dark fortune is, indeed, upon him like an inky cloak; but his sorrows are seen through such a long perspective, pushed so far away by the presence of the one friend whom he knows and can trust, that they seem only to call out his wonderful delicacy and comprehensiveness of mind; and he seems equally happy, whether his thoughts are playing with the lightest and airiest touch around some flower of fancy, or searching the roots of the deepest and darkest mysteries. It is only when he is with the king or Polonius, or the shallow courtiers, that his thoughts take on that terrible irony which strikes and burns like the lightning; and the sea of his thoughts begins to heave till he goes off alone, where one of those storms which seem elemental breaks forth and lashes it into a fury of passion.

It would hardly be the proper thing before an American audience to close such a discussion without at least asking the question, what does it all amount to, what use is there in studying such a character as Hamlet? Let us change the question a little, and ask why it is that the character has such a fascination for every one?

He never inaugurated any great movement, social or political, for the bettering of his people. He gives no hint that he could have managed a convention or conducted to a successful issue a political canvass; while the distracted multitude loved him, he was fatally defective in the gift of organizing them and controlling their actions. There is no evidence that he would have made a great editor or a great lawyer, or a great preacher, or a politician, small or great. He would probably never have invented a telephone, or a printing-press, and his name was, doubtless, not often seen in the court calendar, though he was

> "The expectancy and rose of the fair state,
> The glass of fashion and the mould of form,
> The observed of all observers."

He had few of the qualities necessary to a popular leader or a useful public functionary. He was little more than a target for "the slings and arrows of outrageous fortune"; he was indeed the center about which all the forces of Denmark gathered; his voice was seldom silent, though his longest speeches were little more than "wild and whirling words." Yet, abating all these things, his words are upon the lips of multitudes who never heard the "veni,

vidi vici"; and his thoughts are ministering angels to thousands of hearts heavy in spite of the Rubican and the Capitol. Why is this,—why do men take him to their altars, and let the Caesars and Alexanders sleep on in their tombs? We love Hamlet for himself, because he was Hamlet. In this nineteenth century we have been sitting in the work-shops and listening while the robed priest Carlyle preached the gospel of toil and taught us "the infinite conjugation of the verb to do." No doubt at all, the lesson is a very needful one and a very impressive one. He has done nobly, who has learned it; and is one of Nature's noblemen, who has really done some needful work. But to *be* is a higher thing than to *do*; and while we give our homage and admiration to the noble man or woman who can *do*, we give our love to the noble man or woman who can *be*. The drift of things, the slow but mighty sweep of the central Power which guides the flowers, and the stars, and the hearts of men, is away from the characters of King Claudius and Polonius brooding and hatching their serpent-eggs, and toward the character of Hamlet taking no anxious thought for the morrow, how it shall come,—with sorrow and pain, or like the "Morn in russet mantle clad", —only convinced that "the readiness is all".

GROGAN'S DISAPPOINTMENT.

Hon. Mark L. DeMotte.

AMOS Grogan was a man of "sperrit." He not only claimed it for himself, but his neighbors conceded it to him. In the vocabulary of that region, "sperrit" was a very comprehensive word. It meant a combination of the industry, judgment, physical strength and endurance necessary to success, with a personal courage that punished an insult to one's self or family with a blow or a bullet, as its character might demand. He was a "man of his word," in the full sense of the term. The estimate the neighbors put upon his integrity was well voiced by Squire Crawley on one occasion.

At a merry-making where "applejack" and "peach" had flowed so freely that the blood of some of the young men had been warmed to the fighting point, pistol shots had been exchanged and a serious wound inflicted. The matter was of sufficient dignity to bring the prosecuting attorney up from Griggsville, the county seat, to look after the interest of the commonwealth.

The 'squire thought that the prisoner had been a little more profuse with powder and lead than the circumstances justified, and he ordered him to give security in the sum of $300 for his appearance at the next term of the Circuit Court. A moment of silence followed the announcement of the judgment which Grogan broke by saying:

"He'll be thar, 'squire."

"All right," said the squire, "Cote's adjourned."

"But your honor," said the prosecutor, "the prisoner must give a bond for his appearance."

"Grogan said he'd be thar, an' he'll

be thar," added the 'squire. "I don't know how it is down at Griggsville, but up 'yer Grogan's word's as good as his bond. Cote's adjourned."

The quieter portion of the people sometimes criticised him a little because of his fondness for horse-racing, bowery dancing, and like amusements, but they went no farther with it than Elder Browder, of the Coon Creek Baptist Church, who said:

"Grogan's a good man, a mighty straight for'ard one, but he's a leetle too fond uv hilarity fur a Babtis."

At the time the events we propose to relate were transpiring, Grogan was very proud of two things, "The Bowl," and a boy baby.

"Thar ain't another sich a spot in Kaintucky as "The Bowl," he was in the habit of saying, " an' wen you've said thet air you've said all, fur Kaintucky is the ge-yarden of the world."

"The Bowl," as it was known far and wide, was the home Grogan's "sperrit" had made for himself and family in the Cumberland range, in southeastern Kentucky, a good day's journey northward from the famous Cumberland Gap. It was indeed a beautiful spot. On the southeast, Browning's Ridge, or as it was familiarly called, "Old Brownie," rose up abruptly many hundred feet. For a mile it presented a front almost as straight as if the huge rocks of which it was composed had been laid by a skillful mason.

The power which had thrown it there had broken the various strata in a series of steps, each crowned by a luxuriant growth of timber, presenting the appearance of a giant stairway carpeted with green. Opposite this the mountain curved northward in horseshoe form, the sides sloping upwards for nearly a mile to an overhanging ledge of rocks; the whole resembling the half of a broken bowl, hence its name.

The semicircle that formed the bottom contained a hundred acres of comparatively level land; the sloping sides, three hundred more, to the clearing and cultivation of which Grogan had devoted his life. It was the largest and most valuable farm within a radius of twenty miles.

In the center of the bottom of "The Bowl" was a large two-story hewed-log house, with accompanying orchards and outbuildings, where Grogan lived and dispensed a hospitality unusual, even for that hospitable country.

Of the boy baby he was especially proud. His first birthday had arrived, and there was a barbecue at "The Bowl" in honor of it. At Grogan's invitation the people for miles around had gathered in the grove near the house to make merry. With the child in his arms he went about welcoming each fresh arrival.

"This is the son an' arr," he would say. "I'm gittin' him acquainted with his neighbors. He's goin' to be owner and perprietor uv The Bowl some day. He's a boy uv sperrit too, I tell you. Hit crapped out on him afore he wuz three weeks ole. Yes, sir; he's a boy uv sperrit."

"You folks as has lots uv boys or' to be proud uv 'em, an' I'm sho' you air, but hit don't stand to natur' that you kin be quite as proud as I am uv this'n. Thar ain't none uv you fixed as I am. You hain't got sich a passel uv gals as I have, you know."

"Some uv you has knowed me an' Marthy ever sence we come 'yer an' commenced to cler up The Bowl. Marthy, the oldest, you know, named fur

her mother, come the fust yer. Then Hanner Ann, then Tood, then Car'line, then Becky, an' then Gin, only a leetle mor'n a yer apart. Wen I seed Gin, I says, Good Lord-a-mighty Marthy, how many mo' gals is thar to be? She jist flared right up, fur she's a woman uv sperrit, mind I tell you, an' says she, 'Git along with you, ef you don't want the gals I do, an' I don't want no complainin' nuther, fur I hain't the sayin' whether they shell be gals ur boys, no more nur you."

"Lord bless you, I did want 'em though. They wuz as welcome as anngels, but I kinder honed arter a son an' arr, you know. Then come Mary Jane, then Bet, then Lide, an' then Mandy, an' ther ain't finer gals in Kaintucky ef they air mine. Then they stopped a comin' fur seven yers. Long afore the seven yers wuz up I'd done give up all hope uv a son, an' arr, an' while I thought the good Lord hed used us ruther shabby, I 'spected mebbe He mout know more about what wuz best fur us than I did myself.

"A yer ago to-day this leetle feller come, bless his heart, an' I reckon you'll b'lieve me wen I say thar wuzn't two prouder people in Kaintucky than Marthy an' me. She named him. Says she, 'hits Amos Grogan, junior. He's come fur us to lean on wen we git old."

"I says to her, Marthy, says I, I'll sell the roan colt to-morrer, an' he's the best uv the three yer ole's, an' put the money out at intrust fur our son an' arr. Mor'n that yit, says I. Every yer I'll sell a hoss, ur leastways a critter uv some kind, an' put the money out fur him. Mor'n that yit, says I, if the good Lord lets me an' the boy live, I'll give a barbacue on his birthday tell he's twenty-one."

"This is the fust one, frien's. That three yer ole a roastin thar is jam up—no better beef no whar. Hit's fur you, an' hit'll be done to a turn by noon. You know whar the bar'ls is. The furdest one's whiskey; the kag in the middle's peach. Thar's a tub uv honey by it. They're both six yer ole. The other is apple-jack. Hit's a year older. Hit's all fustrate. I made it myself. Thar's cider fur the women folks an' the children. Drink to the boy yer, to Grogan's delight; that he'll make a better man than his pap."

"I'm goin' to give my boy a better chance than I had. I never had no schoolin', you know. Marthy's the scholar uv the fambly. She's from ole Virginny an' wuz two yers to a regular bo'den school. She'll larn him at fust, an' then he may go to college ef he wants to."

The dinner was followed by dancing and other sports, and was heartily enjoyed. As they were going, Grogan extended a general invitation for the next year. "Remember, hit's the 28th uv September. Ef it comes on Sunday your'e invited fur Saturday. Everybody's welcome, 'cept a Bramlett, an' they wouldn't come ef I wuz to ax 'em, an' I'm not goin' to ax em."

This annual birthday festival became known as Grogan's Delight. It was as much an institution in the neighborhood as Fourth o' July or Christmas. If one wanted to fix the time of an event and said "hit wuz a week afore," or "hit wuz two weeks arter The Delight," it was designated with sufficient accuracy for the average inhabitant.

As time passed the boy did not develop as fast as the proud father wished. The truth is that between the chicken pox, measles, mumps, and ague

the little fellow had a hard struggle to live at all. The Delight, however, grew more popular among the people, and the number in attendance increased annually. Grogan was often forced to apologize for the absence or the puny appearance of the boy. "The po' leetle feller ain't well to-day. He's sick most all the time. Hit's a great disappintment to me an' Marthy that he's turnin' out weakly. He's the onlyest boy uv 'leven children, an' hit's a disappintment."

By the time the tenth anniversary arrived but little was said of or attention paid to the "son an' arr" by the guests at The Delights. Without thought of disrespect to child or parents the people began to speak of him as the "Disappintment," until outside of his own family he was known by no other name.

Amy, as he was called at home, was the pupil of his mother until he was 13 years old. A three months' school was taught in the neighborhood during the winter. Grogan insisted the boy should attend. It would give him "sperrit" to be with boys of his own age. Almost every evening Amy came home in tears, with long stories of rough treatment from his school fellows.

"Ef any man abuses you," said Grogan, "I'll tend to him; but as to the boys an' gals, ef you can't gin 'em as good as they send, you'll have to bar it."

At 16 he was a pale-faced, mild-eyed, effeminate boy, no larger than the ordinary 10-year-old of the neighborhood. The master said that he had accomplished all he could in that school, and the mother proposed sending him away.

"I said he should hev all the schoolin' he'd take. Hit wuz right wen I said it, an' hits right now. Hits a pity he's so weakly. Hits tuk all the sperrit out'n him. He cries ef you pint your finger at him. He's our baby, Marthy, an' hit 'pears like he's never goin' to be anything else. I don't like the idy uv his goin' whar we can't nuss him an' keer fur him. As a baby he's tuck right a holt uv me. As a son—an' arr, he's—ah, he's purty weakly. Folks kind 'o spects, you know, to lean on a son an' arr. The idy uv you ur me a leanin' on Amy; hit ah, hit won't do. Hit ain't his fault nur yourn nur mine, but hit's all the same a disappintment."

His mother took him to Indiana and placed him at school. With the exception of a few weeks' vacation each year he remained at school five years, and in his twenty-first year returned home, graduated, a big word for that neighborhood.

He was a tall, slender, pale, beardless young man, of scholarly appearance and habits. As to his physical appearance, Grogan put it forcibly when he said: "He looks like a tater vine growed up in the shade." His father gave him a handsome horse, saddle and bridle, also a gun, with the injunction that he should spend the time until The Delight in getting some meat on his bones and some color in his face; after that he would be of age and could do as he pleased.

Amy gladly availed himself of the leisure. He was without congenial companionship, and spent most of his time on horseback and climbing about the mountains. When inquiries were made as to "who the fine-dressed young feller on the black hoss" was, or, "who wuz that a-settin' way up on Rocky Pint with a book?" the answer would be, "Hit wuz Grogan's disappintment, I reckon a moonin' round."

There was a companionship between mother and son which was a source of great pleasure to both. Quiet, respectful, considerate of her slightest wish, she idolized him. She never tired of talking of his varied accomplishments, to all of which Grogan would respond pleasantly, "He's a mighty nice boy, Marthy, mighty nice. He's the makin' uv a fustrate man sometime ef he kin only git strong. We ortn't to 'spect a weakly boy to hev sperrit, I 'spose." It was evident that he regarded him as a mere child.

(*Concluded next month.*)

PSYCHOLOGY—PERCEPTION.

H. N. CARVER.

IN these articles, all the psychological processes have been defined in terms of consciousness, which at the beginning was itself defined simply as the mind's power of knowing its own activities and products. Sensation was defined as the mind's consciousness of change from one state to another. No doubt, this definition is somewhat ideal, or logical, marking off a segment of what Prof. James calls "the stream of thought," in a way to meet the necessities of our thinking rather than any thing that could be actualized in any concrete observation of the stream. So regarded, the sensations are wholly subjective in the psychological sense ; the term is intended to exclude every thing outside of the mind itself. Any discussion of even nerve processes would be physiological, and not psychological, or at least psycho-physical. When, however, the mind assigns the sensation to something outside the mind as cause, in other words, when an objective element is added to the subjective, the process is called perception, and the product, or mental state, a sense-feeling, sometimes a percept, though we will keep this term for another thing. This process of assigning the sensation to some external thing as cause, is often called localizing the sensation, by which is meant assigning it to this or that sense-organ, as the eye, or ear. In the language of common life, it is knowing an attribute as belonging to some external thing, as size, shape, color, etc., as belonging to a tree. While it is proper enough to call the sensations raw materials of knowledge, it must be evident that only perceptions can properly be called the units of knowledge, since it is out of these that the great body of our knowledge is formed. A sensation cannot be thought of as constituting any proper part of our knowledge, until it is known as standing for an attribute of something ; and this makes a perception out of the process and a sense-feeling of the product.

If there is something on my table, I may look at it, and find out many of its attributes through the sense of sight, its shape, color, etc.; I can find out others through the other senses, touch, taste, smell, etc. When the mind knows the whole aggregate of attributes as belonging to one particular thing, and so constituting a unity, the process has reached its limit as perception, and this total product we will call a percept. Of

course, these percepts, as totals, are rather vague. The percepts of the same thing by two minds at the same time, or by the same mind at different times, could hardly be similar in every respect; the absolute sums of attributes would almost inevitably be different. This is worth bearing in mind, since these percepts are the real units of thought, and any vagueness here will perpetuate itself in the complex wholes of thought built out of the percepts, that is, in our scientific knowledge, which is the knowledge that we use for guidance in all the affairs of life.

It is hardly necessary to say, that the actual percepts of every day life are necessarily of this imperfect kind ; that is, they are not made up of the sum-total of attributes which all of the senses might give. We see something, and usually sight alone must furnish the attributes which we must deal with at the time; we do not have the opportunity to find out what the other available senses might supply. Could we try the other senses, touch, taste, hearing, etc., the percept might be made vastly fuller and more perfect. Often, too, we are unable to detect what a single sense might disclose. The writer once thought he had a strange specimen of feldspar, and showed it to others as such, simply because he had not tried what attribute it had, when tested with an acid or by scratching. This suggests the difference there is between common off hand observation and that more careful kind practiced by trained scientific observers. Of course, in this form of observation there are involved higher processes than mere perception, yet simple perception is present in its entirety. Here, too, the value of the natural sciences as educational means becomes manifest; and here the trained teacher, trained in the proper way, may do his best work. The life of the child is almost wholly in this world of observation; the life of the man ought to be largely in a world built out of the percepts of the child's world, yet a world in which the percepts are vastly more significant than the child's. To such a botanist as Dr. Gray, the plants by the roadside are other plants than those that the rustic sees ; and the same stones preach different sermons to the geologist and the clown. It is not only that the child should form right habits of observation, he should know what to see to make his seeing significant. As Faraday used to say, he should know what to be on the look out for. There are a thousand attributes belonging to any given object, which have no significance, since they have nothing to do with the great worlds of science and aesthetics, in which every one should make his home ; and it is of the utmost consequence to the child that he shall not be burdened at the beginning with a bundle of useless things which he must get rid of, as the Pilgrim did, before he can begin the real life. It was here that the dismal failure was made by that old educational fad, object lessons (*requiescat in pace !*) with its dreary humdrum of question and answer, which emasculated at once thought and language. The stock question was, Children, what have I in my hand ? and the stock answer, You have an ear of corn ; the complete answer being insisted upon with all of Falstaff's "damnable iteration." Of course, it is all well enough to take common objects and have children make out lists of their uses, etc. The practice furnishes a drill in methods of arranging topics of discourse; but such

objects as an ear of corn, or a chair, or a lump of coal, are not the best for observation. There are very few of such objects that have attributes which can afterwards be incorporated into scientific knowledge, and which the child at this stage of his mental development can appreciate; and simply looking at something for the sake of looking, is as futile an exercise, as carrying a pile of stones from one place to another for the sake of having something to do. Botany and Geology furnish innumerable objects for this kind of work, which in the hands of a competent teacher, one who really knows something of these sciences and loves his knowledge, may furnish real and genuine object-lessons. There is not a flower which does not have things that a child will see with a living interest; and enough of them to supply a summer's entertainment of growth and development, which will go with him to the end of his days, which will never grow old, which will never need outgrowing or casting aside, which may be built upon as upon a foundation of rock, and make for him a home to dwell in, a gallery of delight, and a temple of worship. Undoubtedly the teacher must have a good knowledge of his subject before he can use it in this way; but it is not so necessary that the knowledge shall be extensive, or accurate in a pedantic sense, as of that real kind which makes knowledge a part of life, so thoroughly a part that it *must* be communicated and shared. And so it comes about, that it is not so much a knowledge of methods that is needed, as a knowledge of things, of things not disjointed, but organic parts of one co-operating whole of parts.

It has not been thought desirable to give any classification of percepts, or refer to any of the interesting and perplexing questions which make this part of the subject the battle-ground of the theorists. For the classification, Baine's *Intellect* is the fullest and best work; for the speculative parts, Hamilton, McCosh, and Porter, with the writers referred to by them, may be consulted.

EPITAPHS.

J. Fraise Richard.

LITERATURE has numerous departments, each distinguished by its peculiar phases or types. Thought naturally dresses itself with appropriateness for the occasion which requires its use. The rhetorical pomposity of a Fourth of July oration would not be regarded wholly suitable for the solemn message of consolation addressed to mourning friends on a funeral occasion; nor would the concise and barren language of a telegraphic message be strictly in harmony with the spread-eagle efforts of a gushing sophomore. The eternal fitness of things manifests itself in all the diversified productions of the human intellect, and yet there seems to lurk in the mind the latent conviction that epitaphs frequently contain a vast deal of truth, notwithstanding Byron's ugly sneer—

"Believe a woman, or an epitaph."

Funeral orations and epitaphs are, as a rule, striking examples of the prone-

ness of humanity to be guided by the oft-repeated fallacy, "Nothing concerning the dead but good." How much better it would be to have the maxim enlarged and practiced, too, "Nothing concerning either the living or the dead but truth." We should not then be compelled to admit the justice of Shakespeare's statement that—

"The evil that men do lives after them : the good is oft interred with their bones."

Funeral ceremonies would be less frequently the occasions for purchased and fulsome eulogies on the dead, and those in charge would imitate the example of the Roman orator: "I come to bury Cæsar, not to praise him."

To such an extent has the practice of laudation been carried in the matter of tombstone inscriptions that it has been justly dubbed epitaphy (epi taffy). The exceptions have been generally the efforts of wags and just critics and may be taken as a wholesome protest against the nefarious practice.

Addison was a prince among literary men, and yet his domestic life was far from being perfect, if any credence can be placed in the sentiment said to have been placed upon his wife's tomb :

Here lies my wife,
Here let her lie;
She's now at rest
And so am I.

There is probably less of complacency in it than is found in the inscription upon the tomb of a fair damsel whose friends, while appreciating the blessings of rest on the one hand, were humorously mindful of some inconveniences on the other. Here is the inscription:

Here lies our Mary Ann at rest
Pillowed now on Abraham's breast;
It's very nice for Mary Ann,
But rather rough on Abraham.

Upon a tombstone in an old Scotch cemetery is found an inscription which reveals an unusual degree of post-mortem felicity and restfulness, as well as consummate skill in the use of appropriate words :

Here at length I repose,
And my spirit at aise is,
With the tips of my toes and the end of my nose
Turned up to the roots of the daisies.

In the Western Reserve of Ohio is a tombstone which expresses filial regard in metrical style, thus :

Here lies our father beneath this sod;
His spirit has gone up to his God.
We never more shall hear his tread
Nor see the wen upon his head.

Every intelligent person has read with growing delight that masterpiece of English composition, "Gray's Elegy in a Country Church Yard," and has had his attention called to the poet's graceful tribute to the humble one whose lot was cast amid lowly surroundings :

Here rests his head upon a lap of earth,
A youth to fortune and to fame unknown;
Fair Science frowned not at his humble birth,
But Melancholy marked him for her own.

The services of the wag or professional rhymester are frequently brought into play in saying what others only dare to think. The truth of this is illustrated in the subjoined stanza :

He lieth here
Who lied before;
But since he lieth here,
He lies no more.

Closely related to the foregoing, by the ties of consanguinity, was the lawyer in western Pennsylvania, concerning whom some evil genius wrote this epitaph :

Here lies poor Sam, and what is strange
Grim death in him has wrought no change;
He always lied, and he always will,
He once lied loud but now he lies still.

Some poor soldier in the campaign against Corinth in 1862 was remembered by a comrade in this quaint couplet:

Here lies Jim Crow
For all I know.

Intemperance teaches its victims some important lessons which are very often learned after it is too late. It is just as true in the mental and moral world as it is in the physical world that "Whatsoever a man soweth, that shall he also reap."

This accounts for the sentiment which marked the final resting place of the inebriate:

Beneath these stones
Rest the bones of Theodosius Grim;
He took his beer from year to year
Until his bier took him.

It is refreshing to witness some variation in the make-up of epitaphs. In the following will be exhibited a strange combination of the spirit of mammon and parental affection:

Here lies our darling little babe;
She neither cries nor hollers;
She lived but one and twenty days
And cost us forty dollars.

When the gold fever broke out in 1849 the rush to California was very great. One of the adventurers from an eastern state realized fully the truth of the declaration, "It is not good for man to be alone." In consequence of his faith he married, in succession, three courageous women, who dared to go to the far west. After they had all died in succession, he concluded to provide a suitable monument to perpetuate their memory and to proclaim his good qualities as a husband. Collecting their remains and placing them in a common receptacle he erected a monument to their common memory. It contained this unique inscription:

Stranger, pause and shed a tear,
For Mary Ann lies buried here,
Mixed in some mysterious manner
With Nancy Jane and probably Hanner.

MONEY AND MORALS.

An address delivered by Col. Henri Watterson before the Scientific Class of '91, Aug. 12, 1891.

LAST winter as I was about setting out to fill a round of lecture engagements I received a letter from an old friend of mine saying that he had seen it stated in the newspapers that I was going to talk about money and morals, and adding regretfully that as he had very little of either, he would come and hear me.

Let me hope that those of you who have done me the honor to come here to-night have not been brought out by a similar state of destitution. For, to be in the beginning entirely candid and confidential with you, it is not my purpose in undertaking to state a few cases at an address, touching those great forces of life and thought, to dwell very long upon the economic aspects of the one, or the abstract relations of the other. Whatever my offenses may have been in that regard on occasions past and gone, it is my present wish rather to avoid than to invite or provoke controversy, though as a matter of fact I do not believe since the days of the bard who

"Wrote like an angel and talked like poor Poll,"

a man has lived who could argue the case better or more to his own satisfaction, whenever there happened to be no one around to answer him or listen to him, than I can myself.

And yet, on the other hand, if we would only allow ourselves to see it, there is scarcely a question, public or private, that has not two sides to it, on which some common ground might not be reached by the men who seek earnestly and honestly to ascertain the facts involved; and although agreement as to conclusions might not always follow, certainly much of the bitterness and disagreement would be struck from the record. Indeed, I am inclined to think, that, as a rule, we are nearest to being in the wrong when we are most positive and emphatic. It was, you remember, William Lamb, afterwards Lord Melbourne, who said: "I wish I could be as sure of anything as Tom Macaulay is of everything." A New England deacon on our own side, put this same idea wittily and suggestively, when, going out of church on a Sunday, he observed to a neighbor between whom and himself there had been a coolness, "Brother Jones, after listening to this long discourse of our beloved pastor on Christian charity, I think you and I ought to shake hands and be friends again. Now, as I cannot give in, you *must*." That man was a humorist as well as a philosopher, knowing perfectly well that he was confessing himself to have been in the wrong all the time. So, my friends, in what I am going to say to you to-night I shall not at least be problematical. However, as I happen to have the floor and cannot give in, why, in case of disagreement, you must.

Take the map of North America and fix it in your minds. Behold, what an empire! Cæsar never looked upon the like. Napoleon in his wildest dreams conceived nothing so magnificent and vast. See how it takes up its line and travels with the North star; how it coasts along the frozen seas from Alaska to Labrador; how it sweeps around the capes of Newfoundland, losing itself for a moment in the mists; how it skips, as it were, over her Majesty's dominions; how it deepens in the pine forests of New England with inland oceans for its jewels and the great Niagara for its crown of diamonds; how it journeys in palace coaches and vestibule trains through the glorious North and the teeming South until dropping itself down into the gulf stream it fades at last in a vision of Paradise under the Southern cross amid the silence and solitude of eternal summer.

What a wealth is here to elevate the mind and to inspire the heart, to make us proud of our country and ourselves. What patriotic memories crowd every foot of the way. How does not the prowess of our land rest on the bones of heroes that have reached the borders. The Montezumas marking the inventive work in the triumphs of the senate and the field and in the nobler achievements of the laboratory and the workshop,—the prowess of a people who have already revolutionized the new world and put the old to blush, and are destined ultimately to draw to themselves all the resources of the earth, and form the virtues and powers of man in his final and complete development.

Is there anything to mar the prospect? Is there anything to darken the scene and dim the light? Is there anything across the great highway of the future to obstruct our march of triumph and glory as a nation and as a people?

Yes, I think there is; and, still keeping my text, Money and Morals, in mind, nor yet forgetting our extradition treaties and our detective system, I answer without hesitation, Canada and Mexico. Yes, Canada and Mexico. Canada that is the retreat of the gentleman who has more money than he has a legal right, or is morally entitled to, and Mexico, the flowery home of the gentlemen that, without money, have no morals to speak of. In the olden time gentlemen possessed of obliquity with respect to money and the gentleman who made himself responsible for the funeral not sanctioned by morals, found an easy retreat on this side of the Rio Grande. You will remember the incident of the attorney when he heard from his client the full particulars of the homicide he had committed, advised the client to fly. He was most indignant. "What, fly!" said he, "a'nt I already in Texas?" The Lone Star has become one of the forty-four since then, and now the excursionist who has escaped the blandishments of the district attorney and the court, therefore must put the Sierras betwixt themselves for final safety, or else go to Canada direct, which, on account of its acceptability, seems to find great favor of late in the estimation of that association; and those gentlemen go to Texas who have no time to wait for passports. So it is, I use the terms Canada and Mexico as geographical expressions of a field of irresistible callings. It is the field of the embezzler and the genial defaulter, to say nothing of the forger and absconder, the cashier of the savings bank and the custodian of trust funds. These are not meant as terms of reproach against two friendly neighbors, who, as in the case of Texas before us, are destined at one time to rap at our gates for admission into our sisterhood of states.

I am sure that there is no one here to-night who is old enough to have invaded an apple orchard or ripe watermelon patch who has not thought many a time what a great thing it is to have plenty of money. All of us have turned that matter over in moments of reflection, dejection and embarrassment, seeing in our day-dreams the fairy ship coming home, and building castles in the air off the proceeds of the cargo. Who has not thought of the good he would do with it? How he would administer to the wants of the poor and the needs of his friends? What spendthrift who has not paid debts off the usufruct of vision. What wretched millionaire oppressed about by sorrow, rich in fact though relatively poor, for money like all things else in life except love and duty, is relative,—what rich broker encumbered by his possessions and yet unable to meet the demand of his conscientious creditors who has not wished a thousand times over that money was a vision and only a vision. I say that money is relative, and it is very relative. The man who has ten millions of dollars cuts a very poor figure beside the man who has a hundred or one hundred and fifty millions of dollars; Whilst the man who has only a measly million is regarded by those as a kind of a pauper. The man who has a hundred thousand dollars of income and one hundred and fifty thousand dollars of wants is worse off than the man who has nothing and wants his dinner. There are men living in the great money centres who contrive by dint of the closest economy to eke out a scanty livelihood on fifty thousand dollars a year and

these men, discounting the cost of living there and here, cannot conceive how it is possible that any man should be able to get on, let us say here in Valparaiso, on less than twenty-five thousand dollars a year. Whereas, I have a suspicion that if I should go out into this community with a search-warrant I might find a few persons who make both ends meet on half that sum. But money is not only a relative thing, it is full of illusions and delusions. From the poor creature who is sure he will get it somehow, he don't know how and he don't much care, and goes into debt on the strength of his expectations, to the poor creature who has no hope in particular and loves to talk about it; from the wan woman in the attic waiting for the letter that never comes, to the brave and honest lad at the furnace who believes that the hammer in his hand is the wizard's wand and who means never to let it go until he has struck fortune; from the capitalist in his mansion house who has money, now the master, now the slave, to the young fellow behind the counter who gets seven dollars a week for selling prints and playing base ball on Sundays; from the little maiden out in the garden, hanging up the clothes, and singing "sing a song of sixpence, a pocket full of rye," while the queen is in the kitchen eating bread and honey; the prince and peasant, warrior, philosopher, statesman, —all of us have at one time been struck by that golden rod that has brought so much happiness and so much wretchedness into the world, and will continue to do so, for money is the first great material fact of which life is composed. It is the pivot about which all other facts revolve,—the piston rod that drives all other facts, whether or not we accept the teaching of the New Testament regarding the love of it as the root of all evil. Even with that criticism money has got a right which is divine. No man can afford to disregard it or leave it out of his calculations. Bacon calls it the baggage of virtue. But even he admits though it hinders the march it cannot despair the life behind. It is the one thing universally used and abused; universally coveted and reviled. All men affect to hold it lightly and all men seemingly hanker after it. For my part though not as a rule given to the Pharisaic mood I am sometimes disposed to thank God that to me it has been at all times an instrument and not an end. Indeed, I was never happier in my life than when to avoid the humiliation of borrowing from an uncle, whose politics I did not approve, I went with my watch to an uncle who had no politics at all and got fifty dollars on it. I never knew what it was to be thoroughly unhappy until I had acquired a considerable income with its accumulation of wants and was brought into close personal relation with those terms and phrases, Mr. Promissory Note, and Messrs Discount, Renewal & Co.

Nevertheless, it is a good thing to have plenty of money honestly obtained, and still better thing if this money be honestly applied. The camel's passage through the needle's eye may have been easier in those old days than a rich man's entrance into the gates of heaven, particularly if it happened to have been a very small camel and a very large needle; and yet, on the other hand, there must have been many a rich man gone to heaven, for we have the record of many a good one here on earth; men who served God and loved

their fellow men and have given freely of their store to the needy and the poor. I should hate to think that money is a positive bar to salvation and that it is an actual sin to seek to gain much of it. It is undoubtedly true that the possession of money will harden and corrupt ten times to one time where it will elevate and soften. The man who trades in money is apt to take on some of the brittleness of the metal composing it, and he gets in time to measure everything and everybody by that one metallic standard. It is his business in life to rub two dollars together and make three of them, or better, four, five, or six, or ten. Capital, we are told, is his morals and that, because he has no heart he makes up his lack of courage by a craft that rarely trusts except on good security, and never tires except when the plate is passed,—is always suspicious and alert.

How many a good fellow have we known to turn into a bad fellow by the possession of money. How many persons enter the bank all grace and come out all guile. In how many cases has the possession of money enlarged the mind and amplified the soul? Our lecture field is full of examples, some of them humorous, some of them pathetic, illustrating the evils that pride, station and wealth have brought into the best families. But we need no fictitious examples. We are constantly meeting them in our daily walks, numberless instances that adorn the tale, great expectations coming to naught by actual realization, delightful visions of fancy turning see saw in the hands of possession.

It is my belief that the world has been much misled by some of its best maxims or rather, let me say, by the misinterpretation of some of its most accepted maxims. For instance, there is none of those that appears in so many languages and puts itself into such a variety of phrases as that which urges us to persevere in all things. "Perseverance," we are told, "conquers all things." Then we are told that "Labor conquers all things;" then we are told that "Love conquers all things." Now, perseverance will divert no man from the uses to which he was born. Labor will not convert a clod into a painter or a poet; and love for all its enjoyments never made a silk purse out of a sow's ear, though sometimes many young persons think so. Perseverance may be misdirected and so become vicious; and labor may be misapplied and so be wasted; and love often falls a victim to its own excesses. How often have you seen a man start out in life saying, "I will be rich; I will sacrifice everything to riches;" or "I will be famous; I will sacrifice everything to fame." He has found before the journey was half over that no one thing in life ever procures happiness but that happiness itself shifts its feet from time to time; the man at five and forty fails to enjoy that for which he made sacrifices at five and twenty.

An eminent public man once said to me in the presence of a great domestic bereavement: "I was elected to the Senate of the United States when I was just turning thirty and by a curious form of treason in a supposed friend I lost my seat some three or four years later, and the last fifteen years my single object in life, the sole aim and end of my existence, has been to get that seat back again. At last this wish has been fulfilled and what does it matter after all?" I once heard a President of the United

States say: "I was a candidate for President for twenty years. Regularly every four years my state sent a delegation to the National Convention to urge my nomination, and regularly every four years came away beaten, disappointed. At last when I had given it up and when it had no longer any power and interest to inspire me; when all the friends I loved and wanted to reward were dead and most of my enemies I hated and had marked out for punishment were turned my friends, I was nominated and elected. Here I am, an old man, full of care and trouble with scarce a single joy on earth."

You all remember how, at the very zenith of their fame, both Webster and Clay deplored the fact that they had ever entered public life at all. They both sought the Presidency and they were both disappointed. To the unthinking multitudes they were in positions that brought to them delight and troops of friends. These things were nothing in their sight. Each of them had fixed his heart on one object, the White House, and failing in that, each of them was himself a beaten and broken old man, pitied in life, cheated out of something he had brought himself to believe honestly belonged to him.

A little while before his death, Mr. George D. Prentice said to me that if Mr. Clay had been elected President he would have been the wretchedest man that ever lived, because he would have been proved to be the biggest liar that ever lived. "How is that, Mr. Prentice," I asked. "Why," said the old gentleman, "Mr. Clay was a candidate and aspirant for the Presidency during quite thirty years. He was an orator, well qualified for making friends. He had plastered the country over three plies deep with promises; promises real and imaginary; conscious and unconscious; but promises which could not by any possibility be fulfilled. He was an honorable, proud and self respecting man. When these promises came to maturity, without the person having the appointment and he realized the situation, it would have embittered his life and broken his heart." Indeed, I am so far sincere in believing that self repression in this regard is true wisdom, that I rather think that the young fellow who is in love with a girl and finds her particularly hard to get had better leave her alone and seek to find a wife somewhere else. There must be away down in her heart some very potent reason and not merely if a woman ever marries, to say that she marries him to get rid of him.

In short, my argument is that we are constantly setting our hearts upon the possession of some one material thing in life, the possession of money or the possession of a wife, and think the attainment of that is success in life, or failure in either one is failure in life, when if we were to know the truth in advance that is the very object upon which we would shrink back in horror. Taking the material things of life together they do not bring happiness and comfort. Millions of money won't save a man from the torments of a sore toe. Happiness is a creation of the mind and heart, not of the stomach.

(*Concluded next month.*)

LIFE AT THE U. S. NAVAL ACADEMY. III.

GEO. L. FERMIER.

ONE month of pleasure at home has passed and the cadets on leave return to the Academy, prepared to begin the eight months' work ahead of them.

On the first of October the cadets report their return from leave to the Commandant of cadets, and are assigned rooms and room mates. The programme of recitations and periods assigned each branch of study is posted in some conspicuous place where all the cadets can acquaint themselves with their work.

The academic year, a period of eight months, is divided into two terms; the first being from the first day of October until the latter part of January, the second term, commencing at the expiration of the first term, continues until the last Friday in May, with the first week in June as graduation week.

Each class being separate and distinct from the other classes, the work for the different classes is different and will be spoken of in succession.

First year, or Fourth class work is :—

First term.—Algebra: Fundamental operations; reduction and conversion of fractional and surd quantities; reduction and solution of equations of the first and second degrees; inequalities, involution and evolution. English: The structure and historical development of the English language; exercise in the composition of letters, one of the letters being,—"Dear Father: You may expect me home February first, etc." (The end of the first term). History: Outlines of history, especially the history of Greece and Rome, and of Western Europe down to 1880; historical geography. Modern languages: French, reading and translating and conjugation of verbs.

Second term.—Mathematics: Algebra; course of first term continued; development of algebraic functions by means of indeterminate coefficients and the binomial theorem; permutations and combinations; summation of series; continued fractions; logarithms; exponential equations, including the solution of numerical equations. Geometry: Course of first term continued; spherical geometry, the cone and the cylinder; mensuration of rectilinear figures, and of the sphere, cone and cylinder; application of algebra to determinate geometry. English studies: English; Rhetoric and composition; kinds of composition, narrative and descriptive, etc. History: History of the United States and important points about naval history of the United States. Modern languages: Course of first term continued and Spanish or German additional.

Second year, first term.—Mathematics: Descriptive geometry;orthographic projections; representation of points, lines and planes, and surfaces of the second order. Trigonometry: measurements; trigonometric functions; analytical investigation of trigonometric formulas, with their application to all the cases of plane and spherical triangles; solution of equations. English studies: Classification of words; definitions of words by usage and deriva-

tion; synonyms; faults in diction, etc. History: Contemporary history, including the comparative study of governments, institutions and political geography. Law: Constitution of the United States. Modern languages: Course of first year continued. Mechanical drawing: Preliminary construction of rectilinear and curved figures to scale.

Second term.—Mathematics: Descriptive geometry; course for first term continued; warped surfaces, and surfaces of revolution; intersection of surfaces and their developments, etc.; axometric projections. Analytical geometry: Equations of the straight line and of the conic sections; transformation of coordinates; discussion of the general equation of the second degree; equations of the plane of lines in space and of surfaces of the second order; discussion of the general equation of the second degree in three variables. Physics: Force and motion; gravitation and molecular attraction; hydrostatics; pneumatics. Chemistry: aim and scope of Chemistry; the atmosphere; oxygen, nitrogen, water and hydrogen; notation and nomenclature; arsenic, antimony and bismuth, etc., with lectures and practical work in the chemical laboratory. Mechanical drawing: Orthographic projections, sections, intersections of surfaces; isometrical drawing; perspective, etc.

Third year, first term.—Steam engineering: Marine engines and boilers; explanation of all parts of an engine; types of engines; generation of steam; distribution and expansion of steam; the power of an engine and computations relating to it; building engines, with practical work in pattern, blacksmith, boiler and machine shops. Each year one class builds a small engine. Physics and Chemistry: Sound, light and heat; properties of sound, atmospheric and other vibrations; properties of light, optical instruments, double refraction, polarization, etc.; relation between heat and mechanical effect; thermodynamics; lectures. Mechanics and applied mathematics: Differential calculus; functions; rates; differentials of functions; indeterminate forms; series; maxima and minima; geometrical applications; functions of two or more variables. Integral calculus: the methods of integration, definite integrals; quadrature of surfaces; cubiture of volumes; rectification of curves; centers of gravity; moments of inertia. Mechanical drawing: second year's work continued.

Second term.—Steam engineering: course for first term continued. Physics and Chemistry: Electricity and magnetism; frictional electricity; electrostatics; electromagnetics; measurements; heat; light and work from electric currents, with thorough course in practical work. Mechanics and applied mathematics: Mechanics; dynamics; the motion of projectiles; friction and other resistance. International Law.

Fourth year, first term.—Naval construction: Wooden and iron shipbuilding; sheathing of ships; composite ships; docking and launching. Seamanship: Rigging ships; bending and unbending sails; evolutions; duties of officers; repairing rigging and spars; laws of storms; naval tactics. Ordnance and gunnery: Ordnance instructions; handling great guns. Infantry tactics: School of the soldier; company and battalion. Gunnery: The motion of projectiles in a non-resisting medium and in air; methods of finding the trajectory, the re-

maining velocity and angle of fall and dangerous space. Astronomy, navigation and surveying; the celestial sphere; spherical and rectangular coordinates; the use of instruments; time and its units; law of universal gravitation; precession; nutation, etc.; motion of the solar system; the use of tables, and the solution of problems; determination of meridian distances. Mechanics and applied mathematics: Method of least squares; theory of least squares and probable errors; fundamental principles of the theory; independent and conditioned observations.

Second term.—Seamanship and naval construction: Course of first term continued. Ordnance and gunnery: Gunnery, accuracy and rapidity of fire; the probability of hitting objects of various forms; the penetration and effect of projectiles. Ordnance: The manufacture of guns; computation of the strength and shrinkage of guns; the manufacture of all kinds of explosives and the effects of explosives under various conditions; the equation of motion of the projectile in the bore of a gun; formulas connecting muzzle velocities and pressures with the elements of loading. Astronomy, navigation and surveying: Theory and deviation of the compass; nature and causes of the several parts of deviation; determination of the horizontal and vertical forces of the earth and ship, etc.; surveying instruments used; selection and use of base line and its measurement; determination of azimuth of base; leveling; plotting a survey; hydrographical surveying; tide and current observations.

The recitations are so arranged that each cadet recites five times a week on each subject and if possible oftener.

The classes are divided into sections of about eight members each. At the end of each month examinations are held in every branch and the marks for recitations and examinations are averaged and posted: the marks being averaged by the formula $(2t+e)\div 3$ in which t is the average for recitations and e the mark on examination.

At the end of the first and second terms, examinations are held covering the work of those terms. The average in case of the term's work is from the formula $(3t+e)\div 4$ in which t is average for the months of the term and e the examination mark.

During the entire year practical work and exercises are continued from four until six o'clock in the afternoon. The drills being of various forms.

After the cadet has successfully passed all examinations and completed the four years' course he is graduated and given a diploma; after this he is no longer under the ever watchful eye of the Department of Discipline, but is sent to sea for a two years' cruise. The two years' cruise though not always pleasant affords one opportunities of seeing the world in a different style than he could otherwise do, as his voyages cost him his mess bill only, and the ports visited are always the most important.

Having finished the two years' cruise the Government sends the cadets home, allowing each one his actual expenses outside the United States and milage in the United States.

Returning to Annapolis in the early part of May, the entire class passes through that dreaded ordeal of examinations which in this case are a reproduction of the examinations of the first class year or fourth year at the Academy with addition of steam engineering.

These examinations are improved upon, in being more difficult than those of two years previous; but since so much depends upon passing these, each cadet does his best and usually is successful, and is commissioned on the first day of July as an Ensign, or assistant Engineer U. S. N., or a Second Lieutenant U. S. M. C. ready to assume all the responsibilities of his rank. After such training as he has had during the six years he should be what he has studied for, "An officer" of the United States.

THE TEACHER.

MAP-DRAWING.

MANTIE E. BALDWIN.

THERE are three stages in map-drawing: 1. Preliminary work; 2. Map-sketching; 3. Map-drawing.

The preliminary work consists simply in teaching pupils how to make coast-lines, wave lines, representations of mountains, hills, lakes, rivers, cities, &c.

In this work, they should be drilled until they can do it neatly and rapidly. The work may be done chiefly upon the blackboard and their slates.

Map-sketches may be made of the school-room, the school grounds, the school district, or town, the state, groups of states, grand divisions of continents, and of continents.

A map-sketch simply presents an outline of a country or section without regard to its latitude or longitude. Map-sketches are helpful in the study of the geography of single states, of groups of states, and of battle fields, &c, in history.

In making a sketch, it is better to use a scale greater than the one in the book; say two times, or three times.

Suppose a sketch of Pennsylvania is to be made four times the size of that in the geography.

First observe the boundary lines. On the north is a straight line extending east and west. At the western end of this line is a short line extending northward. West of this is a short portion of shore bordering upon Lake Erie. On the western side of the state is a straight line extending north and south. Joining this line on the south is another extending eastward, forming the greater part of the southern boundary line. The remainder of the southern boundary line is irregular and somewhat curved. The entire eastern line is formed by the Delaware River, which is irregularly winding.

In making a sketch, the straight lines must first be drawn. Measurements must be accurately taken. Beginning with the straight line on the south, make on the board, or slate a *broken* line four times the length of the one in the book. Join the west line to this, making it also four times the length of the one in

the book. Measure from the north end of this line in the book to where the northern boundary line begins. Four times this distance on the board place a mark or dot. From this, eastward draw the longest northern boundary line. Join to the west end of this line, the short line extending northward. All of the lines thus far drawn should be *broken* or *dotted* lines instead of continuous ones. In drawing the shore line of Lake Erie, measure on the map in the book from the southern boundary line north to the middle of the shore line; on the map to be drawn, place a mark four times this distance and midway between the western and the northern boundary lines. Measure, in the same way, between this middle point and the western line, and between the middle point and the northern line. Three of these small lines or marks will be sufficient to indicate the trend of the shore. An irregularly waving line may there be drawn to represent the lake shore. This line should project some distance beyond the ends of the northern and the western boundary lines, to show that the lake is larger than the portion of the state on which it borders. Parallel with this shore line and on the side next the lake four or five irregular lines, each more faint than the preceding, may be drawn to represent wave lines, to show where the land and body of water meet.

The trend of the river may be outlined in a manner similar to that used in getting the trend of the lake shore. Six measurements across from the western boundary line to the east will be sufficient. The course of the river may then be clearly traced. The irregular windings of the river should be imitated as nearly as possible, and the line should increase in shade toward the mouth of the river to indicate the increase in the size of the river.

The chief mountain ranges should be located, measurements being taken to get them in their proper position in the state. The mountains should be most heavily shaded where the height is greatest.

The most important rivers should be drawn; the chief cities located, the metropolis, Philadelphia, being indicated by a mark different from that used to mark the other cities, and the capital should be marked in a still different way.

The battle field of Gettysburg might be marked by a small flag, and any other interesting points by suitable marks.

The coal fields, gas fields, petroleum regions, &c, should be indicated.

The names of all these may either be neatly written in the proper places on the map; or numbers may be placed there to refer to the names which can then be written on the margin of the paper, slate, or board.

A map in the true sense of the word consists of a foundation, and an outline.

I. Foundation.

1. Inside lines of the frame.
2. Parallels.
3. Meridians.
4. Numbers of parallels and meridians.
5. Degree marks.
6. Outside lines of the frame.

II. Outline.

1. Coast line of the main-land.
2. Coast line of the islands.
3. Wave lines.
4. Surface features.

a. Mountain chains and peaks. b. Lakes. c. Rivers. d. Boundary lines between countries. e. Cities. f. Rail-

ways. g. Battle fields and other points of interest.

The descriptive geography of a country should be studied in connection with the map-drawing. The map of each country studied should be drawn at the time of the study. The dimensions of the map to be drawn should for various reasons be either greater or less than the dimensions of the map in the book. For young workers, the dimensions of the map should be multiples; that is, two times, or three times those of the map in the geography.

Every point on the map should be accurately drawn. The outline and surface features should be located in their proper latitude and longitude. Generally no names should be written on the map, because these are outline maps, not maps for reference.

This work should, properly, be done upon paper. A lead pencil of medium hardness should be used.

DIRECTIONS FOR DRAWING A MAP.

1. Determine what dimensions the map is to be. Suppose it is to be two times the dimensions of the printed map.

2. Measure, on the map in the book, from the inside line of the frame on the north directly across to the inside line of the frame on the south. Make the length of the map to be drawn two times the length of the map in the book. Measure on the map in the book from the inside line of the frame on the east directly across to the inside line of the frame on the west. Make the map to be drawn two times that distance from east to west. This will give the size of the map to be drawn.

3. Count the parallels. Put just as many on the map to be drawn as there are in the book, but put them twice as far apart. All of these should be accurately measured in order to get them the exact distance apart.

4. Count the meridians. Put just as many on the map to be drawn as are on the printed map, but put these twice as far apart. Careful measurements should be taken for meridians are not everywhere equally distant, as parallels are.

5. Number the parallels and meridians as they are numbered in the book. Small figures should be neatly made, just outside the inside frame lines, and at the ends of the parallels and meridians.

6. Place around on the inside lines of the frame, the small marks to indicate the length of the degrees.

7. Draw the outside lines of the frame. These should be very heavy lines, and should be placed far enough away from the inside lines of the frame to admit the numbers of the parallels and meridians.

The parallels and meridians should be fine, hair lines, but very clear and distinct.

This constitutes the foundation of the map, and if it is correctly drawn, there is reason to suppose the entire map will be correct; but, if it is not right, the remainder of the map cannot possibly be so.

8. Put on the coast line, or outline of the country or state to be drawn. Locate every prominent point of the coast in its proper latitude and longitude. Wherever a coast line crosses a parallel or a meridian in the printed map, it should cross the corresponding parallel or meridian in the foundation of the map to be drawn. Bear on heavily so as to bring out the outline of the coast

clearly and make it look raised above the parallels and meridians.

9. Draw the outline of the islands adjacent to the coast, locating these in their proper latitude and longitude.

10. Draw wave lines along the coast line and around the islands. These are four or five lines parallel to the coast line, and diminishing in shade towards the water.

11. Draw the mountain chains and prominent peaks, locating them in their proper latitude and longitude. Observe that where the mountains are highest, the shade must be heaviest. Mountain slopes are usually shorter and steeper on one side than on the other; the shade on the map must be correspondingly shorter.

12. Draw the lakes, locating them in their proper latitude and longitude. If the lakes are large, trace wave lines in them parallel to their coast; if they are small, shade them slightly over the entire surface.

13. Draw the rivers, locating them in their proper latitude and longitude. Observe that rivers increase in size as they approach their mouths, and that they are irregularly winding. They should be so on the map.

14. Draw the boundary lines between the divisions or countries. These should be broken lines, not one continuous line.

15. Locate the Capital, the Metropolis, and other important cities. Represent the capital by a star, the metropolis by a cross, and other cities by a dot. These should all be in proper latitude and longitude.

16. Draw the prominent railway lines.

17. Mark battle fields with a flag; and other points of interest in any way that may be desired.

All pupils cannot make handsome or artistic maps, but all can learn to make an accurate map. So none need be discouraged, even if their maps are not as handsome in appearance as the maps of others. When the maps are finished, they should be labeled. The name of the country or state should be written in the margin below the map, and the name of the pupil placed below the name of the country. The map should be left open, not folded nor rolled. It should be submitted to the teacher for inspection, criticism, and grading.

Sometimes it may be well to have a map of this kind drawn and have the names of the divisions, cities, mountains, rivers, lakes, products, &c, put upon it; or these various points may be numbered and the names corresponding written on the margin.

After a certain degree of proficiency in map-drawing has been attained, maps may be drawn upon the black-board or slate, from memory.

It is well, sometimes, to have the outlines and relief forms of countries moulded in putty, clay, sand, or other suitable material.

Pupils may also be required, occasionally, to glue fragments of the products of countries in the places on the map where they are produced. Bits of cotton, in states producing it; grains of corn, wheat, &c, in the localities where they are grown; pieces of coal, iron ore, wood, &c, in the regions where they are abundantly found.

In another article, some suggestions will be offered as to the use of this map-work in the study of political geography.

ARITHMETIC. VII.

Common Fractions.

H. B. BROWN.

TEACHER. — (Holding up four sticks.) What have I in my hand?

Class.—Four sticks.

T.—Suppose I place these in lots of two sticks each, how many lots will I have?

C.—Two lots.

T.—What operation have I performed?

C.—Division.

T.—By what have I divided?

C.—By 2.

T.—Suppose I place them in lots of 1 stick each, how many lots have I?

C.—Four lots.

T.—How many sticks in each lot?

C.—One stick.

T.—What operation have I performed?

C.—Division.

T.—By what have I divided?

C.—By 4.

T.—Suppose I take one of these sticks and break it into two equal parts, what shall I call one part?

C.—One-half of the stick.

T.—What operation have I performed?

C.—You have broken the stick into two parts.

T.—But when we break or separate into two parts, what operation do we call it?

C.—Division.

T.—Who can place on the board that which will represent the one-half? One hand rises.

T.—Mary, you may place it on the board. Mary writes *one-half.*

T.—Is there any other way by which this may be represented? Another hand rises.

T.—Willie, you may write it. Willie writes it ½.

If, however, no one in the class should be able to do this, leave it for the next lesson. All will then be prepared. Suppose, however, that it is written ½.

T.—What, then, shall we call this?

C.—A fraction.

T.—What is a fraction?

C.—A part of anything considered as a whole, or the expression of two numbers, one above, and the other below, a horizontal line.

T.—What does the number above the line represent?

C.—The quantity or thing divided.

T.—Have we passed over anything to which this may correspond?

C.—Yes; in division of simple numbers.

T.—To what in division does it correspond?

C.—The dividend.

T.—What does the dividend always show?

C.—The thing or things to be divided.

T.—What does it tell about?

C.—The number taken.

T.—What, then, does the number above the line in fractions show?

C.—It shows how many have been taken.

T.—Then what shall we call it?

If the class is unable to answer, leave it over. It will be answered the next day. In the same way, lead them to see the value of the denominator. In the same way, the improper fraction may be illustrated; also the complex, etc.

The pupils will then be ready for the following:—

Principles.

I. Multiplying the numerator of a fraction without changing the denominator, multiplies the fraction.

Why?—Because it increases the number of parts, while the size of the parts remains the same.

II. Dividing the denominator of a fraction without changing the numerator, multiplies the fraction.

Why?—Because it increases the size of the parts, while the number of parts remains the same.

III. Dividing the numerator of a fraction without changing the denominator, divides the fraction.

Why?—Because it decreases the number of parts, while the size of the parts remains the same.

IV. Multiplying the denominator of a fraction without changing the numerator, divides the fraction.

Why?—Because it decreases the size of the parts while the number of parts remains the same.

V. Multiplying both numerator and denominator of a fraction by the same number does not alter the value of the fraction.

Why?—Because it increases the number of parts and decreases the size of the parts in the same ratio.

VI. Dividing both numerator and denominator of a fraction by the same number does not alter the value of the fraction.

Why?—Because it decreases the number of parts and increases the size of the parts in the same ratio.

Care should be taken that the pupils use correct terms, and learn to express themselves as forcibly as possible, and with as few words as possible. We shall now give a few problems illustrating the principles in fractions.

1. $3\frac{3}{4}=\frac{15}{4}$; why?

Reason.

1. $1=\frac{4}{4}$.
2. $3=3\times\frac{4}{4}=\frac{12}{4}$.
3. $\frac{12}{4}+\frac{3}{4}=\frac{15}{4}$.

$\therefore$ In $3\frac{3}{4}$ there are $\frac{15}{4}$.

2. $\frac{3}{4}$, $\frac{4}{5}=\frac{15}{20}$, $\frac{16}{20}$; why?

Reason.

The Least Common Denominator is 20.

I.
1. $1=\frac{20}{20}$.
2. $\frac{1}{4}=\frac{1}{4}$ of $\frac{20}{20}=\frac{5}{20}$.
3. $\frac{3}{4}=3\times\frac{5}{20}=\frac{15}{20}$.

II.
1. $1=\frac{20}{20}$.
2. $\frac{1}{5}=\frac{1}{5}$ of $\frac{20}{20}=\frac{4}{20}$.
3. $\frac{4}{5}=4\times\frac{4}{20}=\frac{16}{20}$.

$\therefore$ In $\frac{3}{4}$ and $\frac{4}{5}$ there are $\frac{15}{20}$ and $\frac{16}{20}$.

This gives the process for reducing fractions to a common denominator, and as the same would be used in addition and subtraction of fractions, these subjects will be omitted.

3. $\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}=\frac{1}{2}$; why?

Reason.

1. 1 time $\frac{2}{3}=\frac{2}{3}$.
2. $\frac{1}{4}$ time $\frac{2}{3}=\frac{1}{4}$ of $\frac{2}{3}=\frac{2}{12}$.
3. $\frac{3}{4}$ times $\frac{2}{3}=3\times\frac{2}{12}=\frac{6}{12}=\frac{1}{2}$.

$\therefore$ The product of $\frac{2}{3}$ by $\frac{3}{4}$ is $\frac{6}{12}$ or $\frac{1}{2}$.

$\frac{2}{3}\div\frac{3}{4}=\frac{8}{9}$; why?

Reason.

1. $\frac{1}{4}$ is contained in 1, 4 times.

2. ¾ are contained in 1, ⅓ of 4 times = 4/3 times.

3. ¾ are contained in ⅔, ⅔ × 4/3 times 8/9 times.

∴ ———.

In this it will be seen that finding how often the divisor is contained in unity, inverts the divisor; hence, we invert the divisor to find how often it is contained in unity.

Another method:—

¾ ÷ ⅝ = 18/20 or 9/10; why?

1. 1 is contained in ¾, ¾ times.

2. 1/6 " " " ¾, 6 × ¾ times = 18/4 times.

3. ⅝ are contained in ¾, ⅕ of 18/4 times = 18/20 or 9/10 times.

∴ ———.

Again, the fractions may be divided by reducing them to a common denominator; then dividing the numerator of the dividend by the numerator of the divisor.

SOME LESSONS IN DRAWING. V.

Perspective Drawing.

G. W. FERGUSON.

THE pupil is supposed to have been observing since studying the last lesson, and has probably seen and been convinced that distant objects appear smaller than nearer ones, and that this is due to the visual angle formed by rays passing from the extremities of objects to the eye; the angle formed by distant objects being smaller than that formed by nearer ones.

Before taking up the first rule of perspective drawing, we deem it necessary that the pupil's eye should be trained to see the true appearance of lines and that his hand be trained to reproduce with the pencil or brush, the images such lines form upon the retina.

In order to accomplish this, the pupil must practice diligently the tracing of lines, as follows:—If a blackboard is at his disposal, draw a horizontal line several feet long upon it, trace the line from left to right and *vice versa*. Step back a few feet, imagine that the crayon still touches the board, and trace the line as before. The pencil must be directly between the eye and the line.

He might now hold his drawing book in an upright position before him so that it screens off a part of the line from his view, trace the line until the book is reached, then go right on across the paper in the same direction. Draw vertical lines in the same manner, also oblique lines sloping towards the left and right.

The book might now be held below the line, and with the pencil trace the line a few times as before, then he should place the pencil on the paper, fix his eye on the line upon the board and imagine that he is still tracing it, but he should draw a line across the paper, instead. The line on the paper should be parallel to the one on the board.

The book should next be placed upon the desk, and should be kept directly between the observer and the object to be sketched or drawn. Suppose the

line to be in a horizontal position ; look first at the end toward the left, place the pencil at the left of the paper, allow the eyes to follow along the line towards the right and at the same time draw a line across the paper parallel to the one on the board.

In order to criticise the lines, the book should be held in an upright position before the observer, then he can the better judge of the accuracy of the lines he has drawn.

Fix the eye on the line upon the board and, without looking at the paper, draw several lines upon it and see how nearly parallel they will be to each other. Draw lines parallel to other lines, and edges of window casings &c, in the room and elsewhere.

The practice of playing marbles, croquet and such like games, also shooting at mark with a rifle, will help to train the eye.

Now, if the pupil will resort to the pane of glass and crayon and trace the outlines of the receding side of a building, as described in our last lesson, he will find that some of the lines that are horizontal in reality will appear to slope downward, some upward, some nearly level and one will appear level or horizontal. No two of them will appear exactly parallel.

It was also mentioned that the lines on each side of a receding street or railway, or the cracks in the floor between the boards, appeared to approach each other. Just so. Now it matters not whether the lines are horizontal, vertical or oblique, if they are parallel in reality and running away from you in any direction they will appear to come together in one common vanishing point. A vanishing point is the point where lines appear to vanish from our view.

Rule I. All parallel receding lines appear to vanish at the same point.

This point may be in the horizon line, in the sky or earth. It may be anywhere.

The horizon line that we use in perspective drawing is always on the level of the eye, no matter how low or how high our eye may be located.

The V. P's or vanishing points for all receding horizontal lines lie within the horizon line.

If we stand so as to view the side of a building, the lines in the roof sloping upwards towards the comb will have a V. P. above the H. L. or horizon line. The lines in the farther side of the roof that slope downward and away from us will have a V. P. below the H. L.

Down and up hill views present other examples.

The pupil should practice drawing lines parallel to the edges of books, boxes, tables, doors, floors, buildings, &c.

Do not pay so much attention, at this stage of the work, to the completion of any drawing, rather keep right on and on until you can draw lines parallel to those about you regardless of their lengths, thus making sure of one thing at a time.

Horizontal lines lying above the level of the eye appear to slope downward, those below appear to slope upward while the one on the level of the eye appears horizontal.

The Ground Line is the line that bounds the lower edge of our picture,—it is an imaginary line upon the ground where we begin our drawing. We should draw the objects that lie beyond this line.

The Picture Plane is an imaginary transparent plane directly over the ground line. This plane is always in a vertical position unless otherwise mentioned.

Suppose the pupil now to be seated at the opposite side of the room from the window, the lower part of the window would represent the ground line, G. L., the glass in the window would represent the picture plane, P. P. If the observer had a pencil long enough to reach the window pane and with it should trace the outlines of the objects which he could see through the window, the sketch thus formed upon the window pane would be the true perspective, or appearance, of these objects.

In making a drawing from any object we should not for a moment think about how to make some objects appear distant and others near by, we should imagine the objects painted upon the P. P., and all that we have to do is to copy the picture that is before us.

THE WHITE CROSS IN EDUCATION.

THE White Cross stands for purity of personal life and purity in the people's homes. Though most teachers are unmarried, they are just as loyal to life's most significant and sacred tie as are those who form that tie. Perhaps an estrangement unexplained, a financial burden bravely borne for kindred's sake, or faith kept with the dead may help explain the situation.

There are four great movements which in the largest way will lift the white cross of purity to its rightful place in the lives of our young people. They are co-education,—the training with each other of those formed for each other, that their intellectual sympathy may be increased and their mutual estimate based on a more thorough knowledge than society affords; the financial independence of women, that they may not be tempted to marry in order to secure support; a reform in dress, that women may have better health, greater vigor, and thus enter upon home life under more hopeful conditions; and equal suffrage, that woman's influence and character may react upon government so as to secure more and juster laws for home protection and heavier penalties against those who assail the physically weaker.

All these reforms should be inculcated in the public schools and wrought into the thinking of the young people. I do not mean that this should be done in any formal way, but as the outcome of that "public opinion" in a public school that is largely developed from the teacher's influence, record, and most of all, his or her character.

Recent statistics in Massachusetts prove that "in the employments in which the very lowest wages are paid, women constitute over seventy per cent. of the workers, while in the employments that pay twenty dollars per week women constitute hardly over three per cent. Women standing side by side with men are also paid less wages for the same work, the proportion being that a woman twenty years of age and upwards is made to work for the same wages as a boy of ten." Public school children

should know these facts, and their indignation should be aroused against such a state of things.

The W. C. T. U. has circulated petitions and secured legislation in nearly every state for industrial homes for girls and improved legislation for their protection. Chivalric principles planted in the hearts of boys; training that makes them knights of the new and noble chivalry of justice, would help to enthrone the white cross in their lives.

The four reforms of which I have spoken can only be built up orally and incidentally in public schools. But the ethical teaching of physiology and hygiene as a personal matter with each child should begin in the primary and be continued through all grades. Do not fear to explain the child to himself in language as noble as the facts you teach. Innocence is founded upon ignorance, virtue upon knowledge. One is a rope of sand in the presence of temptation, the other a Damascus blade of safety. Build the child's education up from a physical foundation. Bodily habits that are healthful and pure mean more to the Republic's future than intellectual acumen or acquirements.

Catholics have excelled Protestants in teaching to the young the basis and enforcing precepts of a pure life. Ireland has the most virtuous peasantry in the world, confessedly as the outcome of early education. Before their first communion boys and girls are specifically taught the duty and the reasonableness of personal purity. From the point of view of science they should thus be taught in our schools. This cannot be done in the direct manner that we teach them to let alcoholic drinks and tobacco alone, but by abolishing the recess and using that time for physical training according to the systems of Delsarte and other masters, circulating the White Cross pledge and literature and personally teaching the pupils one by one, or in small groups of boys by themselves and girls by themselves, the facts of physiology and hygiene in reference to a life of personal purity. Fewer pupils should be assigned to each teacher, and physical culture should be the basis of all education. Recitals of impurity should be carefully avoided. Keep the eye lifted to the heights, not lowered to the slums.

The age at which to begin teaching may vary, but let purity have the first word. The child will ask questions early; let not the coarse reply get in its work before the chaste one comes. Science is like fire; it burns away dross; tell him what science says. God's laws are all equally clean and holy; tell him of the laws of God. It is now taught by the best scientists that young men of chaste life make the most brilliant students, and for hygienic reasons. Let your watchword be one standard for man and woman,—a white life for two.

Teach girls the gospel of dress that imposes no ligature; the vulgarity of that "death line" made in the waist that reminds one of an hour-glass or a "yellow-jacket"; and the danger of tilted heels that throw all the vital organs out of their natural place. Put women on school boards that they may help the teacher to guard the little ones against these dangers.

The white cross is the hallowed emblem of the whole social purity movement. It supplies just what has been lacking in the education of our youth. This is its solemn pledge: "I promise to treat all women with respect, and endeavor to protect them from wrong

and degredation; to endeavor to put down all indecent language and coarse jests; to maintain the law of purity as equally binding upon men and women; to endeavor to spread these principles among my companions and try to help my younger brothers; to use all possible means to fulfill the command, 'Keep thyself pure.'"—*Frances E. Willard, in Journal of Education.*

NATURAL SCIENCE IN THE SCHOOLS.

W. C. BELMAN.

"Nature, the old nurse, took
The child upon her knee,
Saying, 'Here is a story-book
Thy Father has written for thee.'"

WE are often told that perception, since it is the first power of the mind to become active in childhood, should be the first power of the mind to be trained in the school-room. Pestalozzi taught us that all success in acquiring knowledge depended upon the development of sense-perception. Following this idea, we have had held up before teachers the vast importance of object lessons. Books have been written and magazines filled with outlines of object teaching in almost every conceivable form. Pins, chairs, tables, bells, coal, metals and almost every object in dead nature has been held before the child to perceive and through this, hoping to obtain a developed and cultured perception, while the child has turned away in disgust, knowing that nothing but chaff has been fed to him. Had we but recognized with Froebel that the mind of the child who is entering school contains in itself the germ of every activity of mind, and that those germs are already expanding and growing in the light of experience, we would long ago have introduced the child to the beauties of nature and have led him into a field that would have given him a chance to grow into self-activity.

It is not enough for a child of six years of age to see, unless he sees to a purpose and expresses his thoughts. It is not enough for the child to see, unless the teacher has a means of knowing how well he sees. It is not sufficient that the child sees, if he modifies his seeing by some other's eyes. He must be trained to see for himself, to draw his own conclusions, and then to express those observations in such a manner that the teacher may measure his individual power. If these statements be true then it must follow that each child must hold in his own possession the object of nature to be examined, the examination must be a personal one to the child and without aid from any other pupil. Whatever is seen must be expressed, so that the teacher may read from the expression the power of the pupil individually to observe; this being done, the pupil has grown, his mind and hand have been trained together; he has known, he has felt, he has willed; he has grown into self-activity and, to a certain extent, has become a self-governing body—a master of self.

The forms of expression constitute a very essential part of this work, since it is through the expression that the teacher determines the power of the

child. Modelling in clay is the first in order. Since it is through the sense of touch that we first gain the concept of form, therefore let every solid object be moulded. Apples, cherries, all fruits and vegetables, leaves, insects, all furnish material for work. In fact, anything that is attractive and that will hold the attention of the child can be used to a good advantage. Next in order is the color work with which the child attempts to color the forms that have been moulded, or attempts to paint upon flat surface the flower that he holds or the opening bud or the frost-colored leaf, all of which may be attempted with good results. It is not likely that the attempts will be anything else than crude, yet we are to remember that perfection in color only, is not what we are after but rather growth in power to see and express the thought.

If the pupil can see better to-day than yesterday and can express better, it is enough.

But if we have not the opportunity of using color, let us use the pencil sketches. Children can draw from the object and represent in a very creditable manner, leaves, flowers, insects, etc., and if an opportunity is given and encouragement offered they will express in a wonderful manner what they have seen, while the seeing and drawing react upon each other in a way that is educative to a high degree.

Again, the thoughts derived from the study of Natural Science are such as commend themselves to the teacher for reading lessons. Thoughts, that are full of life and that are attractive to the child because he knows that they came from live things and were made by live people, hence the reading lessons are a source of pleasure where charts and books fail.

Let us try what can be done in making the school-room more happy by introducing into it more of the life of nature and use it as a means of developing all the powers of the child until he becomes a self-active, and self-willed being.

ACCURACY.

W. H. BANTA.

THERE is one capacity which all are said to possess in about an equal degree, and that is the capacity of growth. Every power of mind is susceptible of development. This must be true or all educative effort is useless. Though perfection in the use of any faculty may be impossible, yet every effort should tend in that direction. Is a perfect memory a thing impossible? Most memories are strong in one or more particulars, but weak in many. A perfect memory seems indeed impossible, but many instances might be cited to prove that some persons have possessed memories with a degree of retentiveness that borders on the miraculous, and even suggests the possibility of perfection.

It has been claimed by some that it is possible to so cultivate the power of attention, and so train the memory in the mastery of number-combinations that within a reasonable limit, absolute

accuracy may be attained in numerical computations. While this may not be strictly true, yet it is well known that such accuracy has been attained that incorrect results are an exception. We believe that the fundamental rules of arithmetic may be so taught that nine-tenths of the pupils in a class of ordinary capacity, will invariably do their work correctly. From the beginning, the old rule "Try, try again," *must* be superceded by the newer and better rule, "*Do it right the first time*". Just as soon as pupils understand that the first answer is the only one that *counts*, and that life is too precious to be used in doing things over again, that might have been done right the first effort, their powers will be exerted to the utmost to perform their work correctly. In this effort the power of attention is cultivated, concentration is strengthened, and the memory receives such encouragement as it never received before. If the teacher has the courage to hold to this rule with a tenacity of purpose that knows no failure, in a short time the following results may be expected :

1. The teacher will have no trouble to get and hold the attention of the pupils.

2. The pupil will be able to concentrate his mental powers upon any subject presented that is adapted to his capacity.

3. He will be accurate, his first answer will be correct.

This, of course, refers to the mechanical work of arithmetic.

The same rule applies with equal force to all work in language and grammar. We have abolished slates, because they tend to make blunders. We forbid the use of erasers for the same reason. The pupil has white paper, and in his written work, when any marking, erasing or interlining are found, the grade of the work is reduced because first work, only, counts. How much time has been wasted because we were never taught to think and write accurately !

The writer of this article has suffered so much from the habits of inaccuracy acquired in youth, that he feels impelled by his love for his fellows, to continue to insist that teachers give this matter serious and conscientious attention.

"WHAT MAKES THE SEA SALT?"

AMANDA B. HARRIS.

THAT is a question that children are always asking. It is a question that troubled and perplexed the peoples of many nations when the world was young.

In folk-lore stories and ancient myths, different explanations are given. Perhaps as satisfactory as any is the one which may be found in the Norse mythology. If you believe in the Man in the Moon and the Wise Men of Gotham, in the Sleeping Beauty and Cinderella, in Jack and the Bean-stalk and Little Jack Horner, in Little Bo-Peep and Boy-Blue, and all those dear old nursery tales, you may as well believe this.

The salt in the sea is all owing to a magic mill, which can do as great wonders as ever were brought to pass by Aladdin's lamp.

"Once upon a time" there were two brothers. One was rich and the other poor, and the rich one always ill-treated the other.

Their names are not given, but as names they must have, suppose we call them Vidfin and Skilfing. That sounds like Norse, surely.

Skilfing, the poor one, came into possession of a magic hand-mill—no matter how. He had only to pronounce certain words and it would grind anything he asked for; and it would keep on grinding until he said certain other words to have it stop.

It was a most obedient mill, and under his wise and proper management, it ground him out everything he wished, so that soon he was far richer than Vidfin.

Of course Vidfin was ready enough now to make everything of him; but he was terribly puzzled to know how Skilfing could have become so prosperous. When he was told, he wanted the mill; and Skilfing, who now had all the wealth he should ever need, sold it to him. He told Vidfin how to make it go, but did not tell him how to stop it.

Vidfin took it home, highly delighted with his bargain. It was haying time, and his men were out mowing. He told his wife that she might go out and spread hay, and he would get the dinner.

When it was time to prepare the dinner he said to the mill, "Grind fish and gruel! Grind both well and fast!"

The mill began to go, and presently there was so much fish and gruel that all the dishes and then all the tubs were full. Vidfin tried to make it stop; he kept "puttering and tinkering," but it was of no use.

Pretty soon the room was so full of fish and gruel that he came near drowning, and when he got the door open and was out of the house, fish and gruel came after like a river.

Vidfin was so scared that he ran to his brother and begged him to go and stop the mill. "For," said he, "if it grinds another hour the whole settlement will perish in fish and gruel."

The result was that Skilfing made him pay a big sum, then he stopped the mill and took it back home with him.

After that he set it to work again and ground out gold enough to cover his house all over with sheets of gold.

The house shone so that it could be seen far out at sea, and everybody who sailed past had to go ashore and visit it and see the magic mill.

Among others who came there was a sea-captain, and he asked if it could grind salt. He said he was obliged to make long voyages to get cargoes of salt, and he thought here was an excellent opportunity to obtain all the salt that was needed without sailing far over the seas for it.

Skilfing sold the mill to him, and the captain was in such haste to get it to his ship that he forgot to ask how to regulate it.

After he was far out on the sea, he said to the mill, "Grind salt both fast and well!"

The mill began to grind with all its might, and kept on grinding and grinding. In vain the captain tried in every way to stop it. The pile of salt grew larger and larger, and at last the ship sank.

Says the myth-maker:

"The mill stands on the bottom of the sea grinding this very day, and so it comes that the sea is salt.

Wide Awake.

Men should be manly, and while a puny, delicate man may have the truest manliness, and a surly, self-indulgent animal of the same genus have little or none, a sound, healthy body in a boy goes far to ensure his manliness and freedom from the tendency to abnormal precocious vice.

Never let it be forgotten that there can be no manliness worth the name until a boy learns to say a strong "no" to himself and his own propensities, as well as to the lawless solicitations of self-indulgent, unprincipled companions. Whatever we do for mental training and equipment, our work is a failure in proportion as our boys fail in the attainment of these first principles of a healthy manliness.

It should be set before a boy as a paramount duty, to serve his country and advance its highest welfare, not by an arrogant assertion of its superiority in all companies and places, but by the settled purpose to become a worthy example of what an American should be, whose patent of nobility, whatever his social claims, comes first from his manhood and his character.—*Henry A. Coit in September Forum.*

THE ZURCHER UNIVERSITY.

G. H. FROMMHOLZ.

IT is quite an impressive structure, the Aula of the Zurcher University and the Swiss Politechnicum, the former a provincial institution, the latter the crowning result of the effort of all Switzerland, but both united in the same building. Scarcely more than a decade since it was built, it bears all the appearance of youth, besides that of beauty and simplicity. It is situated on a slope of the Zurcher bluff, affording one a beautiful view. Looking down, Zurich lies at our feet, divided into two parts by the green waters of the Limmat, the outlet of the Zurcher Lake, still further the horizon outlines the Uetliberg, the highest mountain around Zurich, and between it and the city a beautiful green of trees and shrubs, meadows and orchards. But still more enchanting is the view towards the right. Here still the city,—its gray interspersed this time with the green of gardens and trees, further away the wide expanse of the beautiful green of the Zurcher Lake, surrounded by a belt of bluffs. But here is no Uetliberg, calling cooly "To me and no further," but the landscape unrolls itself more and more, showing the vine-clad mountains and finally the snowy peaks of their larger sisters. A picture one is never tired of seeing—but let us turn again to the University.

Shrubs, little lawns, benches and shady trees are to be found in its vicinity, but no campus,—none of the German colleges can boast of a campus,—the halls of learning are not lowered by being brought into such close contact with base-ball and tennis grounds. The building itself is a three story square, inclosing a lawn with flowers and shrubs.

Merrily we ascended the wide, stone steps. "How good it feels," said my companion, as we met a couple of ladies descending the stairs, "to see women in these halls of learning, and to feel

that we are just as much in our place as the lords of creation." I heartily agreed, for although we had had the audacity to be regular visitors at the Jena Aula, yet we had always made our visits in the spirit of meekness akin to fear, that instinctive feeling that causes women to shrink from being stared at and receiving the prominent attention of the stronger sex. We entered the office at the Pedell. Like most of the German dignitaries, he has not his exact counterpart in this country; perhaps, styling him secretary would convey the best meaning of his work. We explained to him our intentions and were ordered to call again at 9 o'clock the next morning with our certificates, as the Director would be at his office. It was not without ceremony that we were ushered into the august presence of the ruler—although in a republic, the air began to remind me of monarchies. He rejected all my credentials except my diploma, with the remark that a third language was usually required, the diploma only mentioning two. I assured him that I knew some Latin and French and was instructed by him to arrange my studies and appear again on Friday before the Senate. The full import of these words, the amount of work implied, I was not conscious of. My friend who was not so lucky in having a diploma and who neither cared for the ordeal of an examination nor for the honor of matriculation was permitted to register for 2 or 3 lecture courses, a greater number not being permitted to the non-matriculated. We again had refuge to the Pedell, who this time sold us a catalogue of all lectures to be delivered during that term, for five cents, and referred us for further information to the black-boards with which the halls are ornamented.

How eagerly we studied the catalogue to make out our program, and how the questions would come : "What is really meant under this heading of the lecture course?" "At what hour will it be given?" For not always was the heading of the lecture course followed by the time at which it was to occur. And I still was in perfect innocence of the question, that, at least in my course, would soon eclipse all other questions ; . "Where are these lectures given?" With the catalogue in our hands and some ideas of lecture-courses and professors in our brains we went next morning to the building and entered it from the side nearest to us. We scanned every bill that was posted on the doors ; drawing, engineering, bridge-building, met our gaze but no professor we were wanting, nor any study that pleased us. We ascended to the second floor, daily programs with higher mathematics and sciences, quite in our style, but still nothing for us. Wearily we ascended to the third with no better results.

Then we decided to enter the building from the opposite side. It was later, when we comprehended that, we had visited an entirely different institution, the Politechnicum, and that the elegant red brick building, so pretty, so extensive, so inviting,—the chem. laboratory, had also nothing to do with the university. This chem. laboratory is the finest one I have ever seen, perhaps, not accommodating as many students as Ann Arbor with its new addition now.

We returned once more to the Pedell. He kindly answered the questions and referred us again to the bulletin-boards. Here indeed were notices of all kinds,

of all forms and shapes, but they did not give us all the information we needed. "Where does Prof. Van Wyss lecture?" "In the Hygiene Institute." "And when does he lecture?" "The bulletin-board will give that information." "Pardon, it does not, I have looked it over carefully." "Then I do not know,"—and *I* surely did not know it either. "And Prof. Stein, when does he lecture?" "On Wednesday between 4–5." "And where?" "Room No. 3."

(*Continued next month.*)

SIGMA PI MATHEMATICAL ASSOCIATION.

THE Association is entering upon the threshold of its third term's work. Although the work in the past has been very successful, we hope that in the future it may be more so; and it will be if we have the able support of the outside members.

The meetings hereafter will be held bi-weekly, which will give all more time to investigate the subjects. The literary part of the programmes will consist of a series of essays on the history of the Schools of Philosophy. These are to be written by outside members and sent to the Association to be read at the regular meetings. If each performs his duty, as assigned him, it will serve to keep up a deeper interest in the Association.

QUERIES.

21. * A man had 20 cents and wished to buy 20 apples; for some he paid 4 cents, some ¼ cent, and some ½ cent each. How many of each did he buy, the answer being whole numbers? WM. O'CONNER.

22. A man bought a horse for $90, sold it for $100. He then bought the horse back for $95, and sold it for $100. How much did he gain? ID.

Solutions for the 19th and 20th problems have not yet been sent in, but will be answered in the next number.

* Give solution by Arithmetic, also by Algebra.

The following is Ex. 4, Page 209, of Todhunter's Algebra, the solution of which was requested by a member of the Association.

A boat's crew row 3½ miles down a river and back again in 1 hour and 40 minutes: supposing the river to have a current of 2 miles per hour, find the rate at which the crew would row in still water.

Solution.

Let x = rate per hr. in still water.
Then, x+2 = rate per hr. down stream.
And, x—2 = rate per hr. up stream.
Then we would have,

$$1.\quad \frac{3\frac{1}{2}}{x+2}+\frac{3\frac{1}{2}}{x-2}=1\tfrac{40}{60}=\tfrac{5}{3}.$$

Clearing 1. $=2.\quad 42x-84+42x+84=20x^2-80.$

$$3.\quad 20x^2-84x=80.$$

$$4.\quad x^2-\tfrac{21}{5}x=4.$$

$$5.\quad x=5.$$

$\therefore$ Rate was 5 miles per hr.

PROGRAMMES.

The following are the programmes for the next six meetings.

26. Sept. 26.

Arithmetical Progression, M. C. Landis
Exs. 4, 10, 12, 17, 23, 26, 34, 46, 51 and 55. Pages 264–5–6–7–8.

27. Oct. 10.

Geometrical Progression. T. G. Rodgers
Exs. 4, 11, 17, 20, 24, 30, 36, 43 and 44. Pages 273–4–5–6.
History of the Socratic School, Cassie Quinlan

28. Oct. 24.

Harmonical Progression, Carroleane Tyrrell
Exs 2, 6, 8, 11, 14 and 19. Pages 279–80–81.
History of the Platonic School, C. M. Jansky

29. Nov. 7.

Mathematical Induction, T. I. Packard
Exs. 1–12, inclusive. Pages 284–85.
History of the Peripaletic School, J. D. French

30. Nov. 21.

Permutations and Combinations, J. C. McGhee
Exs. 2, 5, 7, 8, 9, 10, 11, 12, 14 and 16. Pages 294–5
History of the Sceptic School, H. S. Ward

31. Dec. 5.

Permutations and Combinations, Addie Clark
Exs. 19, 21, 25, 28, 30, 32, 34, 35, 38 and 40. Pages 295-6–7.
History of the Cynic School, E. O'Riordan

THE EDITOR.

The Teacher and the Citizen.

ONE of the most marked differences between man and brute is that the man's wants are vastly greater in number; and under all ordinary circumstances a man can with industry more than meet his ordinary wants. This fact gives leisure, and leisure creates new wants. Every man finds it much easier to obtain the means for satisfying some particular wants than others, and he has leisure, who can employ his time and energies in those few lines of work in which he can find most satisfaction, and consequently do the best work; for leisure is not unoccupied time, but time fully occupied with *chosen* work. From these fundamental facts, spring the division of labor, the various occupations, and all the duties of life. The duties of life are those things, arising from the division of labor, which each one owes to others, which others may demand of each one, and of which, in various determinate ways, others may compel the doing. The state is an organization which undertakes to define some of these duties, and enforce their discharge in the specified lines. The duties thus defined, are domestic, or economic, or political; and he is a citizen, so far forth as he is the subject of the state in any or all of these defined ways, who has, explicitly or implicitly agreed to settle any conflict of duties and self-interests in a peaceable manner as prescribed by the state.

Now, the theory of our government is, that all are equal before the law; and he is the best citizen who keeps his vocation nearest the great common level of this citizenship, all the time bearing in mind, however, that the law is a very imperfect, because only an average, expression of what life really is. The teacher's relations to the state, then, are just the same as any other class of citizens, the farmer, the mechanic, or the professional man, and he should hold his relations to exactly the same level, claiming nothing that he is not willing to grant the others, and conceding nothing that he does not demand for himself. Yet, there is one respect in which the teacher's practical citizenship does differ from all others',—it may be kept freer from mere partisanship. His calling is not so much a profession, in the usual sense of the word, as a part of the civil service of the country; and it is his good fortune, that no other class of citizens is so little affected by the tidal-waves and cyclones of practical politics. For this, he should return daily thanks to the blessed gods; and while always exercising the full prerogatives of his citizenship, he should do it in such way as may be consistent with his higher prerogative of being largely safe from the smoke and dust that begrime his less favored fellow-citizens.

Our Reading.

As the world advances, more is required of teachers. Not only should

they know more in the subjects to be taught, but they should also have a good store of that somewhat indefinite thing, "general information."

Nor is this all. They are now expected to read much that does not pertain to their immediate work as well as much that does bear directly upon it.

With gaining the requisite knowledge of the branches to be taught, a great amount of reading on psychology, science of education, literature of the past and present, and gathering up points on current events, the average young teacher feels that his path is beset with difficulties. Add to these, the puzzling questions of discipline, and ethics in the school-room, and he may well feel dismayed.

But the experienced teacher knows that all these may be done, and much more, if time is judiciously used. By careful planning, each day sees much attempted and much well done toward the improvement of self and school.

What shall I read? and how? are questions that naturally present themselves to the beginner in the work. Dr. Johnson said, "Read anything five hours a day and you will be learned." But that statement is, in the best sense, no more true than this other, "A little learning is a dangerous thing." A little learning is not dangerous, if it is the right kind of learning, nor will a great amount of desultory reading make a scholar.

One trouble with the young teachers of to-day is, they attempt to do too much. Reading psychology for years will never, in itself, make a good teacher. Neither will trying to cover all the ground laid out in our Teachers' Reading Circles make one learned.

THE STUDENT firmly believes that there is no one thing which contributes more to the educational advancement of the state of Indiana than the Reading Circle work. And it would urge its vigorous prosecution by the teachers of every grade.

But a word of caution is perhaps wise to teachers who try to follow it in its entirety and to read magazines, newspapers, and the latest new books besides.

Quality not quantity should be the thing sought after. He who reads *much* may be learned, but he who reads *well* what he does read, and who makes a choice of a *few good authors* is wise.

Pronunciation.

WHY is it that so little earnest attention is paid to the correct pronunciation of our mother tongue?

The teacher who would consider the misspelling of a word in a written exercise an almost unpardonable offense will complacently listen to a dozen words mispronounced with never a correction, if, indeed, he detects the error at all.

If it is true that we speak fifty words where we write one, it would seem that orthoepy should, at the very least, receive as much attention as orthography. Then the pronunciation of our language is much more regular and easier learned than the spelling. Rules can be devised that will cover most of the more common errors. Books, a plenty, have been written on the subject and long lists of words frequently mispronounced have been made, but too much space in the former is usually taken in which to air some hobby of the author, and the latter generally contain words that the average pupil don't use above twice a year.

There is but little use wasting time over such words as "adamantean, chal-

cedony, cicerone, gaucherie, reconnoissance," etc., when one habitually murders our *long u*,—*institoot*, *enthoosiasm*, *dooty*, *floot*, etc., or is equally destructive of our round and beautiful *short o*,—*daag* or *dawg*, *faag* or *fawg*, etc.

There are mistakes enough to be corrected in our common every-day words, and the teacher who sees to it that the young pupils in his charge are started in the right direction in this matter, and form correct instead of incorrect habits, will deserve and probably receive their lasting gratitude.

Jupiter.

THE beautiful white star that rises in the south-east before sunset and graces the sky with its stately presence nearly all night, is the mighty Jupiter, the king of the planets. The most casual observer cannot fail to notice it, and there is no danger of mistaking it as it is by far the brightest star visible. It shines with a brilliancy five times greater than that of Sirius, and is equalled by Venus alone.

Jupiter is about 480 millions of miles from the sun, and being now nearly in opposition, about 400 millions of miles from the earth. His size is so great that the earth by comparison would be about the size of a large pea when compared with a base ball, and the combined mass of all the other planets would hardly equal one-half of his. By the axial motion of the earth, he now sweeps across the sky at a distance south of the celestial equator equal to about twice the distance between the *pointers* of the Great Dipper.

He rushes through space in his mighty revolution around the sun at a rate which is 700 times the velocity of a fast express train, completing his circuit of the heavens in about 12 years.

Modern astronomers incline to the opinion that the temperature of Jupiter is very high. It is probable that his interior is in a state of incandescence. If this be true, the planet is, of course, not yet an inhabited world, at least is not the abode of any form of life of which we can conceive.

Rain-Making.

THE rain-making expedition from the United States' Department of Agriculture which has been experimenting on the "Staked plains" of Texas has attracted world-wide attention. These rain-makers began operations about the 10th of August and continued their efforts at intervals for some three weeks. The very first trial was followed by a heavy fall of rain, covering a large area of country. Lighter showers fell almost daily during the experiments, and a very heavy storm thoroughly drenched a large portion of western Texas a few days after these bombardments had ceased.

It can hardly be possible that this extraordinary rainfall at this season of the year is a coincidence. Though these experiments have not fully demonstrated the practicability or the possibility of producing rain at all times and under all conditions, yet it cannot be denied that the enterprise has been quite satisfactory and that practical results may follow.

It is said that this rain-fall expedition, under General Dyrenforth, carried to the scene of operations about 20 tons of apparatus and one hundred balloons of 10, 12, and 20 feet in diameter. The mode of procedure is about as follows:—A "line of battle" is formed covering an area about 3 miles long and 2 miles wide. All along the front of the line giant powder is fired from mortars, and

bombs are exploded. Behind this the line of kites is arrayed. About fifty cloth kites are held by electric wire and bear dynamite bombs.

These are exploded when the kites are high in the air, by means of a cap and an electric current. The dynamite hangs suspended from the kites by wires at a sufficient distance below to prevent injury to the kites by the explosions.

The third line is the line of balloons. These are charged with oxyhydrogen gas, the most violent explosive known. From 10 to 20 of these balloons are sent up into the air at once. In order that no injury comes to operatives or the surrounding country by the great concussion from the explosion of these balloons, they are sent to a great height, ranging from 1,000 to 7,000 feet. They are exploded by means of electric wires or time fuses.

Another set of balloons are used to make observations. These are about 20 ft. in diameter and are held at a height of about 1,000 feet by strong cables. The meteorologist in the basket has telephonic communication with those on the ground. He makes his observations, communicates them to those left behind, after which the cable is loosened and he ascends to a height of two miles or more, and then descending, is frequently landed at a distance of several miles from the place of starting. All these experiments are based on certain theories relative to the condensation and precipitation of the watery vapor of the atmosphere. General Dyrenforth mentions three principles or theories which may be very briefly stated as follows: First, rain-storms usually originate in the mingling of warm and cold currents in the upper strata of the air. Some of these currents are moist, others are comparatively cool and dry. As soon as these currents begin to mix or mingle the warm moist current is cooled and its moisture "is squeezed out of it as from a sponge." This moisture is then visible and we call it a "cloud". When precipitated it is rain. Now the great balloon explosions in the upper air start this mingling of currents and the nucleous or storm-center is formed.

The second theory is that repeated explosions tend to agglomerate the particles of moisture into rain drops and they are precipitated to the ground.

The third theory is that the frictional electricity which is generated by the explosions polarizes the earth and air and so forms a magnetic field that draws the particles of moisture together forming rain clouds and hence hastening precipitation.

THE SOCIETIES.

The Crescent.

The Constitution and By-Laws of the society have lately been revised and made much more satisfactory and complete.

The "H Trio" gave an entertainment Friday evening, Sep, 18, in the interest of the society. They drew a good house and pleased everybody. We are proud to have such men as Howe, Holt and Harmon on our roll.

J. J. Pattee will teach in Lowell Ind., the coming year; Joseph Conroy teaches in the Lake Station school and J. C. Cleveland and wife have gone to Texas where Mr. C. has a position. C. M. Holt left Sep, 21, for Ann Arbor where he goes to attend the University.

A good many of the best members of last year have gone away but there are new ones coming in to take their places, and the society will continue to do the excellent work characteristic of it in the past. Among the recently elected members are Misses Marie Starkey, Ella McDonald, Retta Wood and Messrs. Daum, Williams, Johnson, Gates, Callahan, and L. H. Noble.

There was a splendid program given Sep, 4. We hope that the success of the first meeting will be an incentive to the members to make the others equally good. Dr. Rose, one of the charter members, was present and gave a complete history of the society from its organization in 1875 to the present. His talk was very interesting, especially to the members.

The society in special session on the last Friday of last term elected the following officers :

Pres., T. W. DeHaven ; Rec. Sec., Nellie Austin; Cor. Sec., Kate Austin; Critic, H. H. Stroeter; Choristers, W. T. Howe and Marie Starkey; Treasurer, E. P. Harmon; Executive Committee, Messrs. McGhee, Yoder and Bittner; Marshals, Messrs. Hock and Campbell; Editor, A. C. Pattee.

A. C. P.

Star Society.

Miss May Tinsley, a prominent Star of last year, is now teaching at Buffalo, Mo.

Miss Nellie Moreau and Sadie Kanouse are rusticating at their homes in Mich. at present but will begin teaching soon.

F. F. Phillips and W. R. Blackwelder gave such universal satisfaction in their teaching of last year that each is retained in his former position with increased salary.

Mr. J. D. French, an ex-president of the Star, is assistant principal of the city schools of Marion, Ill. Reports say that he is making a success in his chosen profession.

Mesers J. B. Dicus and A. E. Baker, prominent among the Stars are both teaching at good salaries : the former at Streater, Ill., and the latter at Le Claire, Iowa.

Miss Addie Clark and Miss Vertie Warfield, are dispensing their genial rays among the school children of Porter County.

They seem as guiding Stars for their associates to a higher mark in the profession of teaching.

C. M. Jansky, a star of the first magnitude, is assistant City Engineer of Crookston, Minn. His headquarters are at Crookston, but he spends much of his time keeping wolves and other wild animals off a quarter section of land which he calls his own.

He is getting, at present, $80 per month with prospects of an early advance to $100 per month.

The Star Society has begun what bids fair to be one of the most prosperous years in its whole existence. The President, M. C. Landis, and all the other officers are putting forth all their energies to make the society what it should be, a place for social, mental, and moral development. The society now numbers

about sixty members; twenty-five of these have been received this year, and she prides herself on the mental caliber of these new members. The Star is justly proud of her present music members. The music department has more members than usual and many of them are very proficient in their line of work.

J. L.

WHAT THEY ARE DOING.

Bertha Johansen will teach the coming year in the schools of Forest City, Ia.

F. W. Howser, of '87, is the principal of the Garrison, Neb., school. He has met with good success.

P. J. Dempsey, of the Surveying class of '79, is a successful physician practicing in Cascade, Iowa.

A letter from Olof Green announces that he has already secured a position near St. Croix Falls, Wis., for the coming year.

Miss Anna S. Delahunt writes a kind and cheering letter to THE STUDENT from Hinton, Iowa, where she is successfully teaching.

J. M. Taylor, scientific of '89, is the principal of the Port Gibson Normal College, a school for colored people, in Port Gibson, Miss.

Jno. R. King, the elocutionist, is traveling in the interests of the publishing house of W. M. Welch. He makes a good agent.

F. L. Smart, has resigned his position as principal of the High School of Phoenix, Arizona, and has been elected principal at Manteno, Ill.

Frank L. Thomas, of '90, is a poultry merchant in Lafayette, Ind. He keeps about 4000 chickens and is very enthusiastic over his business prospects.

A. J. Healey is principal of the Mount Dora, Florida, school. The recent death of his father prevented his return to school as he had intended.

A. T. Parker writes to say that he is a dry goods merchant in Greentown, Ind. He states that he has a good business and is making money.

R. H. Spragg is in business in Marquette, Wis. He writes,—

> The young people of this county are becoming very partial to Valparaiso. They nearly all take it for granted that they must go there after finishing in the schools here.

O. L. Lyon has resigned his position at Steelville, Mo., and is a student in De Pauw University. He teaches half of each day in the high school at Greencastle.

Miss Maggie Easly teaches elocution and physical culture in the Bushnell, Ill., normal school. She is very popular with both faculty and students, and is doing a great work.

C. M. Jansky has entered upon his duties as Civil Engineer in Crookston, Minn. He is greatly pleased with his surroundings and work. And the people of Crookston, we add, will be greatly pleased with Mr. Jansky as soon as they come to know him.

A. F. Harvey, of Waterloo, Iowa, was married to Miss Mamie G. Baker on the 22 of July last. Mr. Harvey had intended coming back to school but has altered his plans and the couple will reside in Fayette, Ia. THE STUDENT extends congratulations and kind wishes.

H. M. Little is teaching mathematics, penmanship and elocution in Heald's Business College, San Francisco, California. He has a good position and writes that he is busy and happy, though

he regrets that he did not remain longer in school while here.

J. J. Murray is a newspaper man. He writes that he was offered a position as principal of the Davenport, Wash., school but refused the position because he could make more than the $75 a month it paid. He is traveling through Washington and Arizona writing for the Spokane *Daily Chronicle*.

D. K. Rawlings who graduated in the Law Department in 1885 has been actively engaged in the practice ever since. His home is at Barboursville, Ky., where he located in 1887. He has a lucrative practice and is the regular counsel of the Louisville & Nashville Ry. Co.

Comparatively few of our students become professional literary workers: among the most prominent of those who have achieved some success in this field is Livy S. Richard, now on the editorial staff of the *Times* of Troy, N. Y.— the largest daily paper outside New York City in the state. The capital little paper in our August issue, *A Plea for Good English*, is from his pen.

G. U. Gordon is studying law in Clinton, Iowa; Lee Bricker teaches in Fulton, Ill.; May Williams holds a responsible position in the city schools of Shelbyville, Ind.; Anna Suter is teaching in the high school of Aurora, Ind.; H. C. Risner will teach in Dunkirk, Ind.; W. W. Gillespie is teaching, with good success, in Wisconsin; S. R. Lamden is traveling for a book firm with head-quarters at Bloomington, Ind.

D. B. Flickinger will remain another year at Webster, S. D. In a recent letter he says,—

We had a fine commencement this year, there being four in the graduating class. The patrons of the school heartily endorse my methods, and appreciate my work to the extent that the board of education has unanimously elected me for next year at a salary of $100 per month—an increase of $25 a month over last year.

J. H. Perkins is doing a great work for the schools of Liberty, Mo., and is deservedly popular there. Mr. Perkins has added a grade to the school each year he has been there, and this year they have secured C. C. Rogers, of the Classic class to do special teaching. Besides superintending the public school Mr. Perkins teaches bookkeeping in the Wm. Jewell Business College.

In a letter to Prof. Brown, D. V. Hancock, well-known to many readers of this column, says,—

At the commencement of the Kentucky School of Medicine, last evening, it was my good fortune to be awarded the Broadus gold medal, for general proficiency, also an excellent hospital appointment. I enter at once upon my duties as Resident Physician. In thinking of those who have inspired in me a desire to excel, I gratefully remember you and others of the faculty of the N. I. N. S.

The following extract is from a pleasant letter from F. P. Hocker, now at Audubon, Ia.

As you see from the heading I have changed location, and again I step into a higher and bet ter position. I have been gradually bettering my condition, but, as I have a desirable position, I have concluded to remain here permanently. Audubon is a growing town twelve years old, and has a population of 2500.

D. P. Repass, a friend and a former student of the Normal, is county superintendent of this county. No doubt you remember him. He is still as fleshy as he was when he attended school and, what is more, he has a wife and three children all nearly as fleshy as he is himself.

Many of you will be glad to hear from F. K. Blake and wife, *nee* Iva Minnick. Mr. Blake was in school in '80-'81, and will be remembered as an ardent student in mathematics. The following is an extract from a recent letter to THE STUDENT:

You will observe that we are quite a distance from home. Have been in this city for three years, during which time I have been practicing law, and have done very well. We like the west in general and Wichita in particular as a place of residence. Mrs. Blake's sister, Emma, is with us at present, and expects to remain the coming year as she has a position, in the schools of this city, as teacher.

The following is an extract from a

kind letter to THE STUDENT from Etta McBride, of Upper Sandusky, Ohio.

I spent the greater part of this summer in teaching. My term of school, consisting of three months, closed a few weeks ago. I enjoyed the work to the fullest extent and am pleased to state that I was very successful during the entire time I taught. It is quite probable that I shall return to Valparaiso at the beginning of the school year for the purpose of continuing my studies.

Miss McBride who was here during the fall and winter terms of last year has many friends here who will welcome her back.

Des Moines, Iowa, papers speak in the highest terms of O. H. Longwell's address at the closing exercises of the Highland Park Normal College. Mr. Longwell, Classic of '81, was elected president of that flourishing institution about a year ago at a salary of $5000 a year, and has already made it one of the foremost schools in Iowa. He has a great reputation as an educator, won by his own merit and unintermitting labor.

G. W. Ingram writes a pleasant letter from Lehi, Arizona. He says, concerning his work,—

Last year I began superintending the Lehi school with the understanding that, if my work should prove satisfactory, I should receive $40 for the first month. At its close the board advanced my salary to $70, and, at the end of the second month, to $80 per month. They have re-engaged me for next year at $100 a month.

Such reports are encouraging, and only show what can be done by thorough preparation and earnest endeavor.

The "L. U. N." society held their ninth annual banquet this year at Delevan Lake, Wis., Aug. 10–15. Every one of the original nine was on the program. It would be hard to select any nine young men who have been here at one time who have been more successful than these. Here is the roll:

G. W. Norris, lawyer, Beaver City, Nebraska; A. J. Smith, publisher, Hobart, Indiana; C. L. Kinney, surveyor, Goshen, Indiana; Grant D. Harrington, editor, Rock Valley, Iowa; E. E. Smith, lawyer, Dodge City, Kansas; A. T. Lardin, lawyer, Ottawa, Illinois; H. C. Yeager, real estate dealer, Duluth, Minn.; H. H. Harrington, lawyer, Milwaukee, Wis.; A. L. Stevenson, teacher, Chicago, Illinois.

AMONG THE MAGAZINES.

From Naples to Amalfi is the title of the readable sketch that opens PETERSON'S MAGAZINE for October. It is very well illustrated as, indeed, is the whole number. The stories in this issue are good, one, *Sharp as a Serpent's Tooth*, being written in the vein of Edgar A. Poe. The Fashion, Needlework and Household departments show that completeness and careful attention for which PETERSON is noted, and which make them of special value to the ladies.

$2.00 a year. Peterson's Magazine, Philadelphia, Pa.

The FORUM for October will contain a variety of articles on topics of absorbing interest: Henry Labouchere has written a paper on *The English Royal Family; its Uses and its Cost;* Archdeacon Farrar will write *An English Tribute to Lowell;* the poet Swinburne has written an article giving his estimate of a number of the minor English poets.

Edward A. Freeman has announced a paper, on the Eastern Question, that will soon appear.

$5.00 a year. The Forum, New York.

The October CENTURY will contain a frontispiece portrait of Rudyard Kipling and an article on his work by Edmund Gosse. Mr. Gosse says that Kipling was born in Bombay in Christmas week, 1865, and is therefore only in his twenty-sixth year.

Among the other notable articles promised for October are *The Press and Public Men* by Gen. H. V. Boynton. The editors have also secured for the coming year two novels that will attract wide attention: *Characteristics*, by Dr. Weir Mitchell of Philadelphia,

and *The Chosen Valley*, by Mary Hallock Foot. The latter is to be illustrated by the author.

$4.00 a year. The Century Co., New York.

The October number of THE MONIST has just reached our table. No sort of a review of the contents can be made in the brief time at our disposal, as this great quarterly is the exponent of the profoundest thought of our foremost living philosophers. Besides the usual reviews by the able editor, Dr. Carus, and the department reviews, the present issue is made up of papers from Prof. John Dewey, B. Bosanquet, Justice Albert H. Post, Thomas B. Preston, Hiram M. Stanley and George John Romanes. We hardly see how any student of philosophy can afford not to read this magazine. As Dr. Hudson used to say, "It is full of austere and solid sweetness."

$2.00 a year. Open Court Pub. Co., Chicago, Ill.

The Trouble Grandpa Nature had with his Horse, *Bee-Hunting* and *A Joint Snake* are three peculiarly interesting Natural History articles in the October WIDE AWAKE. *A Night with Russian Wolves*, a blood-curdling true story by Lieut. Col. Thorndike, *Jessie's Chickens*, *Edith's Guinea-pig*, a travel story by Esther George and *The Bronson Co.* (*Limited*), are very entertaining. A Moqui folk-tale of *The Genesis of Earth and Moon* and a Norse folk-tale, are both excellent.

WIDE AWAKE is always readable.

$2.40 a year. D. Lothrop Co., Boston.

The publishers of THE LADIES' HOME JOURNAL claim a circulation of 700,000 copies for their popular journal.

It certainly must be that there is a "long felt want" supplied here. If the publishers could but be induced to give up the aristocratic but inconvenient size they have chosen for their pages, and issue their popular monthly in a size a little more convenient for hand, table and file, there would be little more to be desired. It is impossible to give any adequate review of such a variety of articles.

Mrs. Beecher's account of her famous husband will be read with interest, and the sketch of McKinley's loyal wife is timely.

$1.00 a year. Curtis Publishing Co., Philadelphia.

A new feature has just been introduced in the NEW ENGLAND MAGAZINE. It is, *In a Corner at Dodsley's*, a gossip about writers and books by Walter Blackburn Harte, which is as frank and unconventional in tone as any of the political articles from his pen that have made his name familiar.

The very sight of the covers of this charming magazine does one good, and to those who know the publication is full of promise of good things within. The Oct. issue will contain a chapter of the uncompleted autobiography of Ben Butler. This chapter will treat of his boyhood and early life. Another important paper will be one on James Russell Lowell by Edward Everett Hale.

$3.00 a year. New England Magazine, Boston.

The October number of the ATLANTIC MONTHLY is an excellent number of this old and reliable publication. Edited with scholarly care, one is always certain of finding something worth reading in its pages. It occupies a field distinctively its own in American literature. Among the articles this month that will attract the most attention are Henry Stone's account of General Thomas, Thomas Wentworth Higgins' article on Emily Dickinson's Letters and *The Ascetic Ideal*, an account of some interesting passages in the life of Saint Jerome. Dr. Oliver Wendell Holmes contributes a poem, touching alike for the public sentiment of grief that it expresses and for the personal note of sorrow, to the memory of James Russell Lowell.

$4.00 a year. The Atlantic Monthly, Boston.

PUBLISHER'S PAGE.

This number of THE STUDENT will go into the hands of a great many new subscribers whom we hope to make permanent friends.

We want to help you by every means in our power, and to that end seriously invite your hearty co-operation. It is now less than a twelvemonth since THE STUDENT made his first bow to the public and timidly enough announced his intention of endeavoring to occupy a field which he believed was vacant.

He expected to win a place, if he obtained one at all, by earnestly striving to give his patrons the full worth of their money. He can only say now that he has been very fairly and kindly treated thus far in his career. Many encouraging and even flattering letters have been received from friends in nearly every state in the Union, and the subscription list has grown far beyond what was anticipated.

* * *

The Nickel Plate sells tickets at reduced rates to the Chicago Exposition.

* * *

Nevertheless, we have plans for the future which, we believe, will greatly enhance the value of our journal. We expect to enlarge it, and put it into a new dress about the first of the year, and have already secured the assistance of a number of new contributors.

* * *

Cheap Excursion Rates to Chicago Exposition.

The Chicago & Grand Trunk Railway announces very low excursion rates to Chicago and return for the Exposition. The round trip rate from Valparaiso including one admission to the Exposition, is only $1.55. Tickets will be sold on Tuesdays, September 22nd, 29th, October 6th, 13th and 20th, good going on date of sale and good to return up to and including Monday next following date of sale.

* * *

Now, how can you help us?

1. By suggesting topics of general interest, that we may have articles prepared upon them.

2. By sending us educational notes and news or personal items from your vicinity.

3. By sending us questions: we wish to devote a page or two every month to the answers of questions, solutions of examples, etc. If you want to know the best means of presenting any subject in your school, where to find information on any subject, how to answer this or that question in grammar, history, arithmetic, etc.,—what books to read, or not to read, or wish information that we can afford on any subject, write freely to us and we will help you all we can.

4. After becoming acquainted with THE STUDENT, if you like it, please speak of it to your friends. Our present generous premium rates holding good till Jan. 1, 1892, will be sent any one upon application.

* * *

Tickets now on sale to Chicago via the Nickel Plate on account of the Exposition.

* * *

The future of THE STUDENT is thus in the hands of its friends. Help us and in return we will help you. The enterprise is, we are glad to say, on a firm financial basis and our subscribers may rest assured that every dollar we receive whether for advertising or on subscriptions will be immediately laid out in improving our journal.

* * *

Turn to page 10 of our advertising department, and note our great clubbing rates with THE COSMOPOLITAN.

When one can get such books as Grant's Memoirs for 30 cents, there cannot be much excuse for ignorance.

* * *

The very best business firms in Valparaiso advertise in our columns. We beg to say to all students who are strangers in our midst that we are willing to be held responsible for the integrity and fair dealing of our advertisers.

* * *

Go to Chicago Exposition via the Nickel Plate. Cheap Rates.

AUGUST EXAMINATION QUESTIONS FOR INDIANA.

CONDUCTED BY O. P. McAULEY.

READING.

"Father, thy hand
Hath reared these venerable columns, thou
Didst weave this verdant roof. Thou didst look down
Upon the naked earth, and forthwith rose
All these fair ranks of trees."

From "A Forest Hymn," by William Cullen Bryant.

Ask five questions on the above suitable to bring out the meaning. 5 points, 10 each.

All exercises in oral reading to be marked from 1 to 50.

ANSWERS.

1. What is meant by venerable columns?
2. What does the poet refer to when he speaks of "this verdant roof?"
3. Express in your own language the meaning of "Thou didst weave this verdant roof."
4. Why does the poet say that the Father looked *down* upon the earth?
5. Express the meaning of the last two lines in your own language.

ARITHMETIC.

1. Give rules for determining when a number is or is not divisible by 2, by 3, by 4, by 5.
2. Simplify: $2\frac{2}{3}-5\frac{7}{12}+\frac{3}{10}$ of 15.
3. Simplify: $\dfrac{2\frac{1}{5}\times\frac{13}{23}}{\frac{3}{7}\times 1\frac{2}{17}} \div \dfrac{1\frac{2}{5}\times\frac{11}{19}}{\frac{3}{13}\times 1\frac{7}{16}}$.
4. A man gives away \$76.23, which is 9 cents for every \$5 in his income. What is his income?
5. What income would be derived from investing \$9,350 in 5½ per cent. stock at \$1.37½?
6. In what time will \$220 gain \$56 10, interest being at 4½ per cent.?
7. What is the difference in time between two places, one 16 degrees 21 min. 42 sec. east longitude, the other 84 degrees 18 sec. west longitude.
8. If 4 men in 7⅔ days earn \$53⅔, how much will 7 men earn in $\frac{4}{49}$ of a day? Write out full analysis.
9. A merchant tailor sold a suit of clothes for \$64.40, gaining 15 per cent. He sold another suit for \$60 and lost the same amount of money as he gained on the first. What per cent. did he lose on the second suit?
10. If 6 ranks of wood, each 128 ft. long, 3 ft. wide and 6 ft. high, were piled together in the form of a cube, what would be the height of the pile?

ANSWERS.

1. a. Every number is divisible by 2 whose right-hand figure is 0 or even.

   b. Any number the sum of whose digits is divisible by 3 is itself divisible by 3.

   c. Every number is divisible by 4 if the two right-hand figures are 0, or if they express a number divisible by 4.

   d. Any number whose right-hand figure is 0 or 5 is divisible by 5.

2. $2\frac{2}{3}-5\frac{7}{12}+\frac{3}{10}$ of $15=\frac{8}{3}-\frac{67}{12}+\frac{9}{2}=\frac{32}{12}-\frac{67}{12}+\frac{54}{12}$
   $=\frac{32}{12}+\frac{54}{12}-\frac{67}{12}-\frac{86}{12}=\frac{67}{12}-\frac{19}{12}=1\frac{7}{12}$

3. $\dfrac{2\frac{1}{5}\times\frac{13}{23}}{\frac{3}{7}\times 1\frac{2}{17}} \div \dfrac{1\frac{2}{5}\times\frac{11}{19}}{\frac{3}{13}\times 1\frac{7}{16}} = \dfrac{1\frac{1}{5}\times\frac{13}{23}}{\frac{3}{7}\times\frac{19}{17}} \div \dfrac{1\frac{4}{5}\times\frac{11}{19}}{\frac{3}{13}\times\frac{23}{16}}$
   $=\dfrac{11\times 13\times 7\times 17}{5\times 23\times 3\times 19} \div \dfrac{12\times 11\times 13\times 16}{5\times 3\times 19\times 23}$
   $=\dfrac{11\times 13\times 7\times 17\times 5\times 3\times 19\times 23}{5\times 23\times 3\times 19\times 12\times 11\times 13\times 16}=\frac{17}{16}=1\frac{1}{16}$

4. $\dfrac{\$76.23}{.09}=\$847$, the no. of times his income will contain \$5.
   ∴ his income $=5\times\$847=\$4235$

5. \$1.37½ buys \$1 in stock
   \$1 buys $\$\dfrac{1}{1.375}$ in stock
   \$9350 buys $9350\times\$\frac{1}{1.375}$ in stock $=\$6800$
   5½% of \$6800=\$374.=income

6. \$9.90 = interest for 1 yr.
   \$1 = interest for $\frac{100}{990}$ yr.
   56.10 = interest for $56.10\times\frac{100}{990}$ yr. $=5\frac{2}{3}$ yr.

7. 16^0 21 min. 42 sec. $+84^0$ 18 sec. $=100^0$ 22 m.
   100^0 22 min. $\div 15 = 6$ hr. 41 min. 28 sec.

8. 4 men in 7⅔ da. earn \$53⅔
   1 man in 7⅔ days earns ¼ of \$53⅔ = \$13$\frac{5}{12}$
   1 man in 1 day earns $\frac{3}{23}$ of \$13$\frac{5}{12}$ = \$1¾
   1 man in $\frac{4}{49}$ days earns $\frac{4}{49}$ of \$1¾ = \$$\frac{1}{7}$
   7 men in $\frac{4}{49}$ days earn $7\times\$\frac{1}{7}=\$1$

9. Let 100% = cost,
   then 115% = selling price = \$64.40
   1% = $\frac{1}{115}$ of \$64.40 = $\$\frac{64.40}{115}$
   100% = $100\times\$\frac{64.40}{115}$ = \$56 cost.
   \$64.40 − \$56 = \$8.40 = loss on 2nd suit.
   \$60 + \$8.40 = \$68.40 = cost of 2nd suit.
   Let 68.40 = 100% of cost.
   \$1 = $\frac{1}{68.40}$ of 100% of cost = $\frac{100}{68.40}$% of cost
   \$8.40 = $8.40\times\frac{100}{68.40}$% of cost = $12\frac{16}{57}$%.

10. $6\times128\times3\times6=13824$
$\sqrt[3]{13824}=24$

GRAMMAR.

1. An adjective clause which is not restrictive should be set off by a comma. What is meant by "restrictive?" Write a sentence containing an adjective clause that is restrictive. How should it be punctuated?
2. "I shall do whatever is thought best when the time comes." What kind of sentence? Parse "do" and "best" in the above sentence.
3. Write a list of five nouns having two forms in the plural, both meaning the same thing. Write five nouns used only in the plural.
4. Which parts of speech are said to have properties? Name the properties in each case.
5. Illustrate in sentences all the classes of sentence elements that may become the objects of the verb.
6. "Great nations resemble great men in this particular, that their greatness is seldom known until they get into trouble." What does the subordinate clause modify? How does it modify it? Parse "particular."
7. What is incorrect in the following sentences: *a.* Webster was a more able orator than a statesman. *b.* He has no doubt but what you will obey. *c.* This is our friend whom we met in New York, and that came to meet us.
8. Use *like* as a different part of speech in each of four different sentences. Designate.
9. Write five sentences illustrating as many different uses of the clause.
10. "Man is the jewel of God, who has created this material world to keep his treasure in." What kind of sentence? Is the comma after God needed? Justify both your answers.

ANSWERS.

1. In reality all clauses, excepting substantive clauses, are restrictive. "The man who went to town has returned." "Who went to town" is a restrictive clause. "We stopped at the place where my friend lives." "Where my friend lives" is a restrictive clause.
2. "I shall do whatever is thought best when the time comes." With reference to form, it is complex. With reference to use, it is declarative. "Shall do" is a verb, irreg., principal parts, do, did, done, trans., active, indicative, future, 1st, sing., to agree with its subject, "I." "Best" is an adjective, used in the predicate with "is thought," and belongs to the subject.
3. Scissors, ashes, manners, tongs, morals.
4. Nouns, pronouns, verbs, adjectives, adverbs. The properties of the verb are form, voice, mode, tense, person, number, construction, rule. The properties of the noun are person, number, gender, case, construction, rule. The properties of the pronoun are form, agreement, case, construction, rule. The property of the adjective is declension. The property of the adverb is declension.
5. There is but one kind of sentence that can be the object of the verb. This is the substantive sentence; as, "He said he would return."
6. The subordinate clause modifies the noun understood, to which "particular" belongs. It modifies it as an adjective clause. "Particular" is an adjective and belongs to a noun understood; rule.
7. *a.* The sentences should read, Webster was a more able orator than statesman. *b.* He has no doubt but that you will obey. *c.* This is our friend whom we met in New York, and who came to meet us.
8. *a* An adjective, He is like his brother. *b.* A preposition, Then came wandering by a shadow like an angel. *c.* A verb, I like such work. *d.* A conjunction, He ran like a deer. *e.* A noun, I have never seen the like.
9. *a.* The man whom we saw has returned. An adjective clause, limiting "man." *b.* When he comes we will go. An adverbial clause, limiting "will go." *c.* The text, "He leadeth me beside the still waters," was ably managed by the preacher. An adjective clause, in apposition with "He leadeth me beside the still waters." *d.* We supposed that he could accomplish the task. A substantive clause, used as an object of the verb. *e.* It is said that he is an honest man. A substantive clause, the subject of the verb "is."
10. This sentence, according to form, is complex. According to use, is declarative. The comma is not needed after the word "God." It is a complex sentence because it contains a dependent clause. A relative pronoun which directly joins a clause is not set off by a comma.

PHYSIOLOGY.

1. Describe somewhat fully the structure of a muscle. 15.
2. Given a longitudinal section of the humerus. What observations upon structure and the adaptation of structure to functions may be made? 15.
3. Name and describe the several parts of the eye-ball, showing the adaptation of each to the purpose which it is to serve. 15.
4. What is meant by secretion? By assimilation? 10.
5. Give the objections to rapid eating, with reasons for the same. 15.
6. What is the normal temperature of the body? By what means is it maintained? 10.
7. Where is the medulla oblongata situated, and what is its function? 10.
8. What is the pulse and why is it a good index of the state of the health? 10.

ANSWERS.

1. A muscle is composed of bundles of fibers which run from tendon to tendon. They are called fasciculi. Each faciculus is divided into smaller fibers, the contractile tissue of the muscle proper, termed fibrillae. A sheath of connective tissue envelops each muscle and from this, partitions run in and separate the fasciculi.

2. The section shows a longitudinal canal running through the shaft of the bone enclosed by a tube of quite dense bony tissue.

   At the extremities are enlargements for the formation of strong joints. The bone cells are so placed as to receive the stress of weight upon their long axes.

3. 1. Cornea, transparent to admit light; convex to refract it. 2. Iris, a dark annular curtain to regulate the amount of light entering the eye. 3. Crystalline Lens, transparent and convex—convex to admit and refract rays to a focus upon the retina. 4. Retina, a layer of the optic nerve terminals composed of delicate rods and cones to receive the stimulus of the image formed by the refracting media of the eye.

4. 1. A process of gland activity by which certain substances are manufactured to serve the functions of digestion or assimilation. 2. Assimilation is the combination of new material with living tissue. Assimilation and its opposite, dissimilation constitute nutrition which includes all the processes of life.

5. The food is not properly masticated, mixed with saliva and digested in the mouth. Too much food may be taken.

6. 98.6°F. It is maintained by chemical changes, mechanical changes and regulated by the evaporation and excretion from the glands of the skin and mucous membrane of the lungs.

7. At the base of the brain in front of cerebellum and below the Pons Varolli. It contains the respiratory and vaso motor centers.

8. A vibration of the arterial coats caused by the impulse of the heart upon the liquid blood. It indicates the rapidity and force of the heart beat, a process susceptible of variation with the varying states of the bodily activities.

GEOGRAPHY.

1. How can pupils be taught so that they will not regard different countries as mere sections on a map?

2. What circumstances generally determine the location and growth of cities?

3. How do the waters of Lake Superior reach the ocean?

4. Give a short description of the Hudson river in reference to its rise, direction of flow, cities on its banks and the nature of the country through which it passes.

5. What aid may be derived from *relief* maps in teaching geography?

6. Where is Belgium? Name its capital and its chief seaport.

7. What four rivers drain the greater part of Africa? Where do they rise, in what directions do they flow, and into what do they empty?

8. Where and how would you begin to teach the subject of geography to a class? Why?

9. Under what different forms of government do the people of the earth live? Name one country, or state, under each form.

ANSWERS.

1. By having them point toward the country; travel to the country, naming the waters or countries passed through, the direction of travel, the distance, the time required; spend a few seconds each day in trying to think to the country; and impress upon their minds that they do not know the country until they can see it and its neighbors on the earth.

2. The products of the surrounding country and the facilities for commerce.

3. Through the St. Mary's River, Lake Huron, St. Clair River, Lake St. Clair, Detroit River, Lake Erie, Niagara River, Lake Ontario, and the St. Lawrence River.

4. It rises in the north-eastern part of New York, flows south through a mountainous country and has on its banks, New York City, Jersey City, West Point, Poughkeepsie, Newbergh, Albany and Troy.

5. They may help very greatly in teaching the slope of the country and the direction of rivers.

6. *a.* Belgium is in the western part of Europe, bounded by the North Sea, the Netherlands, the German Empire and France. *b.* Brussels. *c.* Antwerp.

7. The Nile, *a.* Victoria Nianza, *b.* North, *c.* Mediterranean Sea. The Zambesi, *a.* In the mountains west of the center, *b.* East, *c.* Mozambique Channel. The Congo, *a.* Lake Tanganyika, *b.* West, *c.* Atlantic Ocean. The Niger, *a.* In Soudan, *b.* South-east, *c.* Gulf of Guinea.

8. *a.* In the school-room or yard. *b.* By drawing and locating the objects around us; also by having children tell or find out what is bought and sold in their town or home district. *c.* Because I wish to have their minds develop from exercise and growth rather than from stuffing.

9. All civilized nations have either a monarchy or a republic. Russia is an example of the former and the United States of the latter.

HISTORY.

1. The Revolutionary War: Its causes, leading campaigns and events, and its results.

2. The United States' Constitution: its origin, its main provisions, its defects.

3. Acquisition of territory: from whom acquired, by what means, results of each.

Note.—Discuss any one of the above topics as fully as the time will permit.

ANSWERS.

1. a. Causes.

I. General.
Right of Arbitrary Government.

II. Remote :
1. Influence of France.
2. Natural disposition of the Colonists.
3. Growth of public opinion in the Colonies.
4. Personal character of the King, George III.

III. Immediate :
1. Importation Act.
2. Iron-works forbidden in America.
3. Felling of pines, outside of enclosures, forbidden.
4. Writs of Assistance.
5. Stamp Act.

IV. Relation.
1. Navigation Acts.
2. Restrictions on internal trade.
3. Courts of admiralty were established.
4. Organization of The Board of Trade and Plantations.

II. b. Events.
1. Battles of Lexington and Concord.
2. Battle of Bunker Hill.
3. The New York campaign.
4. Burgoyne's Invasion.
5. Washington's Campaign in Penn.
6. Alliance of France.
7. Battle of Monmouth.
8. Success of Paul Jones.
9. Siege of Charleston.
10. Arnold's Treason.
11. Battle of Cowpens.
12. Green's Retreat.
13. Siege of Yorktown.

III. c. Results.

1. Independence of the U. S. acknowledged by Great Britain.
2. England retained Canada and the full control of the St. Lawrence River.
3. England gave Florida to Spain.
4. Free navigation of the Mississippi River was granted the United States.
5. Free navigation of the Great Lakes was granted the United States.
6. Boundary of the United States : North, by St. Lawrence River and Canada; East, by Atlantic Ocean; South, Florida; West, the Mississippi River.
7. Cost

1. U. S.: men, estimated at		40,000.
" " money	"	"$140,000,000
2. England: men,	"	" 50,000
" money	"	"$610,000,000

2. a. In January, 1786, the Legislature of Virginia appointed commissioners to meet with those from other states to consider the subject of trade, with reference to a uniform system of commercial regulations. The meeting was held in Sept, at Annapolis with only five States represented. The committee prepared a report expressing their unanimous conviction that a general convention should be held to devise such provisions as might render "the Constitution of the Federal Government adequate to the exigencies of the Union." The report was sent to the states represented and also to Congress as well as the other states. On the 21st of Feb, 1787, Congress adopted the following report:

"*Resolved*, that in the opinion of Congress, it is expedient that, on the second Monday in May next, a convention of delegates, who shall have been appointed by the several states, be held at Philadelphia, for the *sole* and *express* purpose of revising the Articles of Confederation, and reporting to Congress and the several legislatures such alterations and provisions therein as shall, when agreed to in Congress and confirmed by the state, render the Federal Constitution adequate to the exigencies of the government and the preservation of the Union."

All the states but Rhode Island appointed delegates to meet at Philadelphia at time specified, Monday May, 14th, 1787. The organization was completed on the 25th of May when Mr. George Washington was unanimously elected President.

Soon after the organization of the convention, Mr. Randolph submitted a series of resolutions, embodying the views of the Virginia delegates. On the same day, Mr. Pinckney, of South Carolina, submitted a draft of a constitution.

These were referred to the Committee of the Whole, and the discussion commenced. The Committee adopted the following: "*Resolved*, That it is the opinion of this committee that a national government ought to be established, consisting of a supreme Legislative, Judiciary, and Executive." Mr. Patterson of New Jersey offered a series of resolutions, and Mr. Hamilton offered a few suggestions. All these resolutions and suggestions were again referred to the Committee of the Whole. After some heated discussions it was agreed to appoint a Committee of Detail, to whom should be referred the proceedings of the convention. The discussions were continued until Saturday, Sept, 15th, when the Constitution, as amended, was agreed to, all the states concurring. It was ordered to be engrossed, and on Monday following it was signed by the members, after striking out 40,000 as the basis for representation and inserting 30,000.

b. Legislative, Judicial and Executive.

c. General defect—is defective just as any written constitution is. The marvelous thing about it is that it has stood the test of all these years with so little criticism. The criticisms being mainly summed up in the fifteen amendments to the constitution.

3. The original U. S. from Great Britain.
Louisiana Purchase form France by purchase.
Florida Purchase from Spain, by purchase.
At the close of the war with Mexico, we gained by a mixture of conquest and pur-

chase what was then called New Mexico and California, including all the territory westward to the Pacific and south of Oregon.
Gadsen Purchase from Mexico, by purchase.
Alaska Purchase from Russia, by purchase.

SCIENCE OF EDUCATION.

(Answer any seven.)

1. Name some external condition of attention; one or more mental conditions of attention.
2. How may the teacher secure the pupil's attention during class instruction?
3. Name several unwise incentives to study.
4. What do you regard as the principal points in good class management?
5. What are the chief ends to be secured by the recitation?
6. What is meant by the lecture method in education? To what classes of students is it well adapted?
7. Name several class procedures which you regard as erroneous. Give reasons.
8. What are the true objects of examinations?
9. "Knowledge is mental food." Explain.
10. Point out some of the principal defects in the Common School system of Indiana.

ANSWERS.

1. A familiar object in the midst of unfamiliar ones, or *vice versa*.
2. By making the matter in hand interesting to himself and the pupil.
3. Getting a higher grade than any other pupil; securing the approval of the teacher at the expense of some other pupil; working for some end that there is little probability of the pupil's reaching.
4. Training the pupil to act intelligently and manfully in any situation in which he must act with others; giving the pupil a chance to expend all his mental energy upon some single thing for the maximum time.
5. Those implied in the foregoing, with the additional end of enabling the pupil to gain some knowledge that will be serviceable in his future.
6. The teacher's taking the topic of the hour, and developing it before the class. The method is adapted to any class with proper limitations.
7. Making form more than matter. Accustoming the pupil to any manner of acting or thinking which will make him a stranger in real life and good society. The reasons are, such proceedings make him spend too much time in taking off old clothes and putting on new.
8. To give the pupil practice in making out papers in proper form.
9. Food is whatever furnishes power to enable the body to do its work. Knowledge, or what the mind knows, does that thing for the mind.
10. The defects of any system working in an imperfect environment, and constructed by persons who are integrant parts of the environment.

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