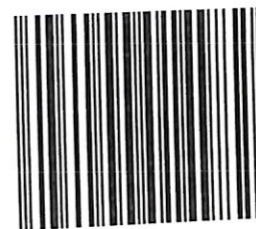# A PRIMARY ARITHMETIC AND TEACHERS MANUAL WITH CLASS AND SEAT EXERCISES

Edward Olney
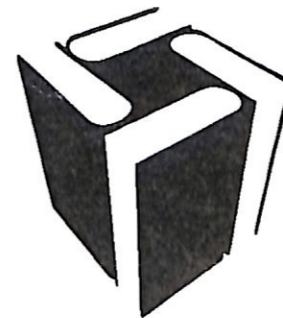
A PRIMARY ARITHMETIC AND TEACHERS MANUAL
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Edward Olney

A

PRIMARY

ARITHMETIC,

AND

TEACHER'S MANUAL,

WITH

CLASS AND SEAT EXERCISES GRADED WITH REFERENCE TO THE VARIOUS STAGES OF THE PUPIL'S ADVANCEMENT IN READING.

BY EDWARD OLNEY,

NEW YORK:
SHELDON & COMPANY.
1875.

PREFACE.

IT is thought that the spirit of this book, and the manner of using it, will be so evident, as the teacher reads it over, that few prefatory words are needed. The following are some of the leading principles by which the author has been guided. How they have been wrought out can be seen only by examining the book itself.

1. A text-book for schools should be arranged with reference to sound principles of teaching, and to convenience of use in the school-room, quite as much as to the principles of the science which it develops.

2. *One thing at a time* is the fundamental maxim of primary teaching. Each exercise must have a single, clearly defined purpose.

3. *Unity of purpose* and almost infinite *diversity of means* characterize the most successful teaching of the young.

4. The young child must be furnished something to *do*. His hands, his eyes, and, as much as may be, his tongue and his whole body, must be busied with the work in hand.

5. In a well-conducted primary school, as careful attention will be given to secure profitable employment for the pupils in the seats, as to the conduct of the class exercises.

6. The cases are exceptional, and very rare, in which much labor or time need be bestowed in order to awaken in the mind of the child the conception of number. The recognition of number is one of the most simple, earliest developed—in fact,

most nearly innate—of all our mental acts. The child who has learned to count 10 by means of objects, has as well-defined, practical notions of number, as he needs, and as he advances with the simple processes of combination, his conceptions will enlarge as occasion requires.

7. There are two distinct mental processes required in obtaining a mastery of the elementary combinations of numbers:

1. The method by which we determine what the result of the combination is, and

2. The fixing of that result in the memory.

Thus, it is one thing for the pupil to learn how he may find out how many 6 times 7 makes, and quite another thing to fix this product in his mind. The former is a *process*, which the child who can count will readily learn, and which he will always apply with pleasure. The latter is a pure act of memory, and the pupil needs all the help an ingenious teacher can devise, to save it from becoming intolerable drudgery. In a single lesson, the child who can count one hundred, will learn to make the Multiplication Table as far as 10 times 10. But to remember these 100 products, so that they can be instantly named, is no less a task than to memorize the answers to any other 100 problems. The same may be said of the Addition, Subtraction, and Division Tables; for they are none of them well learned until the results can be recalled without any mental process except the instantaneous act of the memory.

8. *To perceive* and *to remember* are the chief mental exercises of the grade of pupils for which this book is prepared. Such pupils cannot be expected to give formal statements either of definitions, processes, or reasons; and much less can they obtain conceptions and learn processes from abstract statements. Hence, formal definitions, rules, and processes of reasoning are out of place in such a book.

9. Usually the child who cannot count cannot read; and the processes of learning to read and learning the elementary com-

binations of numbers are going on at the same time. Accordingly, in this book the first 27 pages are addressed to the Teacher; the next 90 are addressed to "pupils reading simple words;" and the remainder of the book assumes that the pupil has learned to read tolerably well.

10. According to the decimal notation, the fundamental combinations embrace only numbers below and including 10. To such combinations this book is, therefore, confined.

11. One is more interested in what he has made himself, than in that which is furnished by another. Hence the pupil is taught *how to make* the Addition, Subtraction, Multiplication, and Division Tables for himself, and, having made them, *to study his own work.* None of these tables are given, except in form, in this book.

12. From objects in sight and in hand to objects out of sight—from the concrete to the abstract, from the known to the unknown, by short and easy steps—an arrangement which will make each advance include a practical review, etc., are principles so well established that no intelligent teacher will countenance the violation of them.

The teacher who is familiar with the methods of the Kindergarten will recognize the spirit of those methods on every page of this book. Indeed, it has been a leading purpose to embody this spirit in forms which are practicable for use in our ordinary Primary Schools.

EDWARD OLNEY.

NOTE.—Since the plates of this book were first cast, the whole book, in complete form, has been thoroughly examined by a number of practical teachers in different parts of the country, and carefully revised. The exceedingly liberal spirit of the publishers has allowed the author to make such revision to any extent he desired. To Prof. N. A. CALKINS, of the New York City Normal School, the author is very greatly indebted for valuable suggestions in connection with this work of revision.   E. O.

INTRODUCTION.

ORGANIZATION AND EXERCISES OF A PRIMARY SCHOOL.

SO much attention has been given of late to primary teaching, and principles and methods have been so rapidly developed, that the author has thought that a synopsis of a few of these results would be acceptable to the teacher. The preface recites some of the established principles; it is the purpose of this introduction, and, in fact, of this book, to exhibit in outline an embodiment of such principles in method.

So great is the diversity among our Primary Schools, that it is practically impossible to present a schedule which is adapted to all. What is designed in this attempt is to indicate somewhat of the plan of organization and course of exercises found in our best Primary Schools in towns of 3,000 to 8,000 inhabitants, where the schools are graded into 4 or 5 departments. In the larger cities, where there are two or more primary grades, the oral exercises can be more frequent for each class, and still greater variety will be practicable. Nevertheless, the spirit and general features of the scheme may be much the same in all.

Such a school as is here described will consist of 50 or 60 pupils arranged in 3 classes, styled respectively the " A " class, " B " class, and " C " class, the first being the most advanced, and the last the least. The pupils of each class will be seated together, as seen in the cut on page 5, where the " A " class occupies the two forms at the left, the " B " class, which is at

the counting table, occupies the two centre forms, and the " C " class the two right-hand forms.

The age of the " C " class will vary from 5 to 7, and pupils will be, on an average, about a year in each class. The " A " class will usually be found reading in what is called the " Third Reader," and will be able to learn easy lessons in descriptive subjects, as Natural History and Geography.

No exercise should occupy more than 15 minutes, and with the younger classes many of the class exercises need not exceed 5 or 8 minutes. Ten minutes are assigned to most of the separate exercises in the schedule. Time saved by the shorter exercises will give opportunity for inspection of work, singing, or any of the numerous, nameless things which need attention.

This plan supposes that the pupil will be kept constantly busy, recreation being as regularly provided for as work. " st." means " exercise in seat, " cl." means " class exercise," and " B—B " means work on the pupils' blackboard. The class exercises are printed in full-faced type.

Part of the writing exercises will be for the purpose of learning to write, and part for the purpose of learning to spell. The former will usually be from copy, and the latter from dictation by the teacher as she is about her other work.

The drawing exercises will comprise geometrical forms, tracing from copies, simple natural objects, and outline map drawing.

The oral exercises will be largely what is known as " Object Lessons." These will be on various subjects, such as color, form, common properties of bodies, direction, etc.

The " A," " B," and " C " classes as here designated correspond with the 1st, 2d, and 3d *Grades*, or years, respectively, of the system now coming into use in many of our Graded Schools. In the larger of these schools it is assumed that each grade will be divided into two *Divisions*.

PROGRAMME FOR A DAY IN A PRIMARY SCHOOL.

FORENOON.

| TIME.	"A" CLASS.	"B" CLASS.	"C" CLASS.
9 to 9:15	Opening Exercises.		
9:15 to 9:25	Writing, st.	Reading, st.	Reading, cl.
9:25 to 9:35	Reading, st.	Reading, cl.	Arithmetic, st.
9:35 to 9:45	Reading, cl.	Drawing, st.	Printing, B—B.
9:45 to 9:50	Gymnastics, and Oral Concert Exercises.		
9:50 to 10	Drawing, B—B.	Arithmetic, st.	Arithmetic, cl.
10 to 10:10	Arithmetic, st.	Arithmetic, cl.	Drawing, st.
10:10 to 10:20	Arithmetic, st.	Writing, st.	Oral Teaching.
10:20 to 10:40	Recess.		
10:40 to 10:50	Arithmetic, cl.	Drawing, B—B.	Writing, st.
10:50 to 11	Geography, st.	Reading, st.	Reading, cl.
11 to 11:10	Geography, st.	Reading, cl.	Drawing, st.
11:10 to 11:20	Geography, cl.	Drawing, st.	Arithmetic, st.
11:20 to 11:30	Gymnastics, and Oral Concert Exercises.		
11:30 to 11:40	Writing, st.	Arithmetic, st.	Oral Teaching.
11:40 to 11:50	Arithmetic, st.	Arithmetic, cl.	Printing, st.
11:50 to 12	Arithmetic, cl.	Printing, st.	Drawing, B—B.

AFTERNOON.

TIME.	"A" CLASS.	"B" CLASS.	"C" CLASS.
2 to 2:10	Writing, st.	Reading, st.	Reading, cl.
2:10 to 2:20	Nt. History, st.	Reading, cl.	Arithmetic, st.
2:20 to 2:30	Nt. History, cl.	Writing, st.	Printing, B—B.
2:30 to 2:45	Gymnastics, Stories, and Moral Lessons.		
2:45 to 2:55	Arithmetic, st.	Arithmetic, st.	Arithmetic, cl.
2:55 to 3:05	Arithmetic, st.	Arithmetic, cl.	Writing, st.
3:05 to 3:20	Recess.		
3:20 to 3:30	Arithmetic, cl.	Drawing, st.	Drawing, st.
3:30 to 3:40	Drawing, st.	Spelling, st.	Oral Teaching.
3:40 to 3:50	Spelling, st.	Spelling, cl.	Printing, st.
3:50 to 4	Spelling, cl.	Writing, st.	Drawing, st.

SECTION I.

COUNTING, AND READING AND WRITING NUMBERS FROM ONE TO ONE HUNDRED.
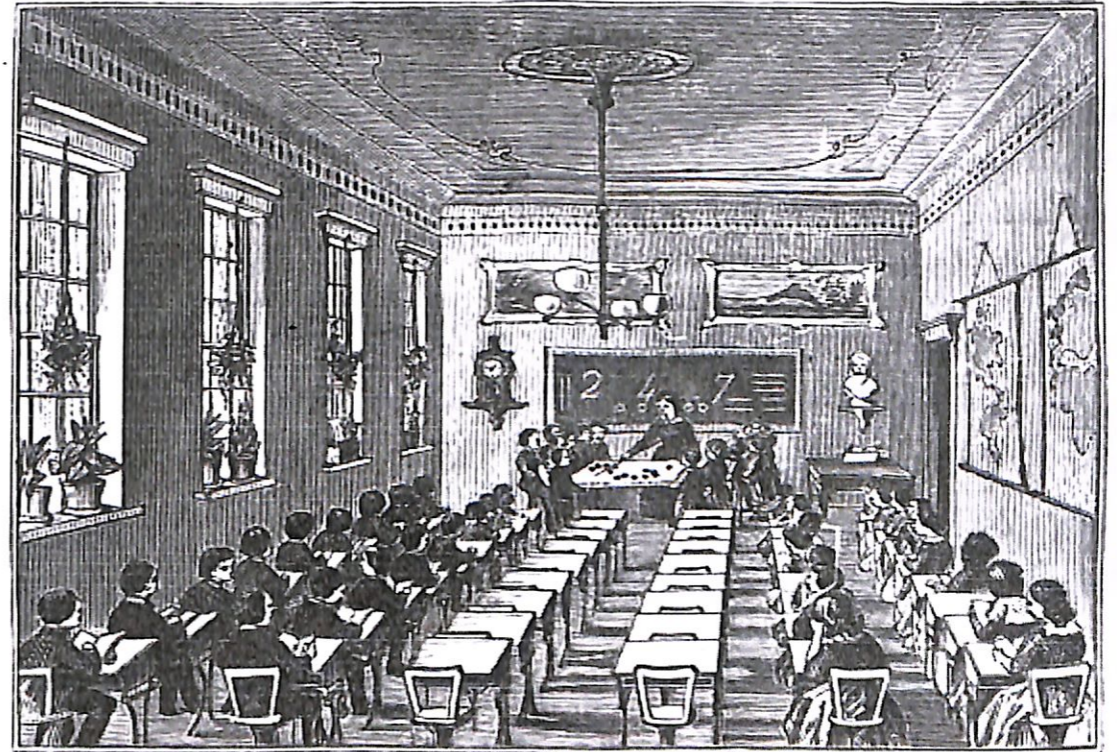
THIS Section is addressed to the *Teacher*. It is presumed that pupils who cannot count, cannot read; and hence that the text of a book can be of no service to them. The pictures in this section will be useful to the pupils, as will appear in the progress of the lessons. Hence the pupils will need the book from the beginning.

The lessons of this section, however, will be wholly oral. We call this class of pupils the "C" class, the lowest grade in the Primary School. (See Introduction.)

Appliances.—1. A good **Blackboard**, crayons, rubber, and pointer, for the teacher's use. The blackboard should be about 3 feet by 9.

2. A **Table** about 3 feet by 6, so arranged that the top can be inclined towards the class, and low enough so that children of 5 or 6 years can see its surface, as they stand around it, and can get their hands on it conveniently.

3. One Hundred **Counters.** Tasty counters can be cut from bright colored, heavy card-board. They should be about ¾ of an inch square; or, if circles, about the same in diameter. Common wooden button molds will answer. Whatever is used should be neat and convenient, but so simple as not to attract undue attention. Small bundles of splints are much used.

4. A **Numeral Frame**—a necessity in a Primary School.

5. A **Long Blackboard** on the sidewall, so low that children of this age can write on it easily, and long enough for 18 or 20 pupils to stand before it at once, and write on it.

6. Each pupil needs a **Slate** and **Pencil**.

LESSON I.

Purpose.—*To teach to Count from One to Ten.*

Method.—Class Exercises. While the teacher stands behind the Counting Table, and the class is gathered around it, as represented in the picture, let the teacher have *ten* counters lying together on the table, and moving out *one* of them, ask, "How many is that?" When this is answered by all, move out another, and placing it with the first, ask, "How many have we now?" In this way see how far any of them can count. If all can count *ten,*

readily, there is no need of spending more time on the exercises in this lesson. But *class* answers must not be depended upon for determining this—each pupil must be questioned separately, while all look on, and, when occasion serves, help.

If few, or none of them, can count ten, the work of teaching must be continued till all can count thus far, readily. Use the counters as above, having the pupils count *in concert,* at first, as the teacher moves out the counters. Then encourage *individuals* to try it. "Now, who can count four?" "Well, Jane, count out four of the counters." "Who else can do it?" "Who else?"

"Who can count out seven counters?" "Well, James, you may try it." "Who else?" etc., etc. Vary the exercise by having the pupils count marks, or dots, as you make them on the board. Also, if they know any letter, as o, make several o's and let them count them. (*Use letters for this purpose as fast as they are learned.*) Have them count the pupils in the class, the buttons on their jackets, the objects in this picture, etc.

As another exercise, use the pictures on pages 5 and 8. "All

find the boys in the picture." "How many have found them?" (Hands raised to indicate.) "Count the boys (silently)." "Who can tell how many boys there are?" (Hands raised.) "Sarah, tell." "Mary, count them aloud." So proceed with other objects found in the pictures.

It will be serviceable as a class exercise to have the class repeat the numbers in concert, while you beat with the hand, bringing the right hand down into the open palm of the left at each count. Thus teacher and class count together. Class count *alone*, while the teacher beats. Class *beat and count*, while teacher only beats. Such exercises as these will be serviceable mainly in teaching the *names* and *succession* of the numbers; but this is no small part of the problem.

The *Numeral Frame* is very convenient in teaching counting.
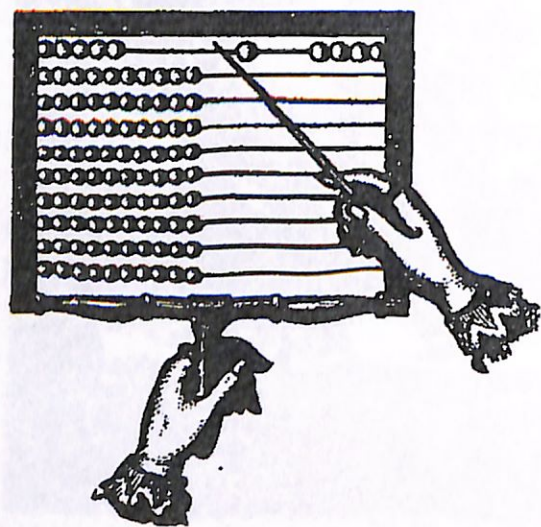
Teacher hold it up and slide out the balls one by one, as the class counts. Pupils take the pointer and slide out the balls and count, or use their fingers if they cannot handle the pointer. For other uses of this important instrument see pages 9, 13, 16, 18, 19, 20, 27, 31, etc.

Another exercise will consist of questions like the following: "How many eyes has each of you?" "How many feet?" "How many noses?" "How many fingers on one hand, without the thumb?" "How many with the thumb?" "How many on both hands, without the thumbs?" "How many with the thumbs?" etc. This exercise is more purely mental than the preceding, inasmuch as, in this, the pupils are expected to count the objects without touching them, or even looking at them. It should be extended to objects outside of the school-room (out of sight). Thus, "How many eyes has a cow?" "How many legs?"
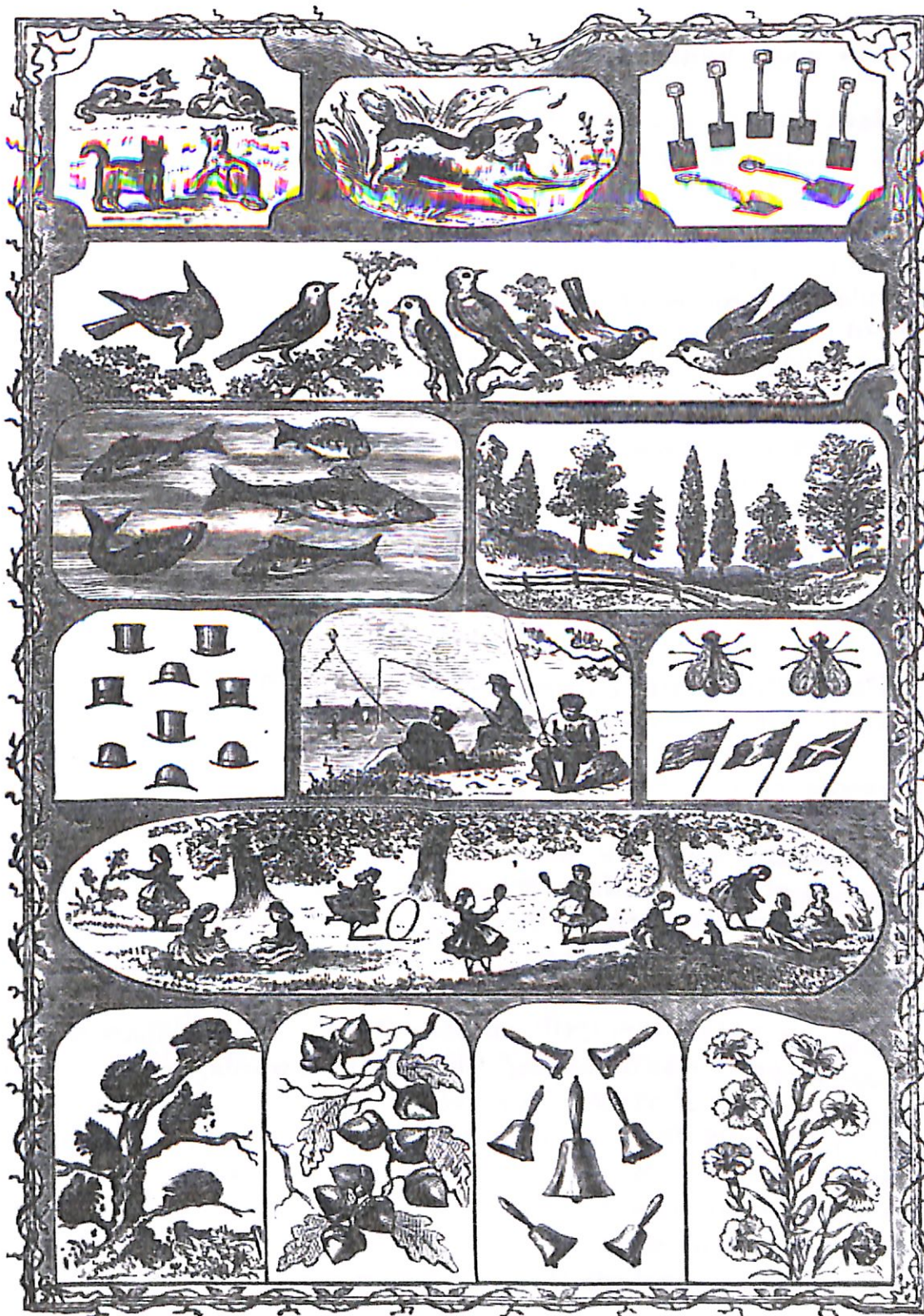
"How many brothers have you?"   "How many sisters?"
"How many brothers and sisters in all?" etc.

Seat Exercises.—While in the performance of other duties, you may say to the "C" class, "The 'C' class may take out their slates, *very carefully*." After a little while, when they are all ready, say, "Each one make *three* marks on his slate." (To be made thus, *///*. Perhaps it may be necessary to show them how, by placing groups of marks in various positions on the blackboard, and instructing the pupils to make them in similar positions on their slates.) Again, after a little time, say, "Each member of the 'C' class make *four* marks," etc., etc.

The exercise may be varied by having dots made, instead of marks. Better still, if they know how to make any letter, as *e*, by having them make five *e's*, seven *e's*, etc.

Vary it again by having the pupils open to the pictures on pages 5 and 8, and tell them to make as many marks as they can find dogs. As many as they can find kittens, etc.

Cautions and Suggestions.—Though this (learning to count ten) is called *one* lesson, it will require several days, with several class exercises each day, for pupils who know nothing of counting at the outset, to master it. No class exercise should occupy more than 5 or 10 minutes with this grade of pupils. The *seat exercises* are quite as important as the *class exercises*. BE SURE AND ALWAYS INSPECT THE WORK WHICH THEY ARE REQUIRED TO DO ON THEIR SLATES. See that they do their best, and do not merely scribble. Do not try to teach anything but counting at this time. Defer teaching the characters (figures), and how to make them, till another time. Do not distract their attention with ideas of adding, counting backwards, or subtracting. ONE THING AT A TIME. Nor need any *special* effort be made to give the pupils the *idea* of number. If this idea is not innate, they will get it from the above and kindred exercises. Generally, one form (or at *most two*) of class exercise at a time is enough. So also of a seat exercise. Short, single, clear, pointed, lively— these are the characteristics of a good exercise.

LESSON II.

Purpose.—*To teach the Names and Meaning of the Figures,*

$$1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9$$

Also to review the preceding lesson in connection with this.

Method.—Class Exercise. With the class around the Counting Table and before the teacher's Blackboard, as represented in picture, page 1, make figure / on the board (make a simple, inclined, straight line, not *1*, nor any elaborate form). Then say, "Children, this means *one*." Pointing to it, ask, "What does this mean?" "James, put out as many counters on the table as this means." "Jane, show me as many fingers as this means" (always pointing to the figure when the question is asked).

Again, make the figure 2 (in this simple form), and repeat the questioning as above. Thus, first telling them that it means *two*, ask them, "What does this mean?" "Hold up as many fingers as this means." "Mary, pick up as many counters as this means." So "question back" what you have told them. Do not be in a hurry. Put a great variety of questions, to the class, and to each member of the class. But let each question be directed to the one end of fixing in the mind the fact that the figure 2 means *two*. Do not call the figure by name, but point to it and say, "As many as *this* means."

Now put both 1 and 2 on the board. Pointing to 1, say, "How many does this mean?" "Each show me as many hands as this means." "Each pick up as many counters as this means." In like manner point to 2, and question and exercise the class.

Proceed in like manner with 3. This will be enough for one exercise. (It may be too much for some classes.)

Seat Exercise.—When the time comes for this exercise, without turning aside from other duties, say, "The 'C' class may take

out their slates." Put the figure 2 on the board. Say, "Each make as many marks (dots, e's, m's, a's, see preceding lesson) as this means." In two or three minutes, put the figure 1 on the board and proceed in the same manner. In like manner, after a short interval, put 3 on the board and direct as before.

Be sure and inspect the work after it is done.

A Second Class Exercise will teach the meaning of the figures 4, 5, and 6.

A Second Seat Exercise like the above will give them practice on it.

A Third Class Exercise and

A Third Seat Exercise, both similar to the above, will complete this part of the lesson.

A Fourth Class Exercise will teach them that *The names of the figures are the same as their meaning.*

A Fourth Seat Exercise may be given by telling them to make as many marks (dots, e's, m's, o's, see Lesson I) as figure 5 means. As figure 6, etc.

Cautions and Suggestions.—Do not let the exercises become monotonous. Strive to have the pupils come to them as to something which they enjoy. Requisitions which can be met by *doing something*, will be relished. Thus, "All clap hands 3 times." "All stamp as many times as this" (pointing to a figure). Counting in connection with gymnastic exercises, and the like, will enable you to accomplish several things at once, and aid in keeping up an interest.

The exercises of this lesson have been written out thus in detail to show how minute the subdivisions really need to be made. (See first *Caution* under the last lesson.) Generally, this subdivision will be left to the discretion of the teacher. Some classes will need shorter exercises than others—that is, will be able to take in fewer new ideas.

The *Numeral Frame* is very useful in teaching the meaning of figures. First let the *teacher* move the balls to show how many any given figure represents; subsequently, let the *pupils* do the same.

LESSON III.

Purpose.—*To teach to make the Figures,*

1 2 3 4 5 6 7 8 9 .

Also, to review, in connection with this, the two preceding lessons.

Method.—Take the figures of simplest form first. They will then be taken about in this order—1, 7, 4, 6, 9, 2, 3, 5, 8.

Let the first *Class Exercise* be to teach how to make 1, 7, and 4. "Who can tell me how to make the figure which means *one?*" Place the crayon point on the board, and lead the pupils to say "Mark right down." Make it too long—a foot long—and have them tell you, "It is too long." Make it crooked, and let them correct you. Incline it the wrong way, and let them tell what is the matter with it. Then ask each of them in turn to step to the board and make figure *one.* Call it sometimes "figure one," and sometimes "the figure which means *one.*" Ask frequently, "What is the name of this figure?" "What does it mean?" "Show me as many counters as it means?" "Clap hands as many times as it means," etc.

When a figure has been made on the board by a pupil, let the class notice wherein it is not right, and let those who notice defects try to make a better one. Thus promote a healthful ambition to do good work.

This is an outline of the procedure with every figure. Only a few farther suggestions need be made.

In teaching to make 7, first show the class *seven* objects. Let them count out seven counters, or count seven dots as you make them on the board. Then putting the crayon point on the board, have them tell you how to move it in order to make 7. They will say, "Towards the door, towards the clock," or give other similar directions. Lead them to say, "To the right," "To the left," instead. Marking a little way to the right, ask, "Which way now?" Lead them to notice that the stem is just figure 1.

Treat 4 in the same way. The general directions which the pupils should be led to give for making it, are, "Mark down—to the right—make a stem across the last line."

As you proceed to the more complicated figures, the importance of teaching the pupils to observe carefully each peculiarity of form increases. This will be best done by making the figure wrong in various ways, and telling them to correct, either by telling or by making a better one. Thus, make *+* instead of 4. Make *и*, or *2+*, or *и*, etc.

Much ingenuity will be needed in helping the children to *child-like* descriptions of the forms of the various figures. But be sure and let them tell, in their own way, what the shape is, as far as they can. Their methods will often give you valuable hints.

Making 6, 9, and 2, will constitute a second *Class Exercise.*

The stem of the 6 is bent (curved) to the left. Its back is bent. It turns up at the bottom into a little o at the right. It has a kind of mouth opening to the right, etc. (Children are fond of such conceits.)

Figure 9 is an o with a one for a stem. The stem is on the right. The o is at the top of the stem and on its left.

When the little ones attempt to make these characters for themselves, either on the board or on their slates, you will often have to take hold of their hands and guide them. Manage the exercises so as to give each one a great deal of practice. The purpose is not to teach *how* to make the figures, but to teach the pupils *to make* them; and this can be accomplished only by much practice.

Have the slates brought to the *Counting Table* frequently, for a class exercise, and require the pupils to make the figures on their slates, as *you* make them on the board.

Figure 2 may be described as a hook, *2*, with a foot to it, 2 —the foot running out to the right. The hook bends over to the left.

Making 3, 5, and 8, will constitute a third *Class Exercise.*

Figure 8 may be described as having two mouths opening to the left, or as two half o's one on top of the other. It has a very crooked back. Its back is at the right, etc.

Figure 5 may be described as having a short stem, a hook or

half o, or mouth opening to the left, and a handle or arm running out to the right from the bottom of the stem, etc.

The 8 is an S with a mark running up through it.

The true child's-teacher is fruitful in such comparisons.

Seat Exercises.—Mark off on the blackboard a representation of a slate, and put upon it a row of 1's. Let the pupils make a similar row on their slates. Then put a row of 7's on the picture of a slate, and let the pupils make them on their slates. Let them make several rows of 7's. Then rows of 4's, etc. This will constitute an exercise in *copying* figures, and will need to be continued for several days.
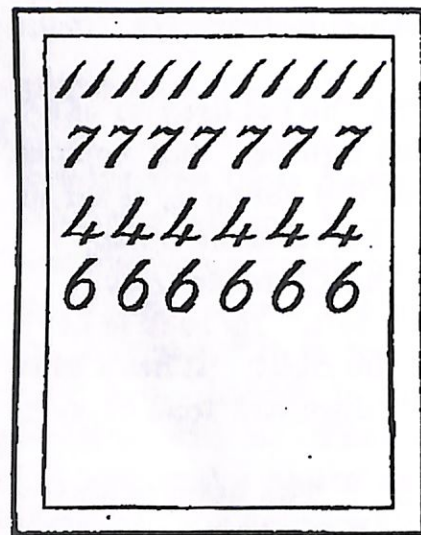
Another *Seat Exercise* may be given thus: Having no figures on the board, tell the class to make a row of 4's, of 2's, of 3's, etc. This is an exercise in remembering the forms of the figures so distinctly as to be able to make them. It will take several exercises.

Still another variety of *Seat Exercise* may be given by presenting objects, marks, dots, letters on the board, or holding up fingers, and telling them to make the figure which means so many.

Let them open their books to the pictures on pages 5, 8, and bid them make the figure which tells how many kittens there are. "Make it five times." "Make the figure which tells how many hats there are." "Make it seven times."

Caution.—Do not attempt to teach them to make anything but the simplest forms of figures. When they are older, and have learned to write, they will modify the style somewhat; but no one makes the more elaborate forms in common work on the slate or blackboard.

LESSON IV.

Purpose.—*To teach to Count from Ten to Nineteen.*

[A review of preceding lessons is *always* to be woven into a new lesson. Not *frequent*, but CONSTANT, reviews, is what we need.]

Method.—To accomplish this purpose will require several days, with several exercises each day. The first class exercise will *begin* the work of teaching to count from ten to fifteen. Move out the counters one by one while the pupils count till you have moved out *ten*. Now, putting another with these, ask, "How many have we now?" Of course, none are expected to know. But arouse their curiosity, create a desire to know, and *then* tell them, "eleven" (not "*leven*"). So proceed to fifteen. Go slowly. Repeat each step several times.

The *Numeral Frame* is exceedingly convenient for this purpose. Sliding all the balls to one side of the frame, move all on the top wire to the other side. Call attention to the fact that there are *ten* in this row. Then, moving out one on the next wire, then two, then three, etc., and requiring the pupils to observe, as you do so, the composition of these numbers is clearly illustrated to the eye.

Let the class name in concert the numbers in order from ten to fifteen, while you beat with the hand. Class beat and count. Call on individuals to count while you beat.

Again, use the counters. Have individuals move them out and count, while the class watches to see if it is done right.

Use the pictures at the close of this lesson. Let the pupils open their books to it. "How many can find the nest?" "How many eggs are there in it?" "How many by the side of the nest?" "How many in all?" "*Ten* and *one* are called what?" "How many fishes *up* in the water in the vase?" "How many on the bottom?" "*Ten* and *four* are called what?" etc., etc.

When they can count to fifteen, call their attention to the fact

that we count from twelve by saying "*thir*-teen," which means *three* and ten (or *three*-teen); "*four*-teen," or four-and-ten, the teen meaning *and-ten; flf*-teen, or *five*-and-ten, etc. Then by means of the counters show them that *thir*-teen is *three*-and-ten, *four*-teen is *four*-and-ten, etc. Do not go beyond fifteen until this idea is clearly perceived by all. Use the subsequent numbers, sixteen to nineteen, as tests. Thus, if they have comprehended the idea, they will be able to tell you what six-and-ten is called, what seven-and-ten, etc. To test the members of the class separately use the pictures below. Repeat the numbers in concert.

You will very naturally speak of these numbers as "the teens." There is no impropriety in it, and it will help to fix them, *as a class*, in the pupils' minds.

Seat Exercises.—"Each make eleven figure 2's." After awhile, "Each make twelve dots." Again, having given time for the former, "Each make thirteen 1's," etc. These directions are to be given without interfering with your other duties, in a quiet manner and low tone, addressed to the "C" class in their seats.

Be sure and inspect their work.
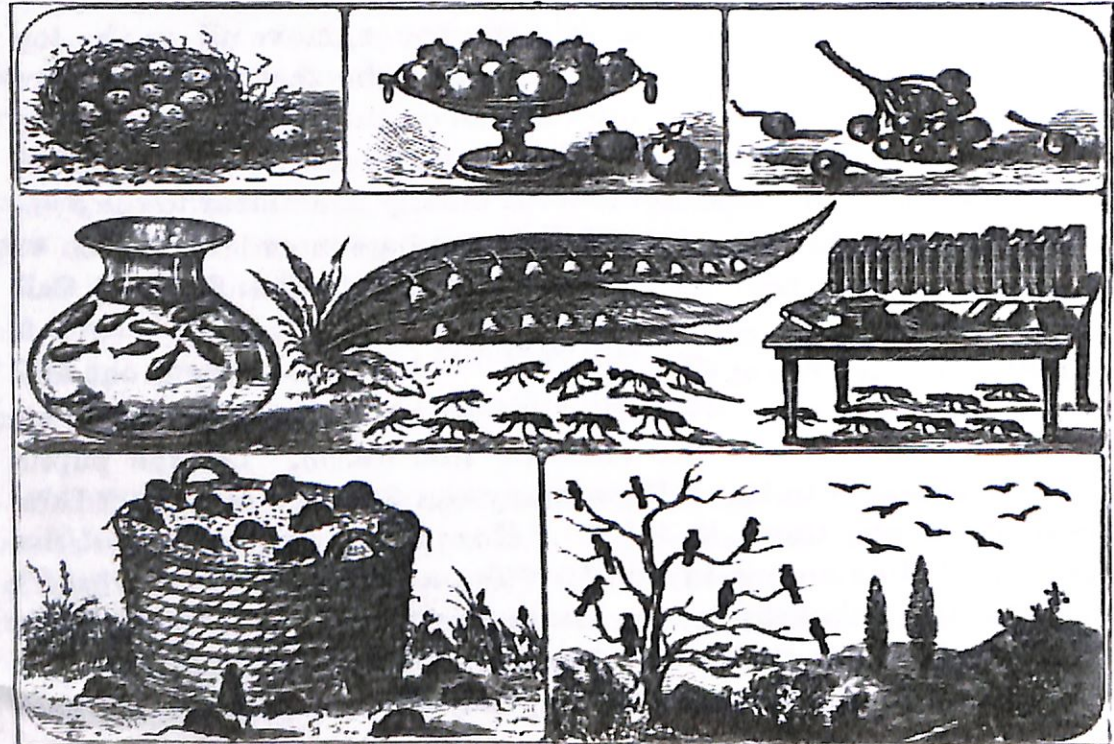
LESSON V.

Purpose.—*To teach to Write the Numbers from Ten to Nineteen.*

Method.—Class Exercise.—Make 0 on the board, telling the class its name, *Cipher*, or *Zero*. Show them the difference between the form of 0 and o.

Having taught the *form* and *name* of this character (you need say nothing of its meaning, or use), let the class count while you make ten marks on the board, thus, / / / / / / / / / /. Write 10 over the marks, and tell them that these figures, so written, mean *ten*. Then, pointing to the figures, ask, "What do 1 and 0 mean when written so?" "How is ten written in figures?" Write the 0 *over* the 1, *under* it, on the left of it, and ask in each case, "Is this ten?" "What figures *do* mean ten?" "How written?" "John, step to the board and write the figures which mean ten." "Mary, write them." "James," etc. Proceed in a similar manner to teach that 11 means eleven; 12, twelve; 13, thirteen.

When they have gone thus far, call attention to the fact that you are just writing the figures 1, 2, 3, 4, 5, etc., in order, after 1. Thus, eleven is written by putting 1 after 1, twelve by putting 2 after 1, thirteen by putting 3 after 1, etc. Illustrate this by writing on the blackboard, thus:

$$0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \ 11 \ 12 \ 13, \text{ etc.}$$

So illustrate and impress the principle, that the pupils can go on from 13 to 19. Such questions as this will aid in this work: "What is the first figure in writing each of the *teens?*" "Well, then, what shall I write first if I wish to write seventeen?" Get the answer from each pupil. "What number am I to write?" (*Seven*-teen.) "What teen?" (*Seven*.) "What, then, shall I write after the 1?"

To enliven the class, call on Mary to take up a handful of counters and lay them in a pile. Let Jane count them, and Henry write the number on the board. Sarah add a handful to Mary's. James count *this* pile. John write the number, etc.

Still another useful exercise will be secured by writing the numbers from 1 to 19 on the board, thus:

0   1   2   3   4   5   6   7   8   9

10 11 12 13 14 15 16 17 18 19 1

and then, as you point to them, promiscuously, let the pupils tell what they mean. Make this also an individual exercise. Name different numbers and call upon pupils to point to the figures on the board.

For another exercise, the pupils may bring their slates to the table and write the numbers as you dictate them.

Seat Exercises.—Dictate numbers to be written on the slates. Write the numbers from 1 to 19 on the board and have them copied. Let the class stand at the long board and write the numbers you name. (Such an exercise should not last more than two or three minutes, and should not interrupt other duties. Thus have the "C" class take places at the long board while the "B" or "A" class is coming out for class exercise. They should return, quietly, at a signal, while other exercises are going forward.)

Make dots, marks, or letters, on the board, and bid them make the figure or figures which mean "so many."

The pictures on page 14 may be used for this purpose, by telling the pupils to make the figures which tell how many eggs there are, when counted together; how many ants, books, mice, etc.

If the pupils in their seats seem restless, have them stand and count in concert. They can count twenty, three or four times in a minute. They may have such an exercise half a dozen times a day.

LESSON VI.

Purpose.—*To teach the Names and Meaning of the Decades, Twenty, Thirty, Forty, etc., to One Hundred.*

Method. — **Class Exercises.** — "Children, if you count the thumbs as fingers, how many fingers has James on both hands?" "James, place your hands side by side on the table" (as in the margin). "Now, how many fingers (including thumbs) are there?" "How many *tens*?" "Now, James, place your hands close together, and Henry, put yours down by the side of James's." (See margin.) "Now, how many *tens* are there?" "How many tens has James?" "How many has Henry?" "How many have both together?" (Two.) "What do we call *two tens*?" (Twenty.)
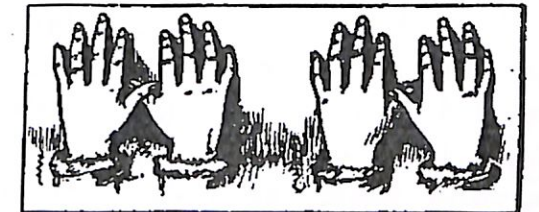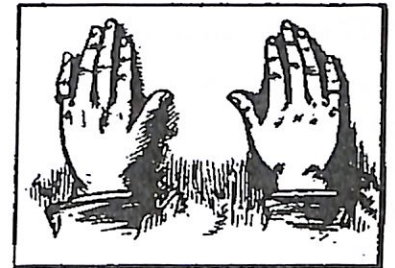
The accompanying cut may be used for this purpose. All having their books open to it, ask, "How many rails in this fence?" "How many birds on one of the top rails?" "Count the birds on
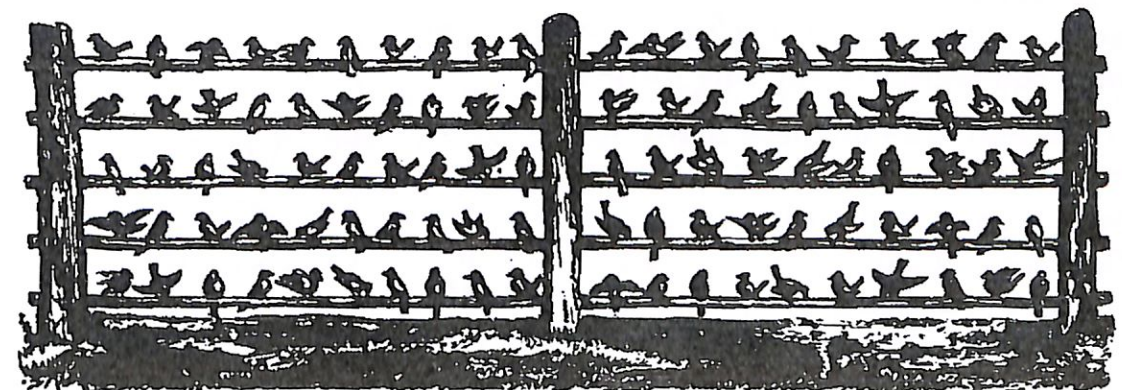
each of the rails?" Lead them to notice that there are *ten* birds on each rail. "Now, on two rails there are how many tens?" "What are two tens called?" etc.

Proceed in like manner to teach what is meant by *Thirty, Forty, Fifty*, etc., to *Ninety.* Repeat these names in concert.

Call attention to the prefixes *Twen* (meaning *two*), *Thir* (three), *For* (four), *Fif* (five), *Six*, etc., and to the *ty* as meaning *tens.* Thus, *Six-ty* means *six*-tens, *Seven-ty* means *seven*-tens, etc.

Have concert exercises like this: "*Twenty*—means *two* tens;" "*Thirty*—means *three* tens;" "*Forty*—means *four* tens;" etc.

Again, let part of the class name the decades, and the other part tell what they mean. Thus, *First Part*, in concert, " Twenty " —*Second Part*, "Means two tens;" *First Part*, " Thirty "—*Second Part*, " Means three tens," etc.

Groups of dots, or marks on the board, ten in a group, may be used to show the meaning of these terms.

Seat Exercises.—"Each make ten marks on your slate and draw a line around them, as I do on the board." "Make another ten right under these, and draw a line around them, as I do." So proceed till they have ten groups of tens. After they have made two or three groups, the single word "Another," spoken by the teacher, will be sufficient direction to keep them at work. The *Numeral Frame* may be used very conveniently for this purpose.

These marks on their slates may be made to afford an excellent *Class Exercise.* Thus, have the pupils bring their slates to the *Counting Table.* "John, rub out ten of Henry's marks." "Henry, rub out *thirty* of your marks." "Mary, rub out *twenty* of Henry's marks." "Henry, how many
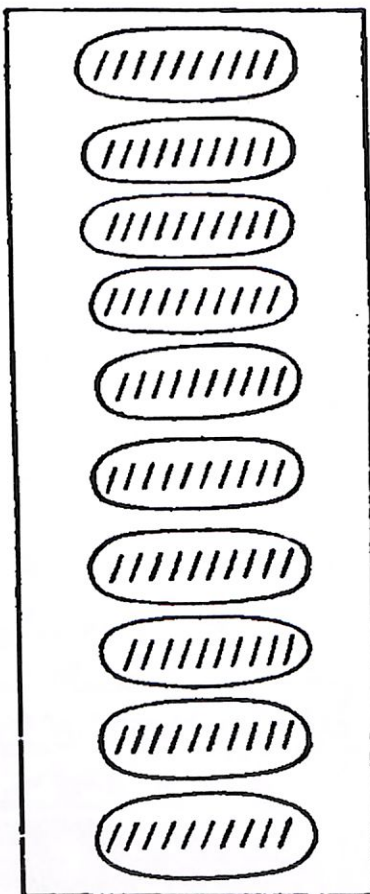
marks have you now?" (This is not for the purpose of teaching Subtraction, but simply to teach what twenty, thirty, forty, etc., mean. Do not ask them how many twenty from sixty leaves, or any such questions. They are out of place here. *Stick to the single purpose.*)

Another *Seat Exercise* may be obtained by having the ten groups of tens made as before, and then telling them to draw a line around twenty, thirty, forty, etc.

———————

LESSON VII.

Purpose.—*To teach to Write the Decades, as,*

10, 20, 30, 40, 50, 60, 70, 80, 90.

Method.—Class Exercises.—Show how ten, twenty, and thirty are written, and then call attention to the fact that each has a 0 (zero) at the right—that ten (*one* ten) has 1 at the left; twenty (*two* tens) has 2 at the left; and that thirty (*three* tens) has 3 at the left. Illustrate this by writing the decades in a column on the blackboard as far as thirty, and lead the pupils to complete the work on their slates.

    0
  10
  20
  30
  etc.

Seat Exercises.—Direct the pupils to make the figures which mean twenty, thirty, forty, etc. Make groups of ten marks each, on the board, as in the preceding cut, and making a mark around two, three, four, or any number of them, say, "Make the figures which mean so many," etc. Slip three tens of the balls on the *Numeral Frame* to one side, and bid them make the figures which mean so many. Then forty, then fifty, etc.

Use the picture on page 17. "Make the figures which tell how many birds there are on two rails." "On three," etc.

LESSON VIII.

Purpose.—*To teach to Count through the Decades.*

Method.—Class Exercises.—Have the pupils count out twenty (two tens) of counters, and place them by themselves. Put another with them, and lead the pupils to tell you that there are "Twenty and one counters." Tell them that we call it "*Twenty-one*," instead of "twenty and one." Put another counter with these, and in like manner lead them to tell you that there are *Twenty-two*, instead of twenty and two. Tell them, "We call so many, *Twenty-two*, instead of twenty and two." Thus lead them to count *through* the *twenties*. Then through the thirties, etc. They should be able to go on of themselves after having been led through two or three decades. The *Numeral Frame* is well adapted to this purpose.

There will be needed much drill in repeating in concert the names of the decades, and in counting *through* them. Many class exercises will need to be devoted mainly to simple drill in oral counting from *one* to one hundred.

Arouse the ambition of the pupils to be able to count one hundred! Test them individually. Give them certificates that they can count to one hundred, when they can do it well. This is one of the greatest mathematical achievements they will ever make! Vary the counting exercise by having one count awhile, then another go on a little further, then another, etc. Also by having them count around the class. Thus, beginning at one end, the first pupil says, "one;" the second, "two;" the third, "three," etc., to one hundred. This should be kept up for a long time, till all are perfectly familiar with the order of the numbers.

Seat Exercises.—"Each make twenty marks." (Two groups of ten each.) "Make enough more so that you will have twenty-three in all." "Enough more to make twenty-five," etc. So of thirty, forty, etc.

"Make three lines of marks clear across your slates" (show them how on the board). "Count them, and tell me how many you have."

Use the picture below. "How many birds?" "Lambs?" etc. Show from the picture that 24 is 2 tens and 4, etc.

LESSON IX.

Purpose.—*To teach to Write in Figures through the Decades.*
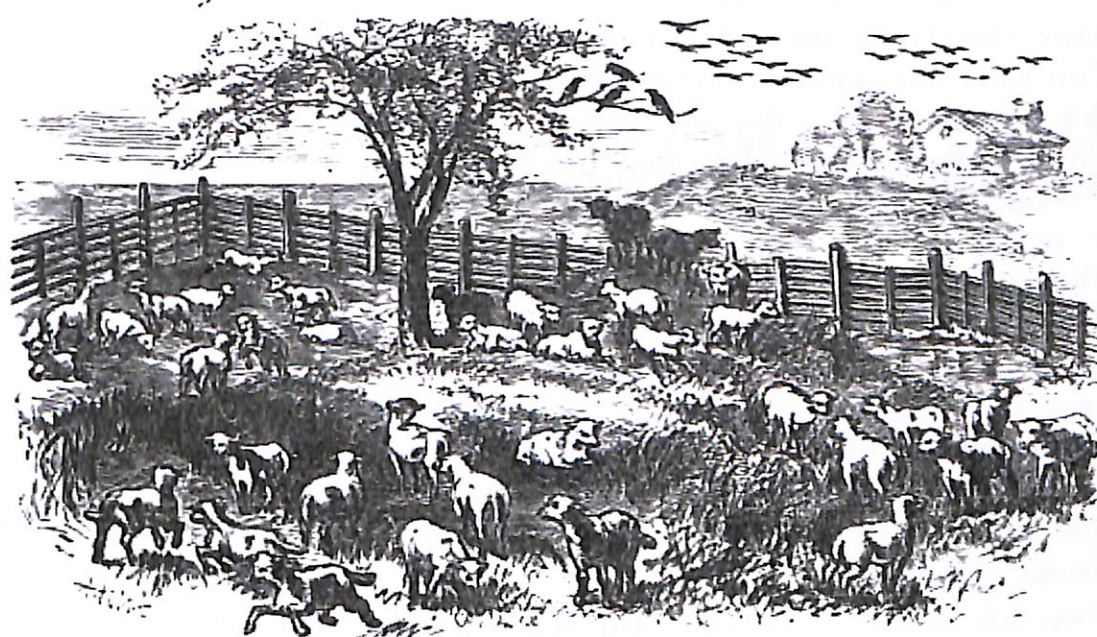
Method.—Class Exercises.—Let one pupil count out ten counters and put them in one pile on the counting-table, and have another count out ten more and place them in a pile near the former. "How many *tens* have we here?" "What do we call *two tens*?" "Tell me how to write twenty in figures, on the board." "John, what shall I write first?" "Jane, what next?"

Now put the two piles of tens together and lead the pupils to say that there are twenty in the pile. Then put a single counter near them, and ask, "How many have we here in all?" "Twenty and one are called how many?" "What comes next after twenty?"

Then calling attention to the 20 on the board, tell them that the 2, in the second place from the right, means so many (two) *tens,* and that whatever stands in the first place at the right means *so many more.** Rub out the 0 and put 1 in its place, thus, 21. "How many does the 2 mean?" "Why does the two mean two-tens, or twenty?" (Because it stands in the second place from the right.) "What does this mean?" (pointing to the 1.) "Twenty and one we call what?" Then write 25, and proceed in like manner. Then 27, etc. (Do not use 22 until the *idea* is fixed. The two 2's may trouble them.) Practice upon this until each pupil clearly perceives the principle, and has it fixed in the mind. You need not confine yourself to the twenties in doing this, nor to the numbers in order; it will be better that you should not. Thus, write 57. "What does the 5 mean?" (Five tens, or fifty.) "What this?" (pointing to the 7.) "What do we call fifty and seven?" "Then what does this mean?" (pointing to the 57.) Then take 43, 65, 72, or any of the numbers.

Whether the fact that in 10, 20, 30, 40, etc., the 0 *is good for nothing but to keep the place,* should be taught or not, will depend upon the ability of the class. I think it can usually be done to advantage. Thus, write 5. "What does this mean?" Put 0 by the right side of it. "What does the 5 mean *now?*" Show them that the 0 helps the 5 to mean fifty, by showing that it is in the second place. *It does nothing else.* Now write 5 again. "What does this mean?" (Five.) Put 3 at its right; thus, 53. "What does the 5 mean now?" "What helps it to mean fifty?" "Does the 3 do anything but help the 5?" *It* does something by itself. It means *three.* In this manner teach that 0 only serves to keep the place, and show that the other figure is in the second place, while any other figure will keep the place and do something else.

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* This form of speech is given as that which the teacher will naturally use, and which she will make clear by her manner.

If these *principles* have been properly taught, the pupils can now tell you how to write any number in any decade. Test them on this point, as a means of determining when your work is well done. Thus, "I want to write forty-five." "How many?" (Class say "forty-five.") "How many tens?" "How many more?" "What shall I write to mean the tens?" "How many more do I want to write?" "Where shall I write the 4?" etc. This drill must be kept up exercise after exercise, day after day, till all can write any number up to 99, readily.

Illustrate the writing of numbers through the decades by writing them on the board in this form:

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34, etc.					

Let the pupils copy this arrangement and carry it forward to 99. Drill them in reading the numbers across the page, and also down the columns.

The single statement that 100 means ten tens, or one hundred, will be enough on this point, if it is illustrated and dwelt upon till the pupils know it.

Seat Exercises.—These will be easily devised. "Each write twenty-six." "Each write fifty-seven." (They will understand what is meant without saying "the figures which mean," etc. although this full form of expression should be kept up till the thought conveyed is fixed in mind.)

"Write fifty-eight three times." "Write sixty-three." "Write seventy-one under the sixty-three," etc., etc.

Use the pictures, having the pupils count the various objects, and write the number in figures. Thus, on page 14, "Count the fishes, the ants, and the lilies of the valley, and write the number." Such a demand as this will require several minutes for its execution, and you should by no means fail to examine the results. Do not forget that it is a great work for the little ones.

Now have an exercise in "finding the page" in their books. "All turn to page thirty-seven." Require them to hold up their books so that you can see from your desk that they have found the right page. "All find page fifty-three." "Show it to me," etc., etc. Drill on this till all can turn quickly to any page you may name.

LESSON X.

Purpose. — *To teach the Ordinals, or how to Number.*

Method. — This may be done by having the class number around. Thus, one at one end says "first;" the next, "second;" the next, "third," etc.

It will not be best to make this an entire exercise, but spend a little time upon it, and the rest of the time on review exercises in counting, writing, and recognizing numbers.

Make figures thus on the board, *beginning at the right,*

$$9 \quad 8 \quad 2 \quad 3 \quad 4 \quad 6 \quad 7 \quad 5 \quad 4$$

"Which figure did I make *first?*" "Which, *second?*" "Which, *third,*" etc.

Let it be understood that you expect them to number from the right, and then ask, "What is the *fourth* figure?" "What the *seventh?*" etc.

Seat Exercise. — "Find the *twenty-first* page." "The seventeenth," etc.

This lesson will require several days, and but few of the ordinals should be attempted at a time. Perhaps for the first exercise from "first" to "tenth."

It is not imperative that the numbering should be carried to one hundredth, at present; perhaps to thirtieth, will be far enough before going on to other lessons. But if they see clearly the principle they may be able to go to one hundredth without difficulty.

SECTION II.
ADDITION.

LESSON I.

Class Exercises.

Purpose. — *To teach how to find out the sum of any two numbers between one and nine.*

* This lesson is not, strictly speaking, a lesson in Addition; —it is a lesson in Counting, and is preparatory to Addition. Addition and counting are not the same thing. The arithmetical process which we call Addition is a method of finding the sum of numbers by means of a knowledge of the sums of the digits two and two, *i. e.*, by means of a knowledge of the *Addition Table.* Hence, as preparatory to Addition, the pupil needs—

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* The paragraphs in small type are exclusively for the *Teacher's* use. Those in the larger type are for the children to study at their seats.

1. *To learn to make the Addition Table;* and
2. *To commit this table to memory.*

Having done this he is ready to learn Addition proper.

The *only* way in which the pupil can find out, in the first instance, what is the sum of any two numbers, as 4 and 5, is by taking one number and counting on the other. *But this is not addition.* When the pupil has in this way learned the meaning of the Addition Table, and can make it readily, he is prepared to commit it to memory. This is the second step : and not until the table is thoroughly learned, is the pupil prepared to enter upon Addition. It is just at this point that all the difficulty in teaching Addition occurs. The pupil is allowed to attempt adding before he is familiar with this table; hence he necessarily falls into the habit of counting. But if he is not allowed to enter upon Addition proper (Lesson III.) until he can tell *with perfect ease* the sum of any two digits, *at sight,* there will be no trouble arising from a propensity to count. This propensity arises solely from an imperfect knowledge of the Addition Table.

We now proceed to exhibit in detail some methods of conducting class exercises for the purpose designated at the head of this lesson.

Have the class count while you place *four* counters in one pile, and three counters in another pile near the first. "How many are there in this pile?" (pointing to the *four.*) "How many there are in this pile?" (pointing to the *three.*) "Now, who can tell how many there are in both piles?" Of course it is not expected that any one can. *But arouse the desire to find out.* Then show them how, by beginning with the four, and counting on the three, they can find out how many there are in both piles. Thus, ask, "How many are there here?" (pointing to the four.) Move one of the three up to the four. "How many now?" Move up another. "How many now?" The other. "How many now?" "Now we have put the three with the four." "How many are four and three together?"

Again, place 5 in one pile and 6 in another, and teach them *how to find out,* by counting, how many 5 and 6 put together make.
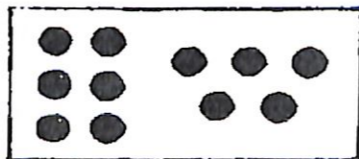
Also lead them to determine how many 5 and 6 make by placing the counters in each collection so that they can be counted without being moved.

The *Numeral Frame* may also be used for our present purpose. Thus, holding it up before the class, let the pupils count out 5 balls as you move them to one side on the upper wire. Then count out 4 on the second wire, moving them under the five. "How many balls have we here?" (pointing to the 5.) "How many have we here?" (pointing to the 4.) "How many in all?" "How many are 5 and 4?"

Again, propose the question, "How many are 5 and 3?" and let the pupils work out the answer by moving the balls. So, also, address such questions as the following to *individuals,* and let them find out the answers by moving the balls: "How many are 4 and 2?" "How many are 7 and 3?" etc.

Counting by 2's, 3's, 4's, etc., is a very useful exercise for many purposes, especially as it furnishes such a variety of systematic exercises in a convenient form for drill. But let the exercise be restricted to the single purpose had in view at the time ; our present object is *to teach to make the Addition Table.* For this purpose, as well as for the purpose of fixing the table in memory, it is not legitimate to carry this form of counting beyond those steps which require the combination of *single digits;* for example, in counting by 2's we shall have these combinations, 2, 4, 6, 8, 10 ; 1, 3, 5, 7, 9, 11 ; and *no more.* Counting by 3's we shall have 3, 6, 9, 12 ; 1, 4, 7, 10 ; 2, 5, 8, 11 ; and *no more.* After the pupils comprehend the *order,* these combinations can be assigned as *seat exercises ;* for example, tell them to write on their slates the numbers as they count by 4, first beginning with 1. These results will be written thus :

$$1, \ 5, \ 9, \ 13.$$

Again count by 4's beginning with 2, and write the results. These will be 2, 6, 10.

The several exercises thus outlined will be distributed through a number of days, *only one being used at a time,* and this repeated till it is familiar before passing to another.

Do not attempt, at this time, to have them *remember* how many any combination makes. The present purpose is merely to learn *how to find out* what 4 and 3, 5 and 6, etc., make. In this first exercise do not take either the smallest or the largest numbers.

Give them sufficient practice so that they can study the following seat exercise. Write the figures 4, 3, 5, 2, 1 on the board, with the corresponding words printed under them, thus,

4   3   5   2   1
Four.   Three.   Five.   Two.   One.

If the pupils do not know all these words, they should be taught them, or at least be shown how to find out what they are by looking at the board.

Seat Exercise.

1. How many birds are on the box?
2. How many birds are in the tree?
3. How many birds in all?
4. How many birds are four birds and three birds?

5. How many birds are on the barn?
6. How many birds are flying to the barn?
7. How many birds in all?
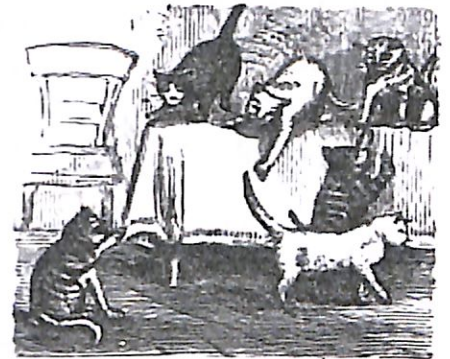8. How many birds are five birds and three birds?

9. How many cats are on the table?
10. How many cats are on the floor by the table?
11. How many cats in all?
12. How many cats are three cats and three cats?

13. How many boys are at play under the tree?
14. How many girls are at play under the tree?
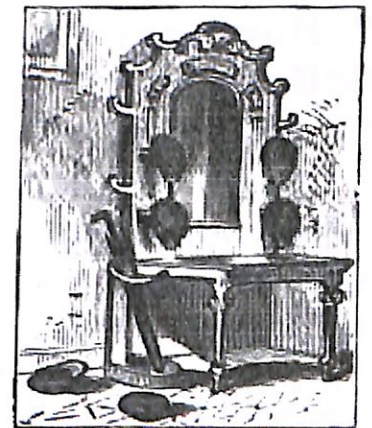15. How many boys and girls in all?
16. How many are 2 boys and 3 girls?
17. How many caps are hung up?
18. How many caps are on the floor?
19. How many caps are there in all?
20. How many caps are 4 caps and 2 caps?

Recitation and Class Exercise.

We are now to have our first *Recitation*.

With books in hand, let the pupils read the questions in the preceding *Seat Exercise*, and give the answers. They are not ex-

pected to have learned the combinations, as how many 4 and 3 make, but only *how to find out by counting*, as above explained. Give time to do this in the recitation. To give variety, let one read a question and another answer it. But, *do not go round in order.* Say, "*All* read the first question, silently." Give time. "Jane, read it aloud." "John, answer it." Thus, letting no one know who is to read, or who is to answer, keep all in readiness.

When they have had a fair opportunity to show that they studied the lesson well, give them a new exercise.

Give them sufficient practice to enable them to find out the answers to the following, while in their seats, *and write the answers in order on their slates, while in their seats.*

Seat Exercise.

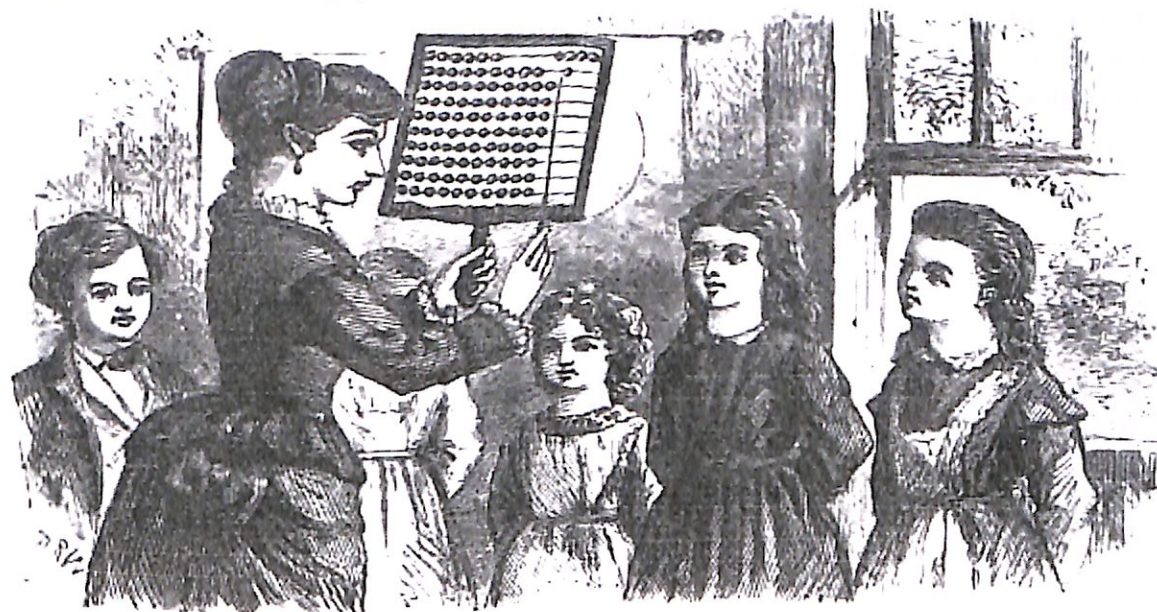|	
1. How many are 4 and 3 ?	9. How many are 7 and 6 ?
2. How many are 3 and 6 ?	10. How many are 8 and 5 ?
3. How many are 2 and 3 ?	11. How many are 6 and 1 ?
4. How many are 5 and 1 ?	12. How many are 9 and 2 ?
5. How many are 4 and 1 ?	13. How many are 8 and 3 ?
6. How many are 3 and 1 ?	14. How many are 7 and 9 ?
7. How many are 2 and 7 ?	15. How many are 6 and 7 ?
8. How many are 6 and 8 ?	16. How many are 7 and 8 ?

Recitation and Class Exercise.

First, the pupils having brought their books, and their slates with the answers in order on them, read the questions to them, and let them give the answers as they have them on their slates. Let several pupils give the answer which they have to each problem, as it is called for. If they do not agree, have the class find out which is right. It may take several exercises to get them all to write their answers in good order on their slates; but the effort should be repeated and persisted in until they do it.

Second, having gone through with all the questions, and given all the pupils a full opportunity to exhibit their work, give a *new*

exercise. Let this be to teach them how to use marks like / / / /, and the balls on the Numeral Frame, for the purpose of finding out what the sum of two numbers is. (See page 27.)

The following exercise is to be studied by the pupils in their seats, and the answers written in order on their slates in the same manner as the last.

Seat Exercise.

1. How many are 5 and 9 ?	8. How many are 2 and 9 ?
2. How many are 6 and 1 ?	9. How many are 1 and 1 ?
3. How many are 7 and 4 ?	10. How many are 2 and 1 ?
4. How many are 4 and 9 ?	11. How many are 5 and 6 ?
5. How many are 5 and 2 ?	12. How many are 8 and 7 ?
6. How many are 8 and 9 ?	13. How many are 3 and 9 ?
7. How many are 3 and 7 ?	14. How many are 1 and 8 ?

Recitation and Class Exercise.

The recitation will be similar to the last, the design being to satisfy yourself that the pupils have done the work well, which

was assigned them to do in their seats, and to make them feel that you notice and appreciate their efforts.

For a *New Class Exercise* teach them that + means the same as "and," and =, the same as "make," or "are." Write on the board $4 + 5 = 9$, $6 + 4 = 10$, and similar expressions, and teach them to read them "4 and 5 are 9," "6 and 4 are 10," etc. Then give them what instruction they may need to enable them to copy the next seat exercises upon their slates, and to determine the answers by counting, with or without objects, and to fill out the expressions.

Seat Exercise.

$3 + 5 =$	$8 + 9 =$	$7 + 4 =$	$3 + 7 =$
$2 + 3 =$	$7 + 6 =$	$6 + 9 =$	$0 + 0 =$
$6 + 4 =$	$3 + 1 =$	$8 + 8 =$	$2 + 0 =$
$7 + 1 =$	$4 + 1 =$	$6 + 6 =$	$3 + 5 =$
$5 + 6 =$	$8 + 3 =$	$4 + 0 =$	$9 + 4 =$

Recitation and Class Exercise.

Examine the pupils' slates to see that the work is done neatly. Question them thus: "6 and 4 are how many?" "7 and 6?" etc. When a question is asked, have *all* look up the answer on their slates, and then call on some one to answer, allowing the others to correct the reply, if wrong.

For a new exercise, show them *how to make the Addition Table*, as indicated in the following exercise. Their slates are to be ruled, and the table copied and filled out.

Let it be borne in mind that it is *ability to find out by counting*, what the sum of any two numbers each expressed by a single figure is, that we are seeking to secure. We are not now requiring the pupils to *memorize*, but to *make* the Addition Table. swers by counting, with or without objects, and to fill out the expressions.

Seat Exercise.

$1 + 1 =$	$1 + 2 =$	$1 + 3 =$
$2 + 1 =$	$2 + 2 =$	$2 + 3 =$
$3 + 1 =$	$3 + 2 =$	$3 + 3 =$
$4 + 1 =$	$4 + 2 =$	
$5 + 1 =$	$5 + 2 =$	
$6 + 1 =$	$6 + 2 =$	
$7 + 1 =$	$7 + 2 =$	
$8 + 1 =$	$8 + 2 =$	
$9 + 1 =$	$9 + 2 =$	
$1 + 4 =$	$1 + 5 =$	$1 + 6 =$
$2 + 4 =$	$2 + 5 =$	$2 + 6 =$
$3 + 4 =$	3	
4		
5		
6		
7		
8		
9		
$1 + 7 =$	$1 + 8 =$	$1 + 9 =$

Encourage the pupils to make a neat *Addition Table* on paper, at home, and bring you a copy to keep.

To make, and thoroughly to memorize this table is a great achievement. Let the pupils know that their teacher thinks they are doing "great things."

Recitation and Class Exercise.

Making the above table will afford three or more seat exercises. Each part should be made several times over, until all can be made with ease. The class exercises will be similar to that suggested last. Remember that the present purpose is *to learn how to find out* what these combinations are. The next lesson will be devoted to fixing them in memory.

A good class exercise can be obtained by writing a series of combinations on the board, thus :

$$3 + 2 =$$
$$2 + 4 =$$
$$1 + 5 =$$
$$6 + 3 =$$
$$8 + 5 =$$
etc. ;

and as you point to any combination, let the pupils raise their hands as soon as they can tell what it makes. Then call on individuals to answer.

Seat Exercise.

1. A boy has three apples and a girl gives him five more. How many has he then?

2. Frank has 2 tops and George has 3. How many have they both?

3. There are 3 birds on one tree and 8 birds on another. How many birds are there on both trees?

4. Ann has seven flowers and George gives her six more. How many has she then?

5. There are 5 books on the chair and 8 on the table. How many books are there in all?

6. There are 4 chickens in the barn and 7 in the yard. How many chickens are there in all?

7. There are 5 eggs in one nest and 7 in the other. How many eggs in both nests?

8. If the black cat has four kittens and the white cat has six, how many kittens have both?

9. How many letters are there in the word ground? How many in the word white? How many in both words? How many are six and five?

10. How many letters are there in the word teacher? How many in the word boy? How many in both words? How many are 7 and 3?

[See first Recitation and Class Exercise for method in this case.]
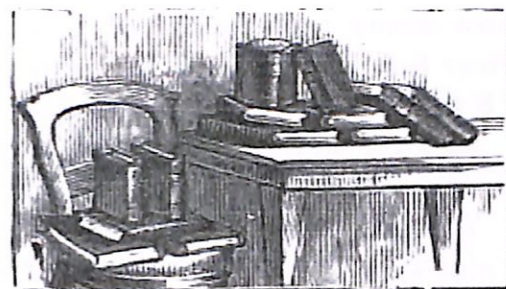
LESSON II.

Purpose.—*To fix the Addition Table in the memory, so that the pupil can tell the sum of any two numbers between 1 and 9 with readiness.*

Class Exercise.

Show them, by the use of the counters or other objects, that 3 and 2 are the same as 2 and 3; 5 and 4, as 4 and 5, etc.

"If you have three nuts in your left hand and 5 in your right,

how many nuts have you in all?" "If you change and take 5 in your left hand and 3 in your right, how many have you then?" "3 and 5 are the same as what?"

Be sure that this is understood and fixed in mind. It diminishes the work of learning the addition table one-half.

When this principle is well learned, drill them in concert on the 1's of the Addition Table. Thus, have them all say, "1 and 1 are 2," "2 and 1 are 3," "3 and 1 are 4," etc.

Again, write on the board such examples as these:

1	1	1	1	1	1	6	1	7	1	8
3	5	4	1	2	6	1	7	1	8	1

Then, as you point to the example, ask, "How many are 3 and 1?" Tell them, "We will write the answer right under the line." Having done it, proceed in like manner with the rest.

Show them how to perform the following exercise, by copying it on their slates and writing in the answers. Each of the nine following exercises are to be thus copied and filled out, and the FIRST COLUMN IN EACH THOROUGHLY MEMORIZED.

Seat Exercise.

1 + 1 =	2 + 1 =	6 + 1 =	1 + = 8
2 + 1 =	1 + 2 =	1 + 6 =	1 + = 9
3 + 1 =	3 + 1 =	7 + 1 =	1 + = 7
4 + 1 =	1 + 3 =	1 + 7 =	1 + = 6
5 + 1 =	4 + 1 =	8 + 1 =	1 + = 4
6 + 1 =	1 + 4 =	1 + 8 =	1 + = 3
7 + 1 =	5 + 1 =	9 + 1 =	1 + = 10
8 + 1 =	6 + 1 =	1 + 9 =	1 + = 2
9 + 1 =	1 + 0 =	0 + 1 =	1 + = 5

1. George has three pigs and Frank has one pig. How many pigs have both?

2. Mary has 1 chicken and Jane has 7 chickens. How many chickens have both?

3. One and 3 are how many?

4. One and what make four?

5. Three and what make four?

6. Five and one are how many?

7. Five and what make six?

8. One and what make six?

9. Mary has 4 flowers. How many more must she get to have five?

10. George has 1 top. How many more must he get to have 4?

1	1	2	1	3	1	4	1	5	1	6	1	7	1	8	1	9
1	2	1	3	1	4	1	5	1	6	1	7	1	8	1	9	1

Recitation and Class Exercise.

First, EXAMINE THE PUPILS' WORK.

Have the pupils repeat the "ones column" (the left-hand one) down and up, by having the first pupil say, "One and one are

two ;" the second, "Two and one are three ;" and so on around the class. Then say it backwards in the same manner.

Then vary the exercise by having one say, "Nine and one are ten ;" and the next, "One and nine are ten ;" etc.

Dictate the second and third columns, and have the pupils answer. Thus, say, "1 and 2 are ——?" and when all have thought, name some one to answer. So of the others.

Again, have the pupils read the fourth column, supplying the answers as they read.

Give the necessary instruction to enable the pupils to prepare the next lesson. This and the subsequent exercises of this lesson are to be copied on the slates and treated as the last. The same general plan of recitation will be pursued in each of the eight following exercises.

In talking with the class about these exercises as they come to them, show them that 1 + 2, in the 2's column, 1 + 3, and 2 + 3, in the 3's column, etc., have been previously learned.

The teacher needs to bear in mind that ability to *add by sight* is quite as important as ability to add by *sound*, and adapt the drill exercises to the fact. Again, a fundamental purpose in these exercises is *to teach the component parts of the numbers from 2 to 18, so that they will be instantly recognized.*

Seat Exercise.

2 + 2 =	1 + 2 =	6 + 2 =	2 + = 4
3 + 2 =	2 + 1 =	2 + 6 =	2 + = 6
4 + 2 =	2 + 2 =	7 + 2 =	2 + = 8
5 + 2 =	3 + 2 =	2 + 7 =	2 + = 5
6 + 2 =	2 + 3 =	8 + 2 =	2 + = 10
7 + 2 =	4 + 2 =	2 + 8 =	2 + = 10
8 + 2 =	2 + 4 =	9 + 2 =	2 + = 3
9 + 2 =	5 + 2 =	2 + 9 =	2 + = 7
	2 + 5 =	0 + 2 =	2 + = 9

1. Ann has 8 flowers and George has 2. How many have both? If Ann has 2 and George 8, how many have both?

2. Frank has 2 hens and George has 6. How many have both? If Frank has 6 and George 2, how many have both?

3. Two white pigs and four black pigs are how many? Four white pigs and 2 black ones are how many?

4. Two and three are how many?

5. Two and what make five?

6. Three and what make five?

7. Eight and two make how many?

8. Eight and what make 10?

9. Two and what make 10?

10. There are 3 eggs in the nest. How many more must the hen lay to make 5?

11. If James has learned 6 words, how many more must he learn to know 8?
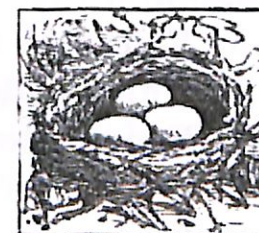
1	2	2	2	3	2	4	2	5	2	6	2	7	2	8	2	9
2	1	2	3	2	4	2	5	2	6	2	7	2	8	2	9	2

Seat Exercise.

	$1 + 3 =$	$6 + 3 =$	$3 + = 8$

$3 + 3 =$

$4 + 3 =$

$5 + 3 =$

$6 + 3 =$

$7 + 3 =$

$8 + 3 =$

$9 + 3 =$

$1 + 3 =$
$3 + 1 =$
$2 + 3 =$
$3 + 2 =$
$3 + 3 =$
$4 + 3 =$
$3 + 4 =$
$5 + 3 =$
$3 + 5 =$

$6 + 3 =$
$3 + 6 =$
$7 + 3 =$
$3 + 7 =$
$8 + 3 =$
$3 + 8 =$
$9 + 3 =$
$3 + 9 =$
$0 + 3 =$

$3 + = 8$
$3 + = 9$
$3 + = 7$
$3 + = 11$
$3 + = 10$
$3 + = 12$
$3 + = 4$
$3 + = 5$
$3 + = 6$

1. George has 7 books and Mary has 3. How many have both?

2. There are five lambs in one field and three in another. How many are there in both fields?

3. If there are 9 cows in one field and 3 cows in another, how many are there in both fields?

4. Eight eggs in the nest and three in your hand, make how many eggs?

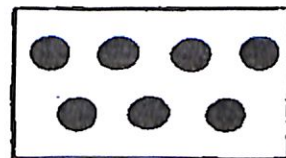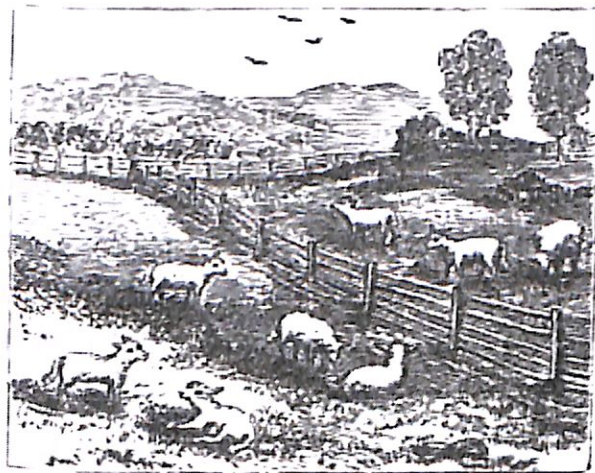5. Four and three are how many?

6. Three and what make seven?

7. Four and what make seven?

8. Five and four are how many?

9. Five and what make nine?

10. Four and what make nine?

11. Four and eight are how many?

Seat Exercise.

$4 + 4 =$

$5 + 4 =$

$6 + 4 =$

$7 + 4 =$

$8 + 4 =$

$9 + 4 =$

$1 + 4 =$
$4 + 1 =$
$2 + 4 =$
$4 + 2 =$
$3 + 4 =$
$4 + 3 =$
$4 + 4 =$
$5 + 4 =$
$4 + 5 =$

$6 + 4 =$
$4 + 6 =$
$7 + 4 =$
$4 + 7 =$
$8 + 4 =$
$4 + 8 =$
$9 + 4 =$
$4 + 9 =$
$0 + 4 =$

$4 + = 6$
$4 + = 7$
$4 + = 9$
$4 + = 12$
$4 + = 5$
$4 + = 10$
$4 + = 8$
$4 + = 13$
$4 + = 11$

1. Four girls and five girls are how many girls?

2. Five boys and four boys are how many boys?

3. Nine pigs and four pigs are how many?

4. There are 7 sheep in one field and 4 in another. How many are there in both?

5. How many letters are there in the word George? How many in the word read? How many letters in both words?

6. George has 4 tops. How many more must he get to have 6? How many to have 9?

7. Mary has 3 flowers. How many more must she get to have 7?

8. Jane has 7 chickens. How many more must she get to have 11?

9. One day the hen's nest had 9 eggs in it. On another day it had 13. How many new eggs had been laid in it?

1	4	2	4	3	4	4	5	4	6	4	7	4	8	4	9	4
4	1	4	2	4	3	4	4	5	4	6	4	7	4	8	4	9