It would seem a fine thing if every teacher of geometry in the high schools could become familiar with such methods; very few of them have had the chance.

For years the colleges have given plenty of courses which are helpful to a teacher of algebra or trigonometry but usually the high school graduate after he has gotten his A. B. or B. S. goes back to teach geometry in the high school and has not had a single course in college which would help him to teach geometry.

Within the last few years, however, a new book of geometry has appeared. This book opens a new field in geometry, in which the geometry of the triangle with a number of new and beautiful theorems is treated by the methods of Euclidian geometry, and with the appearance of this text, a number of the leading colleges in the country have put in courses in geometry based on it.

Try this once. In a circle of centre O inscribe a triangle ABC.

From A draw the altitude AD
From B draw the altitude BE
From C draw the altitude CF

These three altitudes meet at H. Take the middle point of HO and call it N. With N as centre and ND as radius draw a circle. This circle will pass through D, E, and F, the feet of the altitudes, it will pass through the middle points of the three sides of the triangle, and will pass through the mid points of the lines joining A, B, and C to H. This circle is called nine point circle of the triangle. Prove this by ordinary plain geometry.

N. B.—This article is not written to advertise a textbook, hence the title and author of the text referred to is not mentioned, but if any one who reads this will send a self-addressed stamped envelope, the writer will be glad to send the title, author and publisher.

H. A. Converse

Bob: "Daddy, what is a Board of Education?"

Father: "Well, son, when I was going to school it was a pine shingle."

ELECTRICITY: A UNIT FOR GENERAL SCIENCE

IN JUNIOR high school general science the class is being introduced to the whole field of science for the first time, so the different topics cannot be taken up in detail. It is therefore necessary to choose for each unit certain fundamental principles which when thoroughly learned will be of use to the child throughout his whole career of science study. These principles should also be of value to the child who goes no further in science. The eight principles of this unit in electricity, chosen with these points in mind, follow:

1. Electricity is produced by rubbing or friction.
2. Electricity can be produced through chemical action.
3. Electricity can be produced through the use of magnets.
4. Electricity is of two kinds, positive and negative.
5. Electricity to be of value must have a complete circuit.
6. Some substances are conductors of electricity and some are non-conductors of electricity.
7. Resistance to electricity produces heat.
8. Many modern electrical devices are based on the above principles.

On the day that the topic is introduced to the class, a complete assignment, or worksheet, is placed in the hands of the class. Each principle on this worksheet is printed in capital letters, so that the child realizes its importance. Under each principle there are a number of jobs, each focusing directly upon the principle. The child does these jobs to learn the principle. The more difficult experiments are performed by the teacher, and a class discussion runs along to supplement the work. The child is required to master the required jobs in order to make a passing grade; he may further raise his grade through the mastery

of optional jobs. Each pupil may work at his own rate, but no pupil is allowed to begin working on a new principle until he gets the O. K. of the teacher on the one just completed. The pupils are encouraged to do optional jobs, each choosing the ones that interest him most. In making up the final grade for the child, the number of jobs completed is considered, as well as the quality of the work done. The assignment or worksheet for this unit follows:

WORK SHEET FOR ELECTRICITY

I. ELECTRICITY IS PRODUCED BY RUBBING OR FRICTION

What to do to prove this fact

1. Rub a fountain pen briskly on a piece of woolen cloth, and hold it near some tiny scraps of paper.

   What happens? Why?

   What produced the force that picked up the pieces of paper?

2. Rub a dry, warm tumbler with a piece of silk, also dry and warm. Hold the tumbler over scraps of paper. Notice what happens to the scraps of paper, and give the reason why this happens.

3. Rub a black comb with a piece of cloth, and hold it near small pieces of tissue paper, tinfoil, silk, or feathers.

   Compare the amount of attraction that the comb has for each. Why does each thing behave just as it does?

*4. Whittle a cork in a bottle to a point, and balance a silver spoon on the point. Rub sealing wax with silk, and hold near one end of the spoon.

   How did the spoon behave toward the sealing wax? Why was this?

   What makes your hair crackle when combing it on a cold morning?

   What are the sparks that fly from the cat's fur when you stroke it in the dark?

   Why will a silk dress sometimes crackle when you remove it from your body?

   What is the difference between this kind of electricity and magnetism?

5. Write a summary sentence telling how you have produced electricity in all of the above experiments.

*Indicates optional jobs.

II. ELECTRICITY CAN BE PRODUCED THROUGH CHEMICAL ACTION

What to do to prove this fact

1. Take a beaker, a strip of zinc, and a strip of copper. Make a small hole in one end of each strip, so that a wire may be attached. Bend the end with the hole so that it will hang on the rim of the beaker. Make a solution of sulphuric acid, using one part of acid to ten parts of water. Pour into beaker. Fasten the tops of the strips together, and place in solution. Connect one strip by a wire to one binding post of an electric bell. See whether the bell will ring. Connect other strip to other binding post of bell. See whether the bell will ring.

   Why did the bell ring when both wires were connected but not when one wire was connected?

   What takes place in the beaker when you put the copper and zinc into the solution?

   Which way do the bubbles travel through the solution?

   Where do the bubbles collect?

   What passes through the copper wire?

   Which way does the current of electricity flow?

   Which is the positive electrode of the cell?

   Which is the negative electrode of the cell?

   What do you think will eventually happen to the zinc?

   Why will a cell of this kind become useless in a few minutes?

What would you do to recharge a cell of this kind?

2. Write up the experiment according to the regular form.

3. This cell was invented by Volta. Write a summary paragraph in your notebook telling about Volta and the value of his invention.

*4. Take an old dry cell apart to learn how it is made and how it works. Take off the pasteboard box. Find the zinc can.

Find the brass binding post of the zinc can. Find the binding post of the carbon rod. Notice the black layer of black pitch between the carbon rod and the zinc can. Take out pitch and layer of sand under it. Cut open the zinc can. Find the black mixture under it. Find the layer of blotting paper.

Why was paper used for the first layer of the dry cell?

In what kind of condition did you find the zinc can? Why?

Which electrode of the cell is the carbon rod?

Which electrode of the cell is the zine can?

From which electrode do you think the current passes?

What is the use of the pitch to the cell?

Why is moisture found in a dry cell?

Why does a dry cell produce electricity?

How could a cell of this kind be recharged?

Why is a cell of this kind not ordinarily recharged?

5. Draw a cross section diagram of the dry cell, labeling each part represented.

6. Connect three dry cells in series. Connect the negative electrode of one cell to the positive electrode of the second cell, and the negative electrode of the second cell to the positive electrode of the third cell. Attach the other two electrodes to the binding posts of an electric bell.

7. Connect three dry cells in parallel. Connect the positive electrodes together, and the negative electrodes together.

Connect wires to electric bell.

Which of the two methods gives the stronger current?

When do you connect dry cells in series?

When do you connect dry cells in parallel?

For what are dry cells used?

What is the advantage of the dry cell over the wet cell?

*8. Take an old automobile storage battery apart. Make labeled sketches showing its construction.

How is the storage battery recharged?

What is its value to man?

III. ELECTRICITY CAN BE PRODUCED BY THE USE OF MAGNETS

What to do to prove this fact

1. Wrap a large wire nail with about forty turns of No. 24 or No. 22 insulated copper wire , leaving about one half inch of the nail exposed at each end.

Connect the two loose ends of the wire and hold the wire over a compass.

Clamp the nail so that it cannot move, and bring a horseshoe magnet toward it so that the poles pass over the coil which is wound around the nail. Pull the magnet away from the coil.

What happens to the needle of the compass when the magnet approaches the nail?

What happens to the needle of the compass when the needle is held stationary over the needle of the compass?

What happens to the compass needle

*Indicates optional jobs.

*Indicates optional jobs.

when the magnet is moved away?

What caused the needle to behave in this way?

When is electricity produced in a coil of wire?

*2. Make a piece of apparatus or set up an experiment that you can use in explaining to your class how the dynamo works. What is the principle on which the dynamo works?

*3. Make a piece of apparatus or set up an experiment that you can use in explaining to your class how the motor works. What is the principle on which the motor works?

What is the difference between the motor and the dynamo?

When is a dynamo used to make electricity?

Why can we say that we change water power into electric power?

What is the advantage of changing water power into electricity?

4. Make a list of electric devices that are run by motors.

*5. Look up Michael Faraday. Write a summary paragraph about him in your notebook. Tell what two important machines are based on his discovery.

IV. ELECTRICITY IS OF TWO KINDS: POSITIVE AND NEGATIVE

What to do to prove this fact

1. Rub a glass rod with a piece of silk, and hold it to the pith balls of an electroscope. Rub a piece of sealing wax with a woolen cloth, and hold to the same pith balls.

Why did the glass rod repel the pith balls?

Why did it not repel the balls right away?

Why did the sealing wax attract the pith balls?

What kind of electricity is produced in the glass rod?

What kind of electricity is produced in the sealing wax?

2. Write a summary sentence in your notebook telling how like kinds of electricity behave toward one another, also one telling how unlike kinds behave toward one another.

*3. Write a brief paragraph on the cause of lightning.

*4. Write a paragraph describing the experiment which Benjamin Franklin performed in connection with electricity.

What important fact did he discover?

V. ELECTRICITY TO BE OF VALUE MUST HAVE A COMPLETE CIRCUIT

What to do to prove this fact

1. Copy the diagram of the electric bell from the board. Label all the parts. Secure a bell, and find each part on the bell.

2. Attach the bell to two dry cells, and see whether it will ring. Trace the current of electricity from one binding post of the battery to the other. Ex plain exactly how the bell rings.

Why is a push button used in the operation of an electric bell?

Why does the electromagnet not hold the hammer to the bell all the time that you have your finger on the push button?

*3. Study your electric bell system at home. Locate the bells, push buttons, and cells.

If you use a bell-ringing transformer, notice how this is connected. Draw a plan of your bell system, showing the different circuits. Label all parts neatly.

*4. Take a large board, two push buttons, two electric bells, and two dry cells.

Make a wiring plan for a house when

*Indicates optional jobs.

*Indicates optional jobs.

one bell is located in the front hall and the other in the kitchen. Place the push buttons in the front hall and over the back door.

*5. Take one bell, two push buttons, and two batteries. Place the bell in the kitchen with one push button at the back door and another at the front door. Connect the bell to the large board, also.

6. Copy the diagram of the telegraph from the blackboard. Label each part.

7. Write a paragraph telling how the telegraph works.

*8. Copy the Morse code into your notebook.

*9. Write a paragraph about Samuel F. B. Morse.

*10. Make a telegraph instrument that you can use in explaining the operation of the telegraph to your class.

*11. Set up a telegraph connection between two rooms of your school, or between your house and the house of a neighbor.

12. Visit the telegraph office to see how the real telegraph works. Report to your class what you saw in the telegraph office.

VI. SOME SUBSTANCES ARE CONDUCTORS OF ELECTRICITY AND SOME ARE NON-CONDUCTORS OF ELECTRICITY

What to do to prove this fact

1. Write up the experiment performed in class.

2. List all the conductors of electricity that you can find.

3. List all the non-conductors that you can find.

4. Answer the following questions in your notebook.

Why can a bird sit on a live wire without getting a shock?

Why are glass insulators used on telephone poles?

Why do lightning rods protect houses from lightning?

Why are church steeples often struck by lightning?

Why should you not stand inside an open window during a thunder storm?

A lady in a buggy and wearing a silk dress was not injured when lightning struck the buggy and killed the horse.

Can you explain why this probably happened?

A man putting in a new socket for an electric light did not want to turn off the current for the whole house. He was advised to do the following thing:

To work with wet hands, to handle wires with wire pliers, to work in canvas gloves, to work in wet canvas gloves. Which should he have done? Why?

Are you safer in bed during a thunder storm? Why?

When out in a field during a thunder storm, where should you stand?

Is an automobile a good place to be during a thunder storm? Why?

How should you work in disconnecting a live wire from a person who has been shocked by it? Why?

What should be done for a person who has been shocked by electricity?

VII. RESISTANCE TO ELECTRICITY PRODUCES HEAT

What to do to prove this fact

1. Write up the experiment performed in class.

2. List the kinds of wires that offer resistance to electricity.

*Indicates optional jobs.

*Indicates optional jobs.

3. List the kinds of wires that offer little resistance to electricity.
4. Explain in a summary paragraph how the electric light works.

   What kind of wire is used in the electric light? Why?

   Why is oxygen removed from the light globe?

   What kind of gas is found in the globe?

   Why do you find two wires in the electric light socket?

   What is the use of a fuse in an electrict light system?
5. Write a summary paragraph in your notebook about Thomas A. Edison.

*6. Secure an old electric iron, take it apart, and explain to your class why it produces heat.

*7. Make an electric toaster.

*8. Explain how an electric heater works.

VIII. MANY MODERN INVENTIONS ARE BASED ON THE ABOVE PRINCIPLES

What to do to prove this fact

1. Make as many of the following as you wish, and explain to your class what principle is illustrated in the instrument made.

   Electric sign

   Stop and go traffic signals

   Burglar alarms

   Fire alarms

   Signs which come on one letter at a time

   Search lights

   Arc lights

   Any other thing which you may wish to make

The subject matter, or assimilative material, used in the unit is such as will focus directly upon the principles taught. This assimilative material is given here in the barest of skeleton outline:

1. Production of electricity
   a. Friction
   b. Chemical action
   c. Magnets
2. Kinds of electricity
   a. Positive
   b. Negative
   c. Characteristics
3. Principles involved in electrical devices
   a. Complete circuit (bell, telegraph, etc.)
   b. Conductors (copper, water, etc.)
   c. Non-conductors (rubber, silk, etc.)
   d. Resistance

*Indicates optional jobs.

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SALLIE H. BLOSSER

X EQUALS O

Motor Cop (to professor of mathematics): "So you saw the accident, sir. What was the number of the car that knocked this man down?"

Professor: "I'm afraid I've forgotten it. But I remember noticing that if it were multiplied by fifty, the cube root of the product would be equal to the sum of the digits reversed."