pupil understands his text-book in chemistry as well as the average pupil understands his history, we ought to be satisfied. I do not agree with those who speak slightly of text-book work in general or of the existing text-books. There are a dozen or two text-books for high-school use which are very good indeed, and it would be a distinct gain if we should abandon the practice of making syllabuses and admit to college students who have been certificated as having completed any one of these text-books with appropriate laboratory work to make it *real*.

HOW TO MAKE A HYDROGEN GENERATOR.

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Several years ago I hit upon a plan of making a generator which proved in every way reliable, and anyone following these directions I am sure will find no difficulty in constructing a serviceable piece of apparatus at a cost of but a few cents.

The only material needed is a battery jar (See A Fig. 1),

Figure 1.

a bottle (B), a one holed rubber stopper with glass plug to fit, (C and D), a short piece of lead pipe (E), a square of thin plank, (F) and a little rosin. I shall give no exact dimensions but the proper proportions may be readily understood from the drawing.

The lower part of the bottle must be cracked off so as to make it about an inch shorter than the height of the jar. This may be done by heating the line where the crack is to occur with a curved piece of wire heated to redness and

then plunging bottle into cold water. Then cut a hole in the center of the wooden square, just large enough to admit the top of the bottle with pressure, after doing which pour melted rosin between wood and glass to hold it firmly in place. Now put the glass plug in the rubber stopper and place in bottle.

Next take the piece of lead pipe and mark off circumference at end into six equal parts. (See Fig. 2.) Then saw parallel cuts at each dividing point lengthwise with the pipe about two inches long. A hack saw is the best tool for this purpose. Several holes must now be cut or drilled through the uncut por-

Figure 2.

tion of the pipe and three alternate strips cut off so as to make them equal in length to the inside diameter of the pipe, and bent in so as to close the cylindrical portion of the pipe at one end and form a sort of basket which will stand on the three remaining legs.

The generator is now ready to set up and the diagram (See Fig. 1) will give one the proper idea. Partially fill the lead basket with granulated zinc and after spreading its legs a trifle so as to cause it to stand firmly place it on the bottom of the jar. Now pour in enough dilute sulphuric acid to completely cover basket and suspend bottle over it by wooden cover affixed.

The generator is now ready for use. Pull out the glass plug. The acid rushes into the bell jar and into the basket coming into contact with the zinc. Hydrogen is formed and escapes under pressure through stopper, from whence it may be conveyed to any point through tubing. (Care must be taken after fresh filling of generator, not to light hydrogen at point of escapement until after all air in the bell jar has passed off.) To shut off hydrogen, replace plug. Hydrogen soon forces the acid out of the bell jar and chemical action in generator ceases. By using iron sulphide or marble in place of zinc, a hydrogen sulphide or carbon dioxide generator is formed either of which is equally efficient.

Some of the good points of this generator are, its constant pressure, its ever readiness, and the perfect safety attending its use after once the air has been forced out.