

Theory and Practice Hand in Hand

KNOWLEDGE of any subject may be divided into theoretical and practical, and in order to have the best acquaintance with any subject, the more of each kind we have the better we are equipped. The truly educated man recognizes this fact, but there are many so-called "practical men" who look upon the "theoretical man" with disgust, and vice versa. And yet, if all men belonged to either one or the other of these classes, it would be very difficult for either class to get along without the other. It is necessary, therefore, that the practical man who has learned what he knows from actual experience to acquire as much as he can of the theory of what he practices. It is likewise essential for the man who has learned from books the why and wherefore of this and that to get by experience some additional knowledge which cannot be secured in other ways.

I once heard of a young man in a college class who was given the dimensions of a certain gas engine and asked to figure out the size of pipe necessary to supply the engine with gas. The young student in question gave as his result, a 1 1/4 inch pipe. The professor in charge claimed that 1 1/2 inch pipe would be sufficient, but was met by the answer: "Where will you get your 1 1/2 inch pipe? Standard pipe is made 1 inch, and the next large is 1 1/4 inch."

Experience is, no doubt, an efficient, but wearisome, and oftentimes, a costly teacher, and sometimes from the experience of others we can learn a great deal. Oftentimes facts stick in our minds and are called to mind when needed, when the bare statements of the principles they illustrate would never be thought of. Sometimes these practical experience of others will save one a great deal of both time and money, and they are, therefore, often worth remembering.

When an engine fails to explode its charge, there may be any of several causes for it, among which is the failure of the igniter to work. This also may be due to several things, and it is usual in testing for the cause to place together the wires from the battery and see if they make a good spark when separated. If they do, we know that the battery is all right. The next step is to learn if we get a spark inside the cylinder. Most engines are provided with a small hole near the igniter points, and in this hole a plug is screwed. The plug may be removed to clean points or test for a spark. Several years ago an engine was being

Course in Gas Engineering

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tested in this way. The engineer called to a man nearby to see if the gas was turned off. The man reported that it was, and the engineer snapped the igniter, at the same time peeping into the hole to see if there was a spark. At that instant there was an explosion in the cylinder, and, of course, the flame blew out through the peephole into the engineer's face. That he was not rendered totally blind was only a miracle. As it was, he was taken to a hospital, where it was two weeks before he could see at all. As for the cause of the explosion, it was never known just what caused it, whether there was in the cylinder a charge of gas, which had not been exploded after the gas was turned off, or whether the person who stated

attempt to look for the spark, and when you do look, keep your face some distance away from the hole and a little to one side, or else use a mirror to reflect the spark. While these may seem to be rather extraordinary precautions, nothing should be overlooked unless one wishes to run the chance of losing both his eyes.

A somewhat similar accident was told to me by an expert from a gasoline engine factory. He had been sent to locate and correct some reported difficulties in an engine. These were soon fixed all right, but the people had been using a self starter to operate the engine, and found that it was just as easy and a little less trouble, to start it without the self starter. They, therefore,



A good bit of hard practice.

mistaken. Or, possibly, the gas cock was accidentally opened, even if it was closed at the time the gas was reported as shut off. Since the first case of this kind that came to my attention, I have heard of several others, although none resulted so seriously.

In making this test on the igniter, it is well to bear in mind the old saying: "If you wish a thing done well, do it yourself." First see that the supply of gas or gasoline is shut off from the engine. Then turn the engine over several times and operate igniter so as to explode any charge which may be in the cylinder. It is also a good idea to turn the engine over once or twice with the valves and cocks open so as to blow out any charge which may be in the cylinder, for the igniter may not work for several times, and then, just at the moment you happen to be looking in for the spark, it may ignite the charge. As a further safeguard, operate the igniter several times before you

asked the expert if he would disconnect the engine and starter. They were exceedingly busy and did not wish to be out of the use of the engine any longer than necessary, especially as they had been shut down for several days already. The expert told them that he could easily disconnect them without stopping the engine, and proceeded to do so. There was a pipe leading from the compressed air tank to the engine cylinder. All that was necessary was to disconnect this and put a plug in its place. This could easily be done by throwing out the switch in the battery circuit, when the engine would run without exploding for several revolutions, during which time the pipe could be unscrewed and a plug put in. Then the switch could be thrown in and the engine would begin to explode the charges, not having lost more than two or three impulses, so that it would soon be up to speed again.

But again, "If you wish a thing done well, do it yourself." Every thing was ready. The expert

was at the engine with a pipe wrench, plug, etc. A man stood at the switch, and at the word through out the circuit. The pipe was unscrewed and the plug was just going in when the engine fired. The switch had fallen back into contact and completed the circuit. The expert's hands went "chunk" into a bucket of oil that happened to be standing near. A doctor was summoned and dressed the hands, but it was several weeks before they were of much use to their owner.

Sometimes troubles with gas engines occur in a place where the cause is seldom looked for because the trouble may have come about gradually and seem to be due to other things. For instance, when an engine heats too much there are several things which may be the cause of it, and yet one of them often escapes the mind of the operator. A steam engineer usually uses some kind of boiler compound to prevent deposits in the boiler, a gas engineer often overlooks the fact that these same causes may occur in the water jacket of the engine.

In one case an engine was reported as heating a great deal more than it had formerly done. When the expert examined the engine he found the lower portion of the jacket space practically filled with mud, lime, etc., which had baked hard. Of course it had taken several years for this to occur, but as the result of it the water did very little good and the engine became very hot. In another case, while the jacket space had not become so completely filled up, the space around the inlet pipe had become pretty well clogged up, so that the water supply was choked down and the engine heated too much.

These jacket spaces should be thoroughly cleaned out about once a year, depending on the nature of the water used, if the tank is used, and the same water circulates through the engine over and over, a boiler compound may be used or rain water instead of water containing lime and other substances which will deposit. This will prevent the trouble to a large extent.

Sometimes the cause of trouble seems to be rather ludicrous when the explanation is known. When large engines are placed in office buildings, it is usual to draw air from outdoors through a pipe instead of from the engine room, as the sound of the suction is then reduced and is then not annoying. In one case an engine was so arranged, and the end of the air pipe was just outside the building about ten feet from the ground. Some street urchin happened to hear the noise of the air being drawn in