HOW TO SET A SLIDE VALVE.

In all the works on steam engines which have been written we do not remember to have seen any account of the manner in which a slide valve is set, and we have had frequent inquiries from young—and must we say it—old engineers, who confessed they did not know much about it. It seems strange that any person should have charge of a steam engine and be unacquainted with this simple duty, yet it is a fact indisputable. Many an hour locomotives have stood on the track helpless from the slipping of an eccentric which the driver was unable to replace, and mischievous comrades have oftentimes designedly loosened set screws, (in the early days when screws alone held the wheel in place), so as to cause confusion, and subsequent dismissal, to the incompetent driver who could not reset it.

There are indeed no lack of rules in engineering works which direct us to set the eccentric, something in this way:—

"Place the crank in the position corresponding to the end of the stroke (why not say on the center?) Draw the transverse center line answering to the center line of the crank shaft on the bed plate of the engine, or on the cylinder, if the engine be direct acting, describe a circle of the diameter of the crank pin on the large eye of the crank and mark off on either side of the transverse line a distance equal to the semidiameter of the crank pin; from the point thus found stretch a line to the edge of the circle described on the large eye of the crank and bring round till the pin touches the stretched line. When the crank is thus placed at the end of the stroke the valve must be adjusted so as to have the amount of lead or opening on the steam side which is intended to give at the beginning of the stroke and the eccentric must then be turned around upon the shaft until the notch in the eccentric rod comes opposite to the pin on the valve lever and falls into gear; mark the situation of the eccentric, and put on the catches in the usual way, etc."

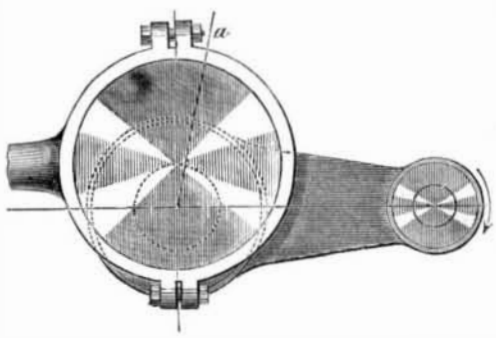
This long and incomplete instruction is from Bourne's Catechism of the Steam Engine and we are sorry to say omits one very important thing, so that it would be impossible to set a valve by this method. The omission is in getting the length of the eccentric rod at the outset. Without further criticism or discussion, we shall explain how an eccentric is set.

Presuming the proportions properly made by the draughtsman at the shop the first thing is

"TO FIND THE LENGTH OF THE ROD.

Put the straps on the eccentric and connect the valve gear as in working order. Disconnect the engine and slip the eccentric around on the shaft and observe what takes place in the steam chest. Doubtless the valve will uncover one port clear to the exnaust while the other is entirely or nearly shut. This shows the rod to be too long or too short as the case may be. If the port nearest the crank, in a horizontal engine, is wide open and the other port shut, the rod is too long and must be shortened half the difference only. We say half the difference, because it must be remembered that what is taken off one end is put on the other so that the real amount the rod is shortened will be seen in a complete revolution.

When the valve "runs square," as it is called, or opens and shuts the ports properly, set the wheel as in this diagram.



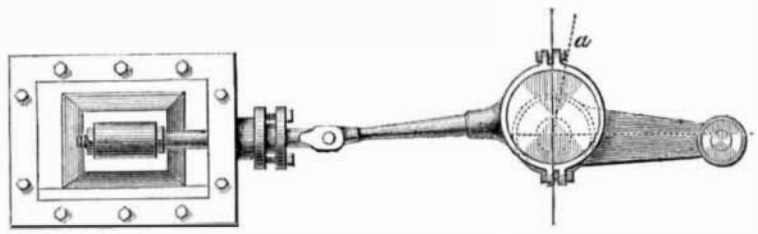
The eccentric is always in this position in every instance, whether the engine be vertical, horizontal or inclined, and the intervention of levers between it and the valve makes no difference in relation to the crank itself. The wide part of the eccentric and the crank are always at right angles to each other excepting such departure from a right angle as the lead and lap takes off.

The diagram represents an eccentric without lead working a valve without lap. Such a coincidence seldom obtains in practice, and the true position of the eccentric is shown by the dotted line, a; this indicates that the eccentric is turned on the shaft towards the crank thus pulling open the port behind and driving the crank in the direction of the arrows. If levers are intervened to reverse the motion of the eccentric the crank would go the other way. We are speaking of a direct connection.

It will be easily understood *why* the eccentric is always in this position when it is borne in mind that the eccentric must commence to open the valve a little before the crank gets to the center. In other words the eccentric must commence its stroke a little ahead of the crank.

AN IMPROPERLY SET VALVE.

Here is a drawing of an improperly set valve. It is not drawn to scale but is none the less a correct



example. It will be seen that the crank has passed the center and commenced the return stroke, but there is no lead on the steam side in front or at the port nearest to the crank, and before the crank passed the center there must have been much compression in the cylinder at the forward end of the stroke. The steam was shut up in the cylinder and its tension or elasticity greatly increased thereby. Steam like other gases follows a law discovered in some experiments by a French philosopher called Mariotte. According to this authority if steam at 60 pounds be shut up in a cylinder six inches long and the piston in said cylinder be pushed down to three inches the volume will be reduced one half and the pressure will have been raised to double or 120 pounds.

So when the exhaust closes too soon, say at six inches from the end of the stroke, when the crank is on the center the pressure will be in proportion to the amount of cushioning or compression. There are many engines working in this condition to-day; should they not be attended to?

Setting the valve with a link motion is precisely the same operation; the eccentric stands exactly as shown in the diagram. There is only this difference —the lead is somewhat disturbed by the action of the eccentric rod which is not in gear, whether it be the forward or back connection. This derangement causes some change in the lead when cutting off at low grades of expansion; and it is necessary to take this into account when setting the valves. The lead should be given properly on the point the engine is to work at, for since the lesser rates of expansion are only used on emergency it matters little whether they are correct or not.

Concluded next week.

MAGENTA AND ITS DERIVATIVE COLORS.

At the weekly meeting of the Royal Institution of Great Britain, held on Friday, May 12, 1865, a paper was read by Frederick Field, F.R.S., from which we take the following extract. After giving the chemical constitution of aniline, he says :—

From the earliest discovery of aniline it was noticed that certain oxidising agents when mixed with a solution of its salts produced a fine violet tint. Even in minute quantities, a few drops of hypochlorite of lime render it purple. There is another test for aniline, which I will show you, and which, as far as I am aware, has not been observed previously. If the red gases obtained by the decomposition of nitric acid by starch or sugar be passed into an aqueous solution of aniline, the liquid speedily assumes a yellow color, owing to the formation of a new base—azophenylamine, which is gradually precipitated as a bright yellow powder. It was not, however, until the year 1856 that aniline was applied to any great practical purpose, although from the beauty of its compounds, and from its comparative accessibility, it had from the time of its discovery become a great favorite with chemists. Mr. Perkin was the first who produced color on an extensive scale from this base. He added a solution of bichromate of potash to a salt of aniline, and from the precipitate thereby produced he isolated a magnificent purple dye, he termed "mauve," which at once become popular, and indeed at the time almost universal. It may truly be said that this discovery has identified Mr. Perkin with the aniline colors, and that he will be always associated with one of the most striking and brilliant passages in the history of chemistry as applied to the industrial arts. It cannot be supposed that such a discovery would be allowed to rest. A mine had been opened which chemists began to explore, and in such numbers, and with such avidity and zeal, as almost to lead us to anticipate that its riches will soon be exhausted. The action of numerous bodies upon aniline and its homologues was found to be productive of color. Nitrate of silver, nitrate of mercury, chloride of mercury, chloride of tin, arsenic acid, iodine, and many others, when heated with the base, gave a rich crimson color, in more or less abundance; and, although it would be impossible for me to enter into a disquisition on the comparative merits of these various methods for the production of color, I trust to be able to produce magenta, although in somewhat crude form, at this lecture table, and also to dye this tassel of silk from a solution of its salt. The reagent I will employ is iodine. A few crystals of this element are placed in a tube with about twice their weight of aniline. Heat is at once evolved, and with the assistance of a higher temperature from the spirit lamp, you will observe that in a few moments intense color is developed. If a few drops are now poured into spirit, and this solution added to water, a fine rose-colored tint will appear.

It may seem strange to those who have read Dr. Hofmann's beautiful researches upon the aniline substitutive products, his chloraniline, bromaniline, iodaniline, and a multitude of others, that he had not observed this curious reaction; and this leads me to tell you, *en passant*, for time will not allow me to dwell upon this interesting topic to night, that aniline, when perfectly pure, does not yield any amount of color with most of the reagents mentioned above—a most important fact discovered by Dr. Hofmann and Mr. Nicholson, and which has given rise to one of the most difficult questions which yet remains to be answered. I will simply say that it appears that there must be a homologue of aniline present with that base to produce the color you see before you, although that homologue, *per se*, will give no color whatever. Thus, for example, toluidine, $C_7 H_9 N$, when treated with oxydizing agents, does not produce color; let it be mixed with aniline, and the dye is immediately developed. The tintorial power of the salts of magenta is something marvellous. No dye that I have examined, whether from the animal, mineral, or vegetable world, can bear comparison for one moment with this crimson color obtained from aniline. One grain in a million times its weight of water gives a pure red, in ten millions a rose pink, in twenty millions a decided biush, and even in fifty million, with a white screen behind the vessel in which it is dissolved, an evident glow.

Personal.

Dr. Thomas Antisell, whose card appears in our advertising columns, was for several years chief examiner of the chemical department of the Patent Office. Since the beginning of the war he has been a volunteer surgeon in the Union army, where he has rendered valuable service to our brave suffering soldiers. Dr. Antisell is the author of valuable scientific works, and is well qualified to give advice and assistance in the line of his profession. We wish him much success.

EGYPT is waking up. A nobleman of Alexandria has 44 steam engines, which work 22 steam plows and cultivators on his estate.