The experiments which we give this week are both performed with an apparatus found in almost every house, namely, a tobacco pipe. Simple as this little article of luxury is to too many, it will serve for many purposes of amusement besides the special one for which it is designed; two of its uses we will now describe.

Take an allspice, or a pea is better, and through its center thrust a pin or needle, so that there shall be an almost equal weight of metal on each side; then place one end of the pin in the stem of a tobacco pipe, and applying the lips to the bowl, blow gently, when the pin and allspice will dance in the air in a very amusing manner. You may not succeed the first few times, but as soon as you have learned to keep the pipe quite steady, and to give a continuous current of air, you will be able to make the pin and allspice dance for a considerable time.

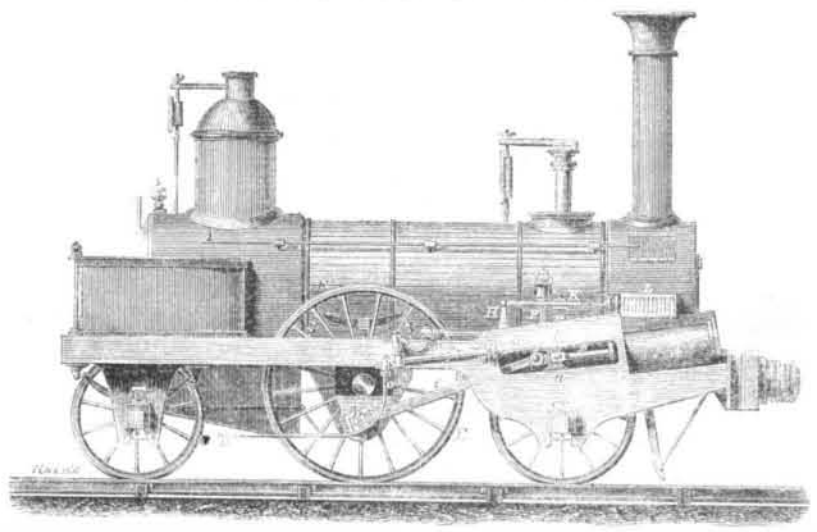
The bowl of the pipe forms a receptacle for condensing the air, and acts like the equalizing chamber of a force pump, by which continual pressure is exerted, and a stream of air passes through the stem to the orifice at the mouth of the pipe; here meeting with the allspice, it blows it up a little way, and then the allspice falling again by its own gravity, is met by another jet of air, and so is kept dancing up and down. "But," we are asked, "why does it not tumble away from the pipe, and not meet the next jet of air?" Because, when the air issues from the pipe it has a tendency to spread itself out, and so forms a kind of cushion, gradually increasing in dimensions and diminishing in power; and besides, if it is blown up straight, it will be sure to take the nearest way to the ground from the point where it stops going up, and that is always a straight line; but if you blow it out at an angle, it will surely fall to the ground, as you will probably find out during your experiments.

The next illustration shows a simple way of making illuminating gas by means of the same apparatus—a tobacco pipe. Bituminous coal contains a number of chemical compounds, nearly all of which can, by distillation, be converted into an illuminating gas; and with this gas nearly all our cities are now lighted in the dark hours of night. To make it as represented in our engraving, obtain some coal dust, (or walnut or butternut meats will answer,) and fill the bowl of a pipe with it; then cement the top over with some clay, place the bowl in the fire, and soon smoke will be seen issuing from the end of the stem; when that has ceased coming, apply a light, and it will burn brilliantly for several minutes; after it has ceased, take the pipe from the fire and let it cool, then remove the clay, and a piece of coke will be found inside; this is the excess of carbon over the hydrogen contained in the coal, for all the hydrogen will combine with carbon at a high temperature, and make what are called hydro-carbons—a series of substances containing both these elemental forms of matter.

Alcyone.

M. Maedler, the author of the recent investigations with reference to the central sun, has long been known to the astronomical world as the successor of M. Struve in the direction of the observatory at Dorpat. His computations of the orbital movements of the double stars have given to him a deservedly high celebrity; and the great theory which he has propounded is only given to the world after a long and patient examination, extending through many years. Assuming Alcyone as the great center of the millions of stars composing our astral system, and the direction of the sun's motion, as determined by Argelander and Struve, he investigates these consequent movements of all the stars in every quarter of the heavens. Just where the swiftest motions should be found, there they actually exist, which demonstrates either the truth of the theory, or exhibits the most remarkable and incredible coincidences. After a profound examination, Maedler reaches the conclusion, that Alcyone, the principal star in the group Pleiades, now occupies the center of gravity, and is at present the sun about which the universe of stars composing our astral system are all revolving.

THE EUROPEAN LOCOMOTIVE.



It will no doubt be interesting to many of our readers who have never crossed the Atlantic to be shown the picture of a European locomotive, and it may also serve to remind those who have visited the Old World of many pleasant trips on foreign railways. The chief points of difference between the general outline of our engraving and the locomotives which we see daily on our own railroads, are: the want of a cow-catcher, the absence of a spark-arrester on the chimney, and the want of covering on the driver's platform, and the reason why these are not needed may be easily explained. European railways are all well-fenced on each side, and in some places protected by high walls, so that it is almost impossible for any animal to stray on to the road, unless through the carelessness of its owner; therefore the cow-catcher is not needed. Again, the majority of European locomotives burn coke of the very best quality, and, in some cases, a mixture of coke and the finest bituminous coal; no wood ever being used, a spark-arrester is unnecessary. As to the last point, a covering for the driver, the French, Belgian and British railway companies are gradually adopting the American system, and providing a suitable shelter for the persons employed on the engine.

It is customary in Europe to use particular engines for special purposes; thus, one will be used for drawing the "express" train, another for drawing the ordinary one, while a third will be devoted exclusively to the traction of merchandise and freight, and receives the name of "goods engine." Many of these latter are monsters, weighing more than sixty tuns; on one railway there is an engine weighing nearly one hundred tuns, and of proportionate power. The "express" engines are made as light as is compatible with safety, and are intended to run very fast; thus on the Great Western Railway of England, where the rails are six feet apart, or as it is called the "broad gage line," sixty miles an hour is not at all an unusual speed; but taking all trains and including stoppages, the average rate in Britain is about thirty miles an hour, and on the continent of Europe about twenty-five miles an hour.

The principal European manufactories of locomotives are at Wolverton, Crewe, Newcastle and Swindon, in England; many are made at Glasgow, Scotland, and Liege in Belgium, which latter city has not inaptly been called the "Birmingham of Belgium." Although somewhat lighter-looking, they are really more heavy and cumbersome than our own; and not being partly mounted on a movable carriage or truck, but being firmly fixed on a rigid frame, they are not so well adapted to turn short curves. A great quantity of polished metal is seen on their exterior, and, with the exception of the boiler which is usually colored green, and the chimney which is generally black, there is little paint used in their outward decoration; but a very pretty effect is produced by the contrast of the white steel and yellow brass which enter largely into their construction.

Our engraving illustrates one of the most modern of the European "express" engines, and may be taken as a type of them generally. In it, A is the cylinder, of which there are two, one on each side, inside the frame, slightly inclined to economize space. The piston of each cylinder has its piston-rod, B, directed in its motion by the slide bars. *a a*, fixed to its extremity. This piston rod is joined to a connecting rod, C, which links on to a pin, D, fixed on the driving wheel, E, at a certain distance from its center, thus forming a crank. The rate of motion of the piston governs the rate of the driving wheels, and the two cranks (one on each side) with their pistons are placed at right angles to each other, so that there may be no dead center in the machine. H is a bell crank connected with an eccentric on the shaft of the driving wheel, that by the action of the rod, K, governs the admission of the steam into the cylinder, and changes its direction from the steam-chest to which steam is admitted from the boiler through a valve in the steam dome.

There is also attached to the cross head, a complementary piston, *m*, which works in the pump cylinder, *n*, and draws water through the tube, *o*, which is connected to the cistern on the tender, and forcing it through the pipes, *p*, *P*, keeps a continual supply of water in the boiler. There is usually one large driving wheel, and two smaller ones, which directly support the frame with the intervention of strong springs to reduce the jar of the road. In some of the engine-houses of Europe, as many as fifty engines may be counted, some breathing forth steam after having done their work, and others sending forth volumes of smoke preparatory to doing theirs. Many of them are now provided with an additional improvement, namely, a steam break; and Mr. McConnell, of Wolverton, the superintendent of the locomotives on the London and North Western Railway, has obtained a number of patents for various modifications in the construction of brakes, applying them to the wheels of the engine itself, and not, as common with the hand-break, to the tender and cars only. The boiler being made of wrought iron plates, and having copper tubes from the fire-place to the smoke chamber, is covered with felt or some good non-conducting material, and then bound round with slats of wood and hooped like a barrel, and this prevents a great amount of radiation, and consequently economizes fuel.

In the European and American locomotives and railroads, there is still much to be improved and perfected; we might learn from one another with advantage, and those points of fault of which neither of us are at present cognizant, but which will gradually develop themselves as railroads progress, we believe will readily and easily be reformed by the inventive genius of the Anglo-Saxon race. In fact, the history of any road, from its conception to its perfect working, is one continuous record of patience, perseverance, daily toil, and nightly thought; and when the first train of cars runs on its level rails, they are triumphal cars demonstrating another victory of Mind over Matter.