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(Illustrations are indicated by an asterisk.

SUPPLEMENTAL SHEET.

With the present number we issue a supplemental sheet of four extra pages, which contains the official list of patent claims.

The pressure upon our columns has been so great during the past six months, that we have been embarrassed for space in which to meet the demands of our numerous advertising patrons, without seriously curtailing our reading matter. The SCIENTIFIC AMERICAN having ten-fold more readers than any similar journal now published, advertisers find that an investment in its columns returns a large profit.

Not wishing to disappoint our generous patrons in any respect, we intend in future to issue supplements whenever, in our judgment, the advertisements and patent claims are likely to trench upon the space that we consider due to our readers.

EXHIBITION OF A NEW ELECTRO-MAGNETIC MOTOR.

In the afternoon of Friday, April 6th, a number of gentlemen met at the lecture room of the Free Academy, in this city, at the invitation of Professor R. Ogden Doremus, to witness the operation of a new electro-magnetic machine, the invention of Mr. L. C. Stewart.

Most of our readers doubtless understand the principle of electro-magnetic machines. They all depend on the power which a current of electricity has to induce magnetism, either in a bar of iron, or in a hollow helix where no iron is present. If a piece of wire is insulated, by covering it with silk, cotton, or other non-conducting material, and it is then wound around a rod of soft iron, so long as a current of electricity is passing through the wire the rod of iron is a magnet, and so soon as the electric current stops, the iron ceases to be magnetic.

The simplest form of an electro-magnetic machine is a lump or bar of iron secured to one end of a vibrating lever, directly over the poles of an electro-magnet. The helical wire of the magnet being connected with a galvanic battery, the soft iron core becomes a magnet, and pulls the iron bar on the lever down; this movement opens a gap in the helical wire and breaks the current, when the bar ceases to be attracted, and it is lifted up by the motion of a fly wheel connected with the opposite end of the vibrating lever. This movement of the lever closes the gap in the helical wire, restoring the current and renewing the magnetism, when the bar is again drawn down. Thus the current is automatically broken and closed by the action of the machine, and the vibrations are made perpetual.

It long since occurred to many mechanicians that much greater velocity could be attained by securing several bars of iron to the periphery of a rotating wheel, and fastening a series of electro-magnets around the inner side of a fixed circumscribing wheel or concave. Mr. Stewart's machine is a modification of this plan, his improvement consisting mainly in the method of breaking and closing the circuit. This is effected by two brass wheels running with their peripheries in contact—shallow depressions being sunk in the peripheries so that the wheels do not touch each other while passing these depressions.

Mr. Stewart said that with one of his engines, with a helical wire 8 miles in length, he had reversed the current 80,000 times in a minute!

One of the advantages that is claimed for this engine is that sparks are avoided in breaking the current, and thus the combustion of the brass is prevented. Mr. Stewart stated that where sparks are produced it is necessary to employ platinum, gold, or some other of the noble metals.

Professor Doremus remarked that he must go a little further than Mr. Stewart. With the powerful battery belonging to the Free Academy platinum was not merely melted, it was volatilized; and even the natural alloy which is used for tipping the points of gold pens, irridosmium, they had melted and run together in larger masses, thus increasing its value.

So far the obstacle to the employment of galvanic electricity as a motor is the high cost of the power. The power is obtained by oxidizing zinc, which is worth thirteen cents per pound, while in the steam engine the power is obtained by oxidizing coal, which is worth half a cent per pound. It is true that in the steam engine not more than one-tenth of the power generated in the furnace is utilized; but all the investigations indicate that thus far in the electro-magnetic machine, the proportion is still smaller.

EXPLOSION OF A PETROLEUM LAMP.

We had an accident at our house last night, but fortunately it did no damage except to scare the children. It was this: Our coal oil lamp exploded with but little warning; the burner, chimney and wick blew out with so much force that it struck the ceiling some six feet above the lamp. The plaster of paris that the burner was fastened in with was all blown out also. Now I want to know the cause of this thing. We have been using coal oil for four or five years without any accident before, and we often leave the lamp burning all night, which I will be afraid to do again unless I know the cause. We bought our oil of a druggist, and supposed that it was good, and I still think it was. Please answer through that valuable paper, the SCIENTIFIC AMERICAN, which I think the best paper in the world, and oblige your friend and subscriber,

SAMUEL LUTHY.

Carrollton, Ill., 1866.

Our access of new subscribers is so rapid that we are obliged to repeat explanations of familiar phenomena, in order to give satisfaction to the largest number of our readers.

The two elements, carbon and hydrogen, combine in a great number of different proportions, forming as many different substances. These hydro-carbons have some properties in common, while they differ in others. For instance, they are all combustible, but they differ widely in their fluidity and volatility. At ordinary temperatures some are solid, as paraffine, and others are gaseous, as oleflant and marsh gas, which constitute the principal proportion of illuminating gas, while between the solids and gases in volatility are a large number of liquid hydro-carbons that boil or evaporate at different temperatures. Petroleum is a mixture of liquid hydro-carbons, usually holding also in solution both gaseous and solid hydro-carbons.

When explosions of petroleum occur, they are produced in this way. The oil is in a tight room or vessel, which prevents the gaseous and volatile hydro-carbons of its constitution from passing away as they escape from the liquid, but confines them together with the atmosphere of the room or vessel. After a sufficient quantity of the combustible vapor or gas is mingled with the air, if fire is applied to the mixture, each atom of hydrogen in the hydro-carbon enters into combination with an atom of oxygen to form a molecule of water or steam, and each atom of carbon enters into combination with two atoms of oxygen to form a molecule of carbonic acid. In other words, the petroleum vapor is instantaneously burned. The heat generated by this rapid burning causes so sudden an expansion of the carbonic acid and steam, which are the products of combustion, as to produce the effects of explosion.

The more volatile portions of petroleum are separated from the illuminating oil, in the process of refining, and are sold as naptha. We have heard dealers charged with mixing this naptha with illuminating oil, in order to sell it at a higher price, and it is possible that our correspondent's oil had been thus adulterated. It may be, however, that the explosion was due to a different cause. When the wick of a petroleum lamp is turned down very low, the oil will ascend and be evaporated more rapidly than it will burn, filling the room with the odor of petroleum, a fact that, probably, most people have observed who are in the practice of burning petroleum. At all events there can be no doubt that, in some way, the upper portion of our correspondent's lamp became filled with a mixture of atmospheric air and the vapor of petroleum, and then this explosive mixture was set on fire.

THE MIDLAND STEAM BOILER INSURANCE CO.

This is the title of a new company, recently organized in England to inspect and insure steam boilers against explosion. They had, at the last report, no less than 1,839 steam boilers under their care, and of these but one had exploded—being the first accident that happened in four years, and this one the proprietors had been repeatedly warned of, but disregarded the warning. During the year, 605 reports have been sent in to owners, and 7,172 inspections have been made, showing that each boiler was inspected every three months.

There were 55 boiler explosions in England in 1865, attended with great destruction of property and loss of life. "Great efforts," says the engineer, in his report, "have been made to obtain the facts in the cases, as they generally show some simple cause, and the utter fallacy of the 'mysterious' theories so popular among those who have only partially considered the subject."

Some of the causes of disaster are mentioned, and being exceedingly interesting to engineers and others, we republish them in a condensed form.

Many old boilers have been removed and replaced by new ones of better construction; explosions of the past year, showing that boilers which have been used for twenty years should be worked with great caution. Many cylinder boilers have been burnt by short water—arising in one case from a chip under the check valve—from the uncertainty of a float indicator where water boils violently, and to the want of back valves to prevent the water being forced out of one boiler into another. Several cases occurred where scale had become detached from the sides of the boiler, fallen to the bottom and there burnt fast; and very great injury has been done to boilers by emptying them under pressure and immediately filling them with cold water.

Many safety valves have been found habitually overloaded. When they leak, instead of grinding them tight, the engineer, or others, put on extra weight, and the want of repair was forgotten. Boilers used without gages, the proprietors depending on the calculated weight on the safety valve, are often found working at much higher pressures than were suspected. Pressure gages are frequently found out of order, one registering as much as 40 pounds out of the way. The most dangerous defects were found in cylinder boilers, and, curiously enough, where the inspectors were assured by the attendants that all was in perfect order. Around the brick work, even though the boiler was entirely separated from it, most dangerous corrosion occurred, and this even in new boilers. One singular case was where a sprung rivet had caused several jets of steam to play on the plates, which by long continuance had cut channels almost through. These defects were dis-