Electricity and Steam Boilers.

[The accompanying experiments and news respecting the causes of steam boiler explosions, and the means of preventing the same, are by Mr. Quarterman, of this city.]

We will, in the first place, speak of the causes of steam boiler explosions. Secondly, on the mode of preventing the same; and, thirdly, conclude with some general remarks.

CAUSES.—Theory :—That the steam boiler is, simply considered, a hydro and thermo electrical machine, and that the surrounding wood, &c., particularly in steamboats, by heat and paint, become almost perfect non-conductors; the boiler is, in consequence, nearly perfectly insulated.

That water has a great capacity for electricity—that this capacity changes, in degree, with variations of pressure and temperature; and also that its conducting power varies from the same causes; that saline and foreign matter, impregnating it, affect both its capacity and conduction.

That, as the atmospherical electricity, near the earth, particularly in stormy weather, frequently changes from positive to negative, and vice versa,—this change taking place, almost instantaneously, there is much danger of the boiler exploding, before the equilibrium of the electricity, between the inside and outside, of the same; can be restored—either by induction, diffusion, &c., particularly if the water and steam should be highly charged, and the engine be at rest.

That this danger would arise, principally from the insulated state of the boiler, in connection with increased temperature, and the crust or deposite on the inside; the former increasing the quantity, and the latter the intensity of the electricity, until, like a Leyden jar overcharged, the boiler will discharge itself.

A great difference exists, however, between the two, viz, the jar is only the receiver of electricity, and is not insulated—but the boiler is the actual generator, and is almost perfectly insulated.

Cases of this nature may probably be confirmed by examining portions of the exploded boiler, to see if a change of the metallic particles have taken place, or other electrical phenomena can be discovered.

That, when the water is low enough in the boiler to allow the flues, &c., to become bare and red hot, a change from negative to positive, &c., may then be generated. In this case steam is decomposed—the red hot iron first absorbing a portion of the oxygen, producing black oxide of iron, then hydrogen is taken up, reducing the black oxide to the metallic state.

During this operation, the electricity is set free by decomposition, and its accumulation is very rapid. Should the engine be at rest, the electric fluid will have no means either of diffusing itself into the atmosphere or being conducted to the condenser, &c.

Another dangerous cause in marine engines, is the presence of chlorine, accruing from the decomposition of sea water, or being evolved (from the salt deposited in the boiler) by the red hot flues, &c.

Now, if part of the oxygen be absorbed, hydrogen will be present; should chlorine be rapidly evolved, it will not only take up the liberated hydrogen, but will aid the further decomposition of the water and steam, in order to unite with the latter gas, and electricity will still be abundantly increased.

Chlorine is also a non-conductor of electricity, and should it exist in a pure, or even an impure state, may obstruct the passage of that fluid, even when the engine is first put in motion or after a stroke or two of the piston. In such cases a spark or flash may ensue, and an explosion be the result. But the greatest danger is, therefore, the vast accumulation of electricity.

Again, equal measures of chlorine and hydrogen unite explosively : flame, greater or less heat, the sun's rays, diffusive daylight, the electric spark, decomposition of water, &c., will cause this unity.

Water at rest and at a temperature of 32°, will absorb 180 volumes of chlorine; and at the temperature of 158°, only 65 volumes—hence its danger in steam boilers.

Again, the red hot flues, while bare, may absorb a portion of electricity, destroying the tenacity of the iron, and may cause a downward explosion, passing into the fire; but the sudden introduction of water, covering the flues, or a motion from the engine would probably prevent this. In such cases, viz., the latter, the tension of the electricity would be increased, and the danger still greater.

That inferior materials, bad workmanship, defects by fire, neglect in examining and cleaning, over-pressure, corrosion, &c., are amongst the causes of explosions. But there is much evidence, on record, which goes to prove the fact that other causes exist also—by some persons, called an explosive and an imponderable agent.

Faraday has experimented extensively upon a boiler, called the hydro electrical machine—and has produced great results—but has overlooked or not mentioned the fact, that the same electrical power exists in every working boiler.

It is also an established fact, that steam issuing through a small orifice produces exceedingly large quantities of electricity.

Locomotive engines, not being so completely insulated, and being almost surrounded by a pure atmosphere, are not so liable to explosions, as those of steam vessels. And amongst the latter, the high pressure will be the most liable.

A leyden jar or a coated flask, cannot be charged, when filled with hot water, as the electricity passes off with the steam.

So with the steam boiler, when it has its due portion of water, and a mean pressure of steam, viz., within the limits of its rated weight per square inch; if at the same time there be an emission of steam, by the working of the engine &c.

Now if it were possible, by diligence, care, &c., to keep the engine in this working state, an uniform current of electricity being established, viz., from and to the boiler, a great portion of heat would be secured. For in proportion as the electric fluid is exhausted, other things being equal, so in proportion will the heat diminish in the boiler. See Faraday's hydro electrical experiments, and W. R. Grove's communication, on magnetic heat, to the Royal Society of London, May 24, 1850. The probability is, that there will be a greater uniformity of working, less jarring and vibration of the machinery—less foaming of the water, and a large percentage of heat economised.

Lastly, there are many indications that electricity is a compound, that its various phenomena are produced principally by catalysis and condensation; that positive, negative, &c., are only modifications of the original fluid, depending entirely upon the generating powers, and the physically constituted properties of those powers, being in many respects analogous to light and heat, except in its most condensed forms, as thunder storms, &c. If further experiment should demonstrate this to be the fact, it is possible, and even probable, that electricity will then become a great and useful motive power, at all events it may give a new impetus to the science.

We now conclude our present theory : what further experiments may develope we cannot tell.

Secondly, we will venture to describe the mode we have adopted to prevent explosions of steam boilers.

MODE—To regulate the electricity and preserve an equilibrium, in relation to the inside and outside of the boiler, so far as positive and negative principles go, we intend to insert metallic conductors, insulated or otherwise, as the case may require, either in the boiler alone—the ends of which shall be below, or above the water line; and so arranged that they shall form a complete or broken circuit, moveable or otherwise; or to connect the steam chest, condenser, &c., with the boiler, longitudinally or transversely, &c., as experiment may further demonstrate; said metallic conductors to be tubular, solid, ribbon, or spiral-shaped, as may hereafter be deemed expedient.

Also a chain or some other metallic conductor, communicating with the boiler or with the other conductors, so arranged that an electrometer, and a prime conductor, &c., can be made permanent and sheltered, being at the same time in full view of the engine room and engineer.

Also, in connection with those, we intend to add a movable or fixed pointed conductor or conductors, and so placed that an excess of the electric fluid may be drawn off silently, when the engine is at rest, &c. The correct distances of those conductors can only be ascertained by repeated and prolonged experiments.

The whole to be so fixed that they will neither disfigure the machinery, nor be at all in the way.

GENERAL REMARKS.—1st. If oxygen should be partly absorbed, by the red hot flues, and the hydrogen should not re-act upon the black oxide of iron, will it combine under peculiar pressure, and temperature with the water and steam, and form a new compound? If so, what will be the properties of that compound, and what variations will be produced in its conducting powers? If oxygen, hydrogen, and atmospheric air exist separately, will electricity cause them to re-unite explosively?

2nd. The water pumps form a metallic connection with the boiler, still, if they are not perfect conductors, the electric fluid, in the boiler, if in excess, may find a shorter path, as in similar cases of imperfect conductors.

3rd. May not the sudden introduction of water upon the red hot flues, by assuming a spheroidal form, increase the intensity of the electricity, and an explosion result from the same, and after the engine being at rest, will not the stroke of the piston produce vibration, recoil, &c., in the boiler?

4th. Is it not often the strongest part of the boilers, through which the explosion has taken place? Even while they have a proper supply of water.

5th. Chlorine can only be generated in marine engines, and only by negligence, in allowing the water to become too low in the boiler, as mentioned in the preceding hypothesis.

6th. Is not electricity the principle of latent heat? Will not its extraction from water, (other things being equal,) diminish the temperature of the latter? Will not the converse hold good?

7th. We are aware that most all the dangers mentioned in our theory arise from negligence and over-pressure. But if it be possible to counteract those evils completely, in the manner we have proposed, much good will result both in the saving of life and property.

8th. If magnetism and electricity should be discovered to be latent heat, set free by evaporation, &c., whereby the temperatures of fluids are diminished, will not an established current of electricity in the steam boiler preserve a greater uniformity of heat, and at a less cost.

9th. Is not electricity the phlogistic principle also? And can combustion take place without the evolution or absorption of that fluid.

10th. There are two important points in our theory, which we wish to be clearly understood: first, too little water in the boiler, producing decomposition, &c., as before mentioned; and, second, by not blowing off steam, at a certain pressure, &c., when the engine is stopped; because the emission of steam prevents an accumulation of the electricity in the boiler.

11. We do not presume that our mode and theory are without defects. The subject is too vast, too occult, and its phenomena too varied, to be demonstrated mechanically or committed theoretically on a few sheets of paper; much has, however, been accomplished—much more will, no doubt, be yet discovered. By degrees we approach nearer the truth, and may, ultimately, arrive at both cause and consequence, and at the same time disarm steam of its terrors.

Medical Discovery.

Our moustached friends will be glad to learn that the London National and Military Gazette has made the discovery that the wearing of moustaches is conducive to health. It affirms that the moustaches, acting as a part of the breathing apparatus, absorb the cold of the air before it enters the nostrils, and are consequently a preservative against consumption. Hence it follows, according to the Gazette, that the regiments which wear moustaches are much less subject than the others to diseases of the chest.

Flax, its Cultivation and Manufacture.

Last week we published a very interesting article from the pen of Mr. Leavitt, of Maysville Ky., on the subject of "Linen." In it, he advances the doctrine that America may yet become the greatest country in the world for manufacturing linen. At present, we believe there is not a single *skein* of fine linen yarn, or a single yard of fine linen cloth made in our country. This is rather singular, and not very creditable to us, considering the great amount of flax which is cultivated. In some of the rich districts of Ohio, particularly in the Miami valley, this branch of agriculture is carried on to a great extent. The average yield of seed is ten bushels per acre, though in some instances it reaches fifteen bushels. The ordinary price per bushel where the seed is principally sold and the oil extracted from it, is eighty cents to a dollar; but last year, owing to the scarcity, the price ranged from a dollar and ten cents to a dollar and forty cents per bushel of 52 pounds. The amount of seed worked up in the city of Dayton, Ohio, annually, is put down down at 150,000 bushels. There are five mills, which altogether use ten hydrostatic presses, some of them having a power of 1,000 tons each. The oil is principally sent to Cincinnati and thence to New York, and the oil cake is exported to England, where it brings $40 to $50 per ton, and is used for fattening cattle and sheep. In other countries the seed and oil is generally subsidiary to the stalk, it is different with us. In every other country, flax has been cultivated for its adaptation to to the manufacture of cloths. Records of the linen manufacture have been preserved from the earliest ages of the world. The fine linens of Egypt occupy a place in the oldest works, and formed the subject of commercial traffic when the Indumens and the Ishmaelites were the rival merchants of the East. Specimens of their manufactures in linen have descended to the present age.

Flax is not a plant of difficult growth. It requires good land and careful cultivation, but it well repays their employment. It grows over a wider surface of the world than any plant of a similar character that could be named.

Any individual acquainted with paper manufacture, is aware that the product from linen rags is stronger than that from cotton; and while the introduction of cotton in the manufacture of textile fabrics has been a very great blessing to all, and especially to the industrial classes, yet it has not improved the strength of printing and writing paper.

Our American paper cannot, in general, compare with that made in England. Ireland is the greatest country in the world for the quantity of linen cloths made. It is estimated that the linen trade of Great Britain and Ireland amounts to more than £12,000,000 sterling per annum (near $60,000,000). A draw-back upon this is the price for the raw material, a great deal of which is raised in America. The cultivation of flax is becoming more extensive than ever, in Ireland, and hopes are entertained that they will be able to supersede cotton in a great measure, with a raw material raised in Britain. The annual importation of foreign manufactured flax goods into our country cannot be far from $10,000,000 in value—a great amount, truly, and which should cause every reflecting person to pause and enquire, "cannot we manufacture this beautiful fabric ourselves?"

The Manchester spinners are in hopes that they will be able to spin fine flax on their cotton machinery, but we do not believe they can. They say, "we used upwards of 770,000,000 pounds of cotton last year, or about 1000 tons per day," and they are afraid to be so dependent, as they have found themselves to be, on cotton. It is time at least, that we devoted more attention to the manufacture of flaxen fabrics—if we never commence to make, we never will make.