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PATENT CLAIMS AND PATENT BUSINESS.

It is our intention, hereafter, to publish the official list of claims of patents one week earlier than usual.

In this connection we would also state that, owing to the large increase in our Patent Office business—which amounts to nearly one half of the entire business of the country in this line—we are obliged to increase our facilities. We have secured valuable and experienced assistants in this department, and are now better prepared than ever before for a large addition of cases, and a correspondingly prompt attention to them.

Through our efficient Branch Office at Washington we have made nearly eight thousand preliminary examinations into the novelty of new inventions. We have efficient assistants constantly at the Patent Office giving personal attention to our cases; and thus, with our additional force, we shall, as heretofore, give every possible facility to all inventors who intrust their cases in our hands.

TYNDAL ON BOILER EXPLOSIONS.

The remark of Tyndal, which was used by one of the witnesses on the inquest into the *Chenango* disaster, to support his theory of boiler explosions has, in fact, no bearing on that theory.

It is a well-known fact that when water has been deprived of its air, by boiling or otherwise, its boiling point is raised much above the temperature at which it boils in its ordinary condition. But in order to prevent it from boiling at this high temperature it must be kept in a perfectly quiescent state; as soon as ebullition commences, enough of the liquid flashes into steam to absorb and render latent the surplus heat in the water, and bring it down to the ordinary boiling temperature.

Tyndal, in his recent work on heat, drops the remark in passing that this property may account for some boiler explosions; and there is certainly force in the suggestion, though it could apply to those cases only in which the boiler bursts at the instant of starting the engine.

But water is very different from superheated steam as a reservoir for heat. At a pressure of 33 lbs. to the square inch a pound of steam occupies 758 times as much space as a pound of water, and as it takes about twice as much heat to heat a pound of water one degree as it does a pound of steam, a cubic foot of water holds 1,500 times as much heat as a cubic foot of steam. It is true that steam holds a large quantity of latent heat which would be given up if the steam was condensed to water, but if this operation should take place it would reduce the pressure and prevent an explosion.

HOLES IN FURNACE DOORS.

Nearly all the fires that are seen in the common operations of life are the burning of hydrogen or carbon; this burning being the combination of these elements with the oxygen of the atmosphere. In examining the chemistry of our ordinary fires, therefore, we have three elements to deal with, hydrogen, carbon, and oxygen. The proportions in which they combine are of course in accordance with their atomic weights. The atom of carbon weighs 6 times as much as the atom of hydrogen, and the atom of oxygen 8 times as much.

Hydrogen—	H	atomic weight, 1
Carbon—	C	atomic weight, 6
Oxygen—	O	atomic weight, 8

In burning, 1 atom of hydrogen combines with 1 atom of oxygen to produce 1 atom of water. Water, therefore, contains 8 lbs. of oxygen to 1 of hydrogen.

Carbon combines with oxygen in two proportions. One atom of carbon combines with one atom of oxygen to produce one atom of carbonic oxide. And one atom of carbon combines with two atoms of oxygen to produce one atom of carbonic acid. Thus by the action of fire the three elements are combined to produce three compound substances.

HO—Water	atomic weight,	9
CO—Carbonic oxide	atomic weight,	14
CO_2—Carbonic acid	atomic weight,	22

The second atom of oxygen in carbonic acid is held with much feebler affinity than the first, and is taken away if brought in contact with carbon at a high temperature; thus reducing the carbonic acid to carbonic oxide, and forming a second atom of carbonic oxide.

$$CO_2+C=2\ CO.$$

When air enters a mass of burning coals at the bottom, its oxygen burns the carbon with which it first comes in contact into carbonic acid, and as this gas struggles upward through the mass it is reduced to carbonic oxide. The oxygen that is set free then combines with the carbon of the coal to produce a further supply of carbonic oxide.

If this carbonic oxide on its escape from the mass of coals finds no free oxygen, it passes away into the smoke-stack and escapes unburned into the atmosphere. But if the space in the furnace above the coals is filled with atmospheric air at a high temperature, each atom of the carbonic oxide will combine with an atom of oxygen, forming again carbonic acid.

It has been ascertained by careful experiment that a given quantity of carbon will generate more than three times as much heat by being burned to carbonic acid than it will by being burned to carbonic oxide. According to the latest determinations of Andrews 1 lb. of carbon in burning to carbonic oxide will heat 2,228 lbs. of water 1 degree, and in burning to carbonic acid it will heat 7,900 lbs. 1° (centigrade).

It has also been ascertained by direct experiment that when the ultimate products of combustion are the same, the amount of heat generated is the same whatever decompositions and recombinations may take place in the course of combustion.

It is only in badly-constructed furnaces that a very large portion of the carbon goes away as carbonic oxide, and that consequently a corresponding economy would be found in making holes in furnace doors. But the above facts in the chemistry of burning show the great importance of perfect combustion.

A VERY curious book has been published by Trübner, the well-known English publisher, on the "current gold and silver coins of all countries," with nine hundred *fac simile* illustrations in silver and gilt. Among the curious facts which it brings out is the one that the Austrian dollar coined at the present day is the exact copy of the dollar of Maria Theresa, of 1780, then struck for the Levant trade.

WE are indebted to the Hon. James Brooks for a copy of the new Navy Register.

BEARING SURFACES.

The economical working of machinery depends upon many things—the care observed in using it, the material employed in its construction, and, lastly and chiefly, the proportions of the design; for good workmanship, material and careful supervision may, for the purposes of discussion, be assumed. The resistance of every machine is very greatly increased or diminished according to the harmony of proportions existing between the several principal parts. The labor of the shaft, the burthen on the beam, the wear and tear of cylinders and packing rings, the duty borne by the guides in sustaining or directing the cross-head, all these points have some importance in the general economy of a steam engine. So also does want of proportion affect the performance of other machines when transferred to them, and the best test of durability, and as a sequence, economy, is found in engines which have run for years without repairs—equal engineering skill and similar conditions being assumed for the purpose of comparison.

If we examine the V-shaped slides of a planing machine we shall find that they do not wear equally, considered through their cross-sections, and that in most cases the points which wear the most are nearest the top of the slide or at its apex. The base on each angle is always the brightest, showing that the most friction occurs at those points. One reason for this may be found in the shape of the wearing surfaces; the form is so unfavorable to lubrication that oil will not remain upon it very long, but runs down toward the lowest parts, carrying with it the dust that may have settled on the slides. Instead of making the slides in this way, it would seem a better plan to cut off the top of the triangle (considering the slide through its cross-section) so as to transfer a portion of the wear which the lower parts of the inclined sides sustain, to a flat or plane surface. By this method of construction, which is often practiced on the shears of lathes, the wear would be more equal and even, and the slides would last longer without replaning. Many makers of planing machines extend the base of the slides very much, so as to make wide and heavy bearings, and this plan has been found to answer well on large machines. We once saw a planer with slides which were semicircular or rounded on the top and they worked very badly indeed. The sides of the semicircle, if we may use such an expression, wore off much quicker than the top, and the consequence was that the surfaces in contact never fitted.

The journals of steam engines are very often made convex in their axial length, some are made concave, and still others have coned bearings to certain parts. These plans are all defective for these reasons:—the wear is unequal because the velocity of the surfaces in contact is unequal; the pressure upon the bearing is not the same throughout the surface; the lubrication is imperfect, because the oil flows from the highest to the lowest points, so that in a short time the greatest diameters are left dry unless more oil is poured on than a journal of similar size properly made should have. Any departure from a true cylindrical surface is costly to manufacture, while the use of such journals is not attended with advantages sufficiently great to counterbalance their evils except on traction engines, some parts of quick-working screw engines, or places where great strain is liable to be thrown on the parts connected—as in long connecting rods or self-propelling engines for common roads.

Quick-working screw engines, having short strokes and the crank shaft so near the cylinder-head that it makes the latter squint-eyed to look at it, wear down their gibs in the cross-head (when they have any) most rapidly, and no remedy for this appears to exist but to make the gibs either of hard-wood boiled in linseed oil or else brass, disproportionately large for the area of the piston. Wooden gibs wear while the slides do not, which is a very important advantage. We have seen the gibs of a cross-head belonging to a direct-acting vertical screw engine (said gibs being of brass, about 14 inches long by 8 inches wide) worn down nearly three-quarters of an inch on their face in going from this port to Savannah, Ga., in spite of all the oil that could be poured on, or attention that could be given them; it may be proper to state that the cylinder was about 50 inches in diameter and the stroke 48 inches. As an economical substitute for small brass boxes, lignum-vitæ boiled in oil or