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#### EXPLOSIONS DUE TO LOW WATER.

In our issue of March 8, we published an article in which we exhibited the fallacy of the popular ideas relating to the consequences of low water in steam boilers, and showed how collapse, even, might occur as a result of this condition. We related a case, as described by a correspondent, in which collapse actually took place. We explained the manner in which explosions might, under some circumstances occur, and, in conclusion, summed up our argument in the statement that overheated surfaces, where low water had occurred, might produce either explosion or collapse, or might cause no dangerous result, according to the peculiar circumstances of the individual case. The question of a correspondent leads us to take up the special case of explosions caused by the increase of pressure which may be produced, in some cases, by the injection of feed water upon overheated surfaces.

In the article above referred to, we showed the possibility of cold feed water, entering a boiler filled with steam, producing the condensation of that steam and the consequent collapse of the boiler. Should, in any case, the feed water be too warm to produce instantaneous condensation, or should it be evaporated so rapidly as to supply fresh steam faster than condensation cou'd take place, an increase of pressure would ccur which might produce, and probably in many cases has produced, the explosion of the boiler.

Let us suppose, as an extreme case, a plain cylindrical boiler, of 42 inches diameter and 30 feet length, to have become completely emptied, by some accident, and then to have a supply of water forced in under the conditions last described. We may easily calculate what pressure of steam will be produced, if the feed water were boiling and the plates red hot, —conditions most favorable to increase of pressure. Such a boiler, if of quarter inch plate, would weigh not far from one and a half gross tuns. If the fire line were at the middle line of the boiler, about 1.800 pounds of iron might become red hot, were the boiler to become empty. Nine pounds of red hot iron were proved, by Professor Johnson and the Committee of the Franklin Institute in investigation of this subject, to contain heat enough to be just c...pable of evaporating one pound of water. Seventeen bundred pounds of iron might therefore evaporate 1800 = 200 pounds of water, under most favorable circumstances. This weight of water, occupying the full caracity of the boiler, 290 cubic feet, would benefit, which perhaps may accrue to a single establishment a stone thrown by hand is moved by a living force." He conluce a pressure of about 300 pounds per square inch. In one actual experiment by the Committee of the Franklin Institute. the pressure rose above 200 pounds per square inch, when it overcame the resisting power of a portion of the boiler, and they were unable to determine the maximum limit.

The case which we have supposed would, evidently, be likely to produce explosion, were the pressure not relieved by the safety valve; but it must be remembered that this is the extreme case, and one likely to be seldom met with. It will rarely happen that one half a boiler will be thus heated to a red heat, and that it will yield its surplus heat to heated and rapidly injected feed water; and even then it is only when the safety valve is inoperative that the pressure can reach the indicated figure. Suppose a boiler of the locomotive type to have its crown sheet similarly overheated, while a heavy pressure still exists within it, say 120 pounds. By similar calculation we can readily determine the increase of pressure. The crown sheet being, say 1 feet s uare and \$ inch thick, and the boiler containing 100 cubic feet of capacity above the then existing water line, the pressure, if unre-

nearly 800 pounds per square inch, except for one very important circumstance: that is, that saturated steam already existing would, as shown by experiment, be condensed by the slightest increase of pressure and, thus yielding before the newly developed vapor, the result would be that the pressure would really be but very slightly increased. It is far more likely that, in this case, the overheated crown sheet would yield from simple weakness, and that an explosion would result in tha manner, as has actually occurred under our own observation.

Our readers will be very likely to agree with us, we think, when we draw the conclusion that the statement that "water coming in contact with red hot iron creates a gas ten times as explosive as the best gunpowder" requires some modification. Learning more precisely in what manner deficiency of water produces danger, those among them who have steam boilers under their charge will be able to act more intelligently in avoiding such risk.

#### INJUSTICE TO WORKMEN.

It is always the case among antagonistic parties that there are a few on either side who rush to extremes and, by their precipitate and ill advised measures, neutralize such satisfactory adjustment of the question in dispute as might be effected through the efforts of the more cautious and conservative majority. We have given a multiplicity of instances of the imprudent proceedings of trade associations, and have repeatedly condemned the coercive system which these societies have seen fit to adopt in order to compel the support of disaffected working men. From the following document, however, which we have recently received from a correspondent, it appears that the extremists are not all arrayed on the side of the unions. The Joliet Iron and Steel Company is one of the largest establishments of its class in Illinois, as will be seen from the description printed in another column.

### RECEIPT AND CONTRACT.

JOLIET, ILL., February Received of Joliet Iron and Steel Company, the full amount due me as per pay roll for services rendered said company during the menth of Janu-

And for the consideration of the above mentioned. I do hereby agree that said company shall not be liable to me (nor my heirs, executors, administrators, or other persons who may be dependent upon me for support in case of my death) for any damage or accident resulting or occurring tome while in its employ, whether caused by the negligence or carelesaness of any of the officers or employees of said company, or from any other cause whatsoever. And that said company shall have the right, at any time, to discharge me from its employ without notice.

Further, that I will continue in the employ of said company from month to month at the current rate paid by said company for the class or kind of work done by me, and not leave the employ of said company or refuse to perform my daily duties without fourteen (14) days notice in writing of such intention to the superintendent, foreman, or the person under whose orders I am employed, previous to the time of leaving or failing to perform my

And in consideration as aforesaid, I do further agree that in case I fail to comply with the conditions last aforesaid, that I will forfeit all moneys earned by me and remaining unpaid at the time of such fallure on my part to comply with the terms of this contract.

Although it is possible that this contract may be legally valid under the statutes of Illinois, we doubt whether its terms would receive a rigid interpretation from any court or be enforced through any jury. It is plainly inequitable, inasmuch as it gives to the employer rights which it denies to the employee, and places the latter in a position in which his means of support may be at any moment taken from him without warning, and without leaving him any mode of redress. That this power may be so used as to cause great hardship is clearly obvious, while the system of requiring men not only to give their time and labor, but to bind themselves by such oppressive obligations, for the simple and single consideration of their already faithfully earned wages, ms to us wrongful and highly unjust. "The laborer is worthy of his hire," and although employers have a perfect right to regulate the quantity, quality, and manner of performing his work, they should not take advantage of the necessity which impels a man to toil for the existence of himself and his family, to impose upon him extreme conditions which, were he less dependent, he would unhesitatingly refuse.

We cannot too strongly protest against the adoption of such a method of governing workmen as the above would signify, and we would earnestly advise its discontinuance. It is on such proceedings as this that the harangues of the is a hundredfold outbalanced by the obstacles thus thrown in the way of those who are striving to reach a fair and equitable adjustment of the question of labor reform.

It seems to us that the coercion in this case is as evident and in every respect as much to be condemned as that exercised in the contrary direction by the unions. Indeed, if employers adopt this course, with their restrictions on one hand and those of his society on the other, the future of the working man is at best sadly unpromising.

## PROPOSED NEW PATENT LAW IN ENGLAND.

A committee of London patent agents has prepared a bill for a new patent law, the passage of which through Parliament is proposed. It is a sort of a patent hash, having been made up, apparently, by means of scissors and paste, its components being derived, in small items, from the patent laws of various countries. It provides that the present set of supernumerary officials, the "Lords and Commissioners," shall still remain in office, to draw their salaries for that is all they have done or are expected to do. To this gallant body, a corps of six new members are to be lieved by the safety valve, would, in this example, rise to added, with salaries varying from \$7,500 to \$10,000 each.

Some items are then taken from the American law. Examiners are to be appointed, all cases are to be examined as to novelty, and rejections made when the examiner thinks proper. This officer may summon the applicant and compel him to make such amendments as he may require. The present burdensome patent fees are to be retained, while another section provides that the patentee shall be compelled to grant licenses for the use of his invention, on such terms as the examining committee may think proper; and they are to be determined by a judge, without a jury, who may call in examiners, if he desires, to assist him. Items from the Austrian and continental systems are introduced, requiring that the invention shall be worked within a specific time or the patent rendered invalid.

The grant of patents to the first applicant, whether inventor or introducer, as at present provided, is prohibited, and patents are only to be granted to the inventor or his authorized agent.

The last mentioned clause is the only really sensible improvement that the bill contains. The effect of the other provisions will be to place difficulties and troubles in the way of inventors, without conferring benefit on anybody. We are surprised at the stupidity which this proposed bill ex-

What is needed for the encouragement of the useful arts in England, and in every other country, is:

First, the publication in cheap and popular form of the drawings and specifications of all patented inventions, so that the people may become fully informed as to what is doing or has been done in the arts.

Second, the reduction of the fees and the forms for obtaining patents, so that the masses of the people, who are poor, but among whom the real thinkers and inventors are to be found, may readily secure patents for their new ideas.

Third, the placing of the entire control of the patent, from the day of its issue to the close of its term, in the hands of the inventor, to be his property, to be used as he thinks proper, subject to no compulsion or other official interference.

Nearly all of the changes proposed in this bill are steps in a backward direction, not an advance in keeping with the spirit of the age. The present British law is immeasurably superior to this one now proposed. Indeed the existing law is admirable in nearly every respect and works admirably. Almost the only change it needs is a reduction of the enormous patent fees it now requires, and the limitation of the issue of patents to inventors only.

### PSEUDO SCIENCE.

We have before referred to the fact that mere reasoning. not based on sufficient observation of Nature, almost always leads to false conclusions and baseless theories, that this was the main fault of the ancient philosophers, and is still the fault of that class of moderns who labor under the serious disadvantage of deficient mental training; we have also asserted that docility to Nature's teachings and a liberal amount of resignation of our own speculative faculties are the real means to come to the knowledge of the truth. Even some of the most eminent men have erred in this way, and are lasting monuments of warning against mere speculation; one such is no less a personage than the famous German philosopher Emanuel Kant, who risked himself on the field of mechanics so far as to write a volume on dynamics, or, rather, on a false imaginary theory of motion, which he calls dynamics. We will only point out a few of his errors:

Kant had evidently never been instructed in regard to the resistance of motion by friction, and he was ignorant of the fact that all motion, once imparted, would continue in the same direction as long as it was not prevented by other causes, of which friction is the most common and, on the surface of our earth, the permanent cause which finally arrests all motion. Having no conception of this, but imagining that force must be a metaphysical immaterial thing which can be communicated to matter, he distinguishes two kinds of force, living force (vis viva) and dead force (vis mortis), and he illustrates these two forces by the following experiment: "When a book lays on the table," he says, "and I push it forward with my hand so slowly that it stops mov ing as soon as the contact of my hand ceases, I give it only a dead force; but when moving it with such violence that it leaders of strikes and labor uprisings find a substantial continues its motion after the contact of the force-giving besis, which lends to their arguments a weight with men who hand has ceased, I give it a living force. So a heavy box or otherwise would fail to be moved by them. The doubtful trunk, dragged over the floor, is moved by a dead force, but siders that a body, when moving it without contact of moving force, possesses the force viva, the living force; and the conclusions he further arrives at, being based on such false premises, are, of course, totally at fault and contrary to experience and even, we dare say, to common sense.

If Kant had discussed this matter with a good physicist of his time, and obtained some information on the subject of friction, and absorbed this information, in place of exclusively indulging in his own fanciful and groundless speculation, he would never have published his volume on dynamics, which must injure him in the eyes of all impartial investigators. It shows how superficial a thinker Kant was after all: it raises the suspicion that if he was not more correct in his metaphysical reasonings than in his plain physics, he does not deserve the confidence of his readers, and his conclusions may go for naught.

Another illustration of a similar nature is Goethe, who in the latter years of his life had a notion to study optics, and wrote a volume on light and colors, in which he proves that he had not the least capability of making experiments, and was still more deficient in his powers of observation. His conclusions are almost all false; he is perhaps worse than