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OBJECT LESSONS IN CENTRIFUGAL FORCE.

Some years ago, before the railroads had begun to replace the light rails with rails of heavier section, and at the time when the development of the locomotive had reached a point where the concentrated axle loads were greater than the track was well able to carry, it was found that the passage of a train at high speed was liable to produce a serious distortion and permanent set of the rails. In one particular case, after a new and unusually heavy engine, hauling a special train at excessive speed, had passed over a certain stretch of track, it was found that the rails had been bent vertically, the depressions occurring at regular and evenly-spaced intervals. Inquiry into the cause developed the fact that the locomotive carried a large amount of excess balance, that is to say, the reciprocating parts had been so completely counterbalanced that there was a large excess balance in a vertical direction, which resulted, at the high speed at which the train was running, in a vertical hammer-blow, whose downward effect was sufficient to depress the rails beyond their elastic limit, and leave them permanently distorted. The best practice to-day is to reduce the weight of the reciprocating parts to the lowest limit consistent with safety, and then counterbalance only a certain proportion of these weights.

In stationary and marine engine practice, where the engine is bolted directly either to a massive foundation or to the rigid structure of the ship, the necessity for careful balancing is not so pressing, the effect of the unbalanced weights and moving parts being absorbed by the inertia of the whole mass of the foundation of which the engine forms practically a part. So long as an unbalanced engine is controlled within the speed of rotation for which it is designed, no serious effects are to be feared from the unbalanced reciprocating weights; but should a powerful stationary or marine engine get beyond control and run away, it can readily be understood that the tremendous forces developed may reach a point at which the engine will be either ruptured internally or torn from its foundations. An examination of the engine room of the "St. Paul" shows conclusively that it was the effect of the massive unbalanced reciprocating parts, revolving at a speed which is estimated as having been anywhere between 250 and 350 revolutions per minute, that was the immediate cause of the break-up of the engine. Centrifugal forces which are negligible at a speed of 90 revolutions a minute become resistless at three or four times that speed. On the lower half of the revolution the downward hammer-like effect of the unbalanced weights took the form of a blow directly upon the mass of the main bearings, the engine-bed and the heavy cellular structure of the hull; but on the upward half of the revolution, the blow had to be resisted by the caps and holding-down bolts of the main bearings of the crank shaft. The strength of the chain is always the strength of its weakest link, which, in this case, proved to be the threads of the crankshaft bearing bolts, which were entirely stripped, allowing the caps and the crank shafts to be torn loose from the bearings. As there was normally only a slight clearance between the pistons and the cylinder heads, the pistons during the next revolution struck the cylinder heads of the high and low pressure cylinders, knocking them out, and smashing the cylinders themselves.

The rapid increase in rotational speeds which is taking place has concentrated the attention of engine builders, particularly in marine work, upon the question of balancing, and the Yarrow-Schlick-Tweedy system, of which we hear so much in these days, was devised to overcome this difficulty, and seems in the vessels which have adopted it to be a very marked success.

ARMOR CONTROVERSY FINALLY SETTLED.

The Navy Department, the manufacturers, and the country at large are to be congratulated that the miserable armorplate controversy which has been the cause of so much regretable delay in the construction of our new navy, is at last amicably settled. The origin of the trouble was the outcry on the part of a few ill-informed members of Congress that the armorplate manufacturers were realizing excessive profits on their output; and it was due to the general lack of information and intelligent interest in the subject that resolutions were put through Congress reducing the price to be paid for future armor to a figure so low as to be positively ridiculous. The manufacturers claimed, and we think justly so, that the high price demanded for their product was justified at the time by the fact that the first outlay for their plants was enormous; that the returns upon this outlay were primarily dependent upon the caprice of Congress, which might or might not authorize the construction of ships; and also that the risks of manufacture in a process so complicated and liable to mishap as that of the manufacture of face-hardened armor were so great as to necessitate the asking of such prices as would not only yield a fair profit, but also cover, in time, the enormous sums expended in the erection of the plant.

The latest bids put in by the Carnegie and Bethlehem companies have been accepted, the price agreed upon being $420 per ton, the government to assume the liability for royalties to be paid to the Krupp firm for the use of its process of face-hardening. No less than fourteen warships are affected by this contract, the total amount of armor called for being 36,217 tons, and the total cost of the same $16,000,000, including royalties. The first deliveries under this contract will commence in about six months' time, and in the case of the majority of the ships, it is likely that no serious delay will occur. The armor produced under the Krupp process will have a resisting quality, weight for weight, from 20 per cent to 25 per cent greater than Harveyized armor. Our new vessels will thus not only be saved from the stigma of carrying an armor which at the time they are completed would have been fully seven years out of date, but with equal defensive powers they will be ton for ton proportionately far more efficient than if they had carried the now obsolete Harvey armor.

BOGUS PATENT ATTORNEYS IN GREAT BRITAIN.

A recent edition of The London Times contains a statement of the bankruptcy proceedings in the case of a certain Percy R. J. Willis, described as a consulting engineer and draughtsman, of Church Court, Old Jury, London. It seems that "according to the statement of the bankrupt he commenced business in 1890 as a patent expert in partnership with a William Martin, the business being conducted as Martin & Willis, and as the International Patentees' Agency." It seems that "he and his partner also used the name of Donald Cameron in carrying on their so-called patent business," and it transpired under cross-examination that Willis was quite prolific in the use of names, figuring at different times as Sydney Estcourt, the International Patentees' and Finance Company, The Universal Patent Disposal Company, etc. His *modus operandi* was as follows: "The names of inventors in the United States having been ascertained, he sent out to them a number of circulars containing invitations to remit money for the purpose of having provisional patent rights granted to them in Great Britain." He seems to have received "a large number of remittances with instructions to protect the inventions specified. In 553 instances the remittances were not so used, and the statement of affairs which he had filed in his bankruptcy proceedings showed that sums amounting to $11,385 were probably due to inventors in the United States and Canada for money so sent to his firm and absorbed in business expenses."

Percy R. J. Willis is one among an all-too-numerous class of bogus patent attorneys in Great Britain, whose operations have no other object than that of thievery. Unfortunately, at the present time the laws in Great Britain are such that it is open to anyone to style himself a patent agent in that country, since he does not necessarily have to qualify for the position. Hitherto it has been difficult to reach these swindlers, for the reason that the bulk of those who intrust them with money are residents of the United States, and do not care to go to the trouble of prosecuting, or of assisting the Institute of Patent Attorneys of Great Britain in carrying through a prosecution.

There is a movement afoot in Great Britain, just now, to protect inventors from the fraudulent practices of unprincipled patent agents who are not on the registered list of the Comptroller of Patents. At present there are about 250 agents registered by the Patent Office, and their official recognition is a sufficient guarantee of their integrity. Should they be guilty of any misdemeanor, their names are immediately erased from the register. The object of the movement now in progress for the protection both of the inventor and the reputable patent agent is to give the Comptroller authority to prevent any one acting in the capacity of a patent agent, unless he is satisfied as to the agent's probity. The problem has been up for discussion on several previous occasions, and it seems that even Lord Herschel's committee was unable to suggest any practical method for efficaciously stamping out the abuse. The scheme referred to is receiving the hearty support of the registered patent agents in Great Britain, who are naturally desirous of protecting their own reputation. An English correspondent says: "The matter can be greatly assisted by American inventors if they are careful to intrust the securing of British patents only to responsible agents in this country."

THE ANNUAL MEETING OF THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS.

The annual meeting of the Society of Naval Architects and Marine Engineers was held last week at the Engineers' Club, 12 West 31st Street, in this city, under the presidency of Mr. Clement A. Griscom. In his opening address the President referred to the present year as having been the most prosperous in shipbuilding in the United States since the outbreak of the Civil War, and he expressed his conviction that the coming century would witness a development which would be fully equal to the high hopes of the members of the Society when it was founded. During the fiscal year which ended in June last, eighty steel steam vessels of 168,000 gross tons were built in the United States. The significance of these figures was best understood by a comparison with the record of the previous nine years, during which the United States built only 575,000 gross tons of the same types of vessels. All the shipyards have been busy, every large plant has increased its capacity, and several new yards have been established and equipped for the construction of the latest merchant and war vessels. The president was followed by Charles H. Cramp, of Philadelphia, who read a paper on the performance of the Russian cruiser "Variag." The excellence of design and construction was proved, he said, by the fact that over a 10-knot course, with 18,000 indicated horse power, the vessel maintained a speed of 24 knots, while with 16,000 indicated horse power it maintained a speed of 23¼ knots for twelve consecutive hours.

Naval Constructor D. W. Taylor read a valuable paper describing the model basin in use at the Washington Navy Yard. Referring to the designs for our five new battleships, and the fact that the limitations of draft imposed rendered the problem of securing adequate speed proportionately difficult, he said that the navy was to be congratulated that it was in possession of such a thoroughly equipped testing basin, the existence or which was due to the persistent efforts of the Bureau of Construction and Repair. Naval Constructor Woodward described at length the tests of electrical plants on the battleships "Kearsarge" and "Kentucky." It seems that the main turrets were turned from extreme starboard to extreme port in 53·4 seconds, and that the full charge for the 13-inch gun was hoisted and lowered between the handling room and the gun electrically fifty consecutive times at the rate of one round trip per minute. Besides the members present there were a number of foreign guests, including Lieutenant-Commander de Faranand, of the French Navy; Lieutenant-Commander Von Rebeur Paschwitz, of the German Navy; Captain Stchensnovitch, of the Imperial Russian Navy, and others.

In subsequent issues of the SUPPLEMENT we hope to reproduce in full some of the papers.

CLOSE OF THE PARIS EXPOSITION.

The 12th of November, the last day of the Exposition, was marred by a cold drizzling rain, which kept the attendance down. The price of tickets dropped until five could be purchased for one cent, and they were finally given away in considerable numbers. Promptly at midnight the lights were cut off, and a cannon on the first story of the Eiffel Tower announced the formal closing. The event was celebrated in the afternoon in the Chamber of Deputies.

The official statistics show that the Exposition was a success, 50,000,000 persons having passed through its gates, against 25,121,975 persons in 1889. In the latter Exposition British and Belgian visitors headed the list as regards numbers, but this year the Germans came first and the Belgians second. Americans also formed a very noticeable contingent. The record day for attendance in 1900 was 600,000, as against 335,377 in 1889. The total cost of the Exposition just closed was somewhere between $40,000,000 and $60,000,000; the exact amount will not probably be known for some time. It is believed that this enormous sum has been returned indirectly in the increase of the treasury receipts, in the surplus of Parisian octroi duties, in the monuments remaining to the state or the city, and in the quays, bridges, and improved transportation facilities left by the Exposition.

The work of removing the exhibits began at once, and as soon as possible the buildings will be demolished, so the unsightly wreck at Jackson Park after our own fair of 1893 will not be repeated. No vestige of the Exposition will be left except the great hothouses on the north bank of the Seine and the Art Palaces. Many of the buildings, owing to poor construction, were already in bad condition on the day of closing. The nineteenth century has been a century of expositions, ten having been held in the last fifty years.