

present the patent solicitor is nearly exempt from supervision, the Patent Commissioner having the right to suspend him from practice for only the worst and most obviously dishonorable practices which come under his personal cognizance after the case is filed in the Patent Office. The raising of the standing of the patent solicitor to a high professional level and the maintenance of the character of the profession is a question of the first importance. The establishment of a patent bar, subject to proper extent of jurisdiction by the Commissioner of Patents, would at once do away with the evils described. Meanwhile the inventor can protect himself to some extent by consigning suspicious firms to the oblivion which they richly deserve.

WIRE GUN CONSTRUCTION IN THE UNITED STATES.

In its recent recommendation to the Secretary of War that an allotment be made from the experimental fund for the manufacture of a ten inch experimental wire gun, the Ordnance and Fortification Board has shown a commendable desire to keep abreast of the times in the matter of heavy gun construction. In view of the uniform excellence of the results obtained with the hooped guns which have already been built for the army and navy, it is natural that ordnance officers should have looked rather coldly upon the wire-wound gun, which is built upon a system so radically different from their own. The fact, however, that they are prepared to spend \$33,000 in the construction of an experimental weapon of the new type shows that they are fully alive to its great possibilities, and are determined to ascertain by practical proof the limits of its power and endurance.

On another page will be found drawings and a description of this gun, which will be sufficiently detailed to make clear to our readers the theory and method of its construction. While the subject is of great intrinsic interest as embodying one of the most brilliant applications of science to mechanics of the present day, it also has a very serious and practical value to the country at large. Recent developments in gun and armor construction—the high resistance of the one and the enormous pressures and velocities in the other—point to the universal adoption at no distant date of some system of wire-wound gun by the makers of the world.

The introduction of nickel steel and the Harvey system of face hardening has increased the resistance of armor plate so enormously that the foreign gun makers have been obliged to raise the velocity of the projectiles far above the 2,000 feet per second which was standard in foreign countries a few years ago, and is standard in this country to day. The value of high velocity was clearly shown last September at the Indian Head proving grounds, when two 6 inch Johnson shots were fired at a 10 inch reformed nickel steel plate. The first shot, striking at the standard velocity of about 2,000 feet per second, broke up on the plate with eight inches penetration; whereas the second shot, delivered at 2,500 feet per second, made a clean penetration, and was picked up comparatively uninjured. As an instance of the high velocities which are in use abroad, it may be mentioned that the service guns of the British navy develop 2,400 feet per second; Armstrong's guns, 2,642 feet; Krupp's rapid fire guns, 2,625 feet; and Canet's rapid fire guns as high as 3,281 feet per second, all of which, of course, represents a corresponding increase in energy and penetration.

Now there are two ways in which the velocity may be increased. The gun may be lengthened and the powder gases given a longer time to exert their elastic force upon the projectile, or the length may be left the same and a quick burning powder, exerting very high pressures, may be used. In each case the resulting velocity at the muzzle will be the same; the low pressure throughout the long bore producing the same ultimate acceleration as the high pressure throughout the short bore.

At first sight it would seem advisable, on account of its lighter weight and convenience in handling, to build the shorter type of gun and use the higher powder pressures; but as a matter of fact the makers of built-up guns have not been able to turn out weapons of that type that will safely carry such pressures; and they have been driven to the alternative of lengthening the gun, until in the case of such weapons as the Canet 4.72 inch rapid fire gun it has reached the absurd and unwieldy proportions of 80 calibers. The objections to such guns, especially on shipboard, are many and obvious. They are difficult to balance, require large turret space, and the abnormally long chase is liable to be struck by the rapid fire shells of the enemy. In addition to this, such long guns will be relatively very heavy. From the above considerations it is to be hoped that, when the United States adopts high velocities, as it must shortly do, it will not attempt to secure them by increasing the length of the gun at the expense of its handiness.

On the other hand, the alternative method of employing high powder pressures calls for a gun of great elastic strength. Where it is a comparatively simple matter to construct a weapon capable of resisting the 16 to 18 tons per square inch pressure of the built-up gun burning slow powder, it is another proposition

altogether to provide for the 25 to 30 tons pressure set up by the smokeless powders, and it is doubtful if the builders of hooped guns will ever successfully accomplish it. To give the necessary elastic strength to withstand such enormous strains, the metal of the gun must be subjected to an amount of mechanical working which the process of hooped construction will not admit of.

It is just here, in the mechanical manipulation which can be given to the metal of its segmental core and the wire wrapping, that the Brown wire gun is so admirably adapted for high powder pressures. The core has an elastic strength of 126,000 pounds, and the wire an elastic strength of 230,000 pounds to the square inch. The wire winding sets up such a high degree of initial compression in the segments of the bore that even under the highest powder pressure the compression at the surface of the bore will not be reduced to zero; that is to say, the interior lining of the gun will never be thrown into tension, and the pressure will be directly resisted by the wire wrapping.

Of course there are other questions besides that of power and handiness which will have to be considered, chief among which is that of endurance. This can only be determined by a prolonged series of tests such as the Ordnance Board is about to undertake. But if the segmental wire gun should develop no minor defects, it is certain that its enormous power in proportion to its weight will place it far in advance of the present style of gun. This is evident from a comparison of the proposed gun with the standard 13 inch gun of the service.

Style of Gun.	Caliber.	Weight.	Velocity.	Energy.
Hooped.	13 inch	60.5 tons	2,100 foot sec.	33,627 foot tons
Segmental wire.	10 "	30 "	3,000 "	87,800 "

Such figures as these speak for themselves, and further comment would seem to be superfluous; but we would point out in closing that by adopting the wire gun the Indiana, without reducing the energy per round of her main battery, would be able to put half of its present weight into larger coal supply or higher speed or better accommodation for her crew, and at the same time greatly increase the number of rounds which she could deliver in a given time. If the system were applied to her 8 inch and 6 inch batteries, there would be a proportionate decrease in weight and increase in efficiency.

DELAY IN FURNISHING COPIES OF PATENTS.

The recent reduction in the price of copies of patents, which went into effect July 1, 1896, has so greatly increased the demand that the Commissioner of Patents has been quite unable to keep the patent attorneys promptly supplied. In many cases these gentlemen have had to wait three or four days for copies which they required in prosecuting preliminary examinations and in other professional work for their clients, and as a consequence they have been blamed for a vexatious delay for which they were in nowise responsible. The commissioner admits the existence of this grievance, but says that he is powerless to remove it, for the reason that he has not the necessary funds to pay the extra force that would be needed to supply the copies as fast as they are required.

We think it is unfortunate that the finances of the Patent Office should be cut down to such a close margin that they cannot deal with a slight emergency such as this. A department whose operations are so far reaching should present some degree of elasticity in the matter of working expenses. The delays and losses which may arise from any kind of a deadlock in the operations of the Patent Office are of a nature that cannot be measured in dollars and cents, and we trust that this very serious exception to the otherwise admirable management of this department will be removed at an early date.

Dispatch and the general economy of time should be—as we believe in general they are—one of the first considerations in the planning and execution of the routine of Patent Office business; and as the present delay has grown out of special conditions, the public have every reason to hope that they will be promptly met and provided for.

Motor Cars on the Brooklyn Bridge.

The new electric motor cars to be operated on the Brooklyn Bridge, and which are to take the place of the old switching engines, are being tested, and so far have proved successful. On November 14 one of the twenty new cars was run over the bridge several times. It was tested by Chief Engineer Martin, who ascertained that from the time the bell sounded to the time the motor switched a train and got back on the siding ready for another train only forty-three seconds had elapsed, a saving over the old method of thirty-seven seconds.

It is Mr. Martin's intention to have the new motors put in operation on the bridge in a few days. The new power house will be ready about the first of the year, and then the motors will be run regularly, and trains will be run on forty-five seconds headway.

Experiments with Melinite at Avignon.

The experiments recently made at Avignon by the seventh regiment of engineers, by order of the Minister of War, are of great importance from a military view point. The object that the authorities had in view in trying them was to obtain an accurate idea of the effects produced by melinite when employed in large quantities, and to compare them with those produced by blasting powder.

It was necessary to proceed with extreme prudence, since it was a question of bringing into play 3,300 pounds of powder on the one hand and 2,750 pounds of melinite on the other. The ravages caused by powder were already known, but the same was not the case with regard to the effects of melinite employed in such a quantity, and the probabilities furnished by approximate calculations needed verification. So it was not till after a detailed study of the ground in different parts of France that the administration of war made its final selection and assigned to the seventh regiment of engineers the task of preparing for the experiments and carrying them out. The Ravine of Combes, situated at about four miles from Avignon, upon the right bank of the Rhone, fulfilled all the conditions required. The preparatory work, which was executed under the direction of Commandant Delort, was long and difficult.

The sinking of the three mine wells was likewise very laborious. Their sites were marked at the summit of the slope of three neighboring hills, with an interval of a hundred yards between the first two wells and a slightly greater distance between the latter and the third. They were square in section and 26 feet in depth. At their lower part there was formed a large chamber capable of holding thirty cases, each containing 110 pounds of explosive.

The first two explosions took place on the same day (Saturday, October 10), between three and four o'clock in the afternoon. It was not till the evening of the preceding day that the 3,300 pounds of powder that were to fill one of the mine chambers and 2,750 pounds of melinite that were to fill the other were brought from the arsenal of Avignon to the ravine. Around each well, within a radius of 500 yards, had been placed a cordon of sentinels to prevent the curious from venturing too near.

At a signal given by a clarion, an electric current sent from the barracks ignited the powder in one of the mines. A strong detonation and a prolonged rumbling due to the fall of the disintegrated rocks was heard, and then a great column of smoke ascended and spread above the mine were crushed and thrown down, and the paths that gave access to the mine disappeared under the accumulated debris. A wide opening had been made in the rock, and upon the opposite side and at the bottom of the ravine were piled up masses of blocks that in some cases were 35 cubic feet in bulk. The road was buried under a layer of stones several feet in thickness, every trace of vegetation had disappeared, and the general aspect of the ravine was completely modified. The detonation was not heard at Avignon.

About an hour afterward the second explosion took place, that of the chamber charged with 2,750 pounds of melinite. It was more violent than the preceding the noise of it was distinctly heard at Avignon, and the earth was sensibly shaken at 500 yards from the mine.

The ravages caused by the melinite were appalling; less so, however, by reason of the materials displaced than by the extreme degree of comminution to which they had been reduced. Here there were no more blocks; nothing but a formidable heap of bits of rock, very few pieces reaching the size of the fist. What is a singular and unexplained fact is that upon the side of the ravine opposite that which directly suffered from the explosion the thick stratum of debris was arranged as if it had been formed by three jets directed in a parallel manner. Another point to be noted is that fissures and crevasses were exhibited for quite a wide extent around the mine. The rocks disturbed were in a state of unstable equilibrium, and the least shock sufficed to precipitate them into the ravine, where they broke up into innumerable fragments.

The experiment of October 13, that with the third mine, charged with 2,200 pounds of melinite, was no less interesting.

The consequence of the smaller charge was that the rocks were not so greatly comminuted. Nevertheless, it was easy to be seen that the debris around this mine was much more divided and more regular than that which strewed the ground in the vicinity of the powder mine.

This explosion offered a striking spectacle. At the moment of the detonation a sort of crater opened upon the hill, and, like a volcano, vomited up an enormous mass of debris, which, ascending like a wheat sheaf jet to a great height, amid an immense cloud of smoke fell back in a shower with the noise of thunder. A few seconds afterward the ravine exhibited the aspect of an indescribable chaos. The shrubs had been literally chopped in pieces by the volley of stones.