either sharper than the *Warrior's*, out of shape, or else her plates must be heavier; over so vast a surface the thirty-second part of an inch would make a great difference in weight. It is certain that the loss in speed is not occasioned by the working of the engines, as they fully maintained the reputation of their builders; the loss then is due to the ships' hull, and to find the exact reason whether it may be referred to the immersion or to the bottom, it would be necessary to lighten, trim, set her propeller at the same pitch and try her again under exactly the same circumstances (or as nearly as possible the same) as attended the *Warrior's* trip. With reference to speed under steam much ignorance prevails. If a ship is said to have made 14 knots per hour, this is supposed to indicate her future speed at sea; there never was a more fallacious supposition. From all speeds made at the measured mile 1½ knots may be deducted; the remainder giving the vessel's best speed at sea, with clean fires, good fuel and the ship in fact pushed to do her best. Taking the average at sea, two knots may be deducted from the measured rates; the reason is plain: at the measured mile she burns the best picked fuel, her fires are manned by picked men, and the trial is only made under the most favorable auspices. When the *Warrior* made her 14.354 knots at the measured mile, her average sea-speed was set down at 12½ knots per hour; this, when in good order, is her true rate. The *Black Prince* concluded her trials for the present with reduced boiler power on Monday, September 1st.; the first trial was made with six out of ten boilers, with a net result for the four trials as follows:—In speed 11.663 knots, with steam at 20 lbs. mean, turns at 44 mean, and vacuum at 26 inches. The *Warrior* on her trial on the 26th of October realized a speed of 11.040 knots with six boilers.

The *Black Prince* was tried subsequently with the suggested alterations in the screw; the expectations in regard to revolutions were met, but the speed of the vessel was the same. The average results, therefore, of the second trial of the *Black Prince* are thus summed up:—Mean speed 13.585 knots, indicated horse power 6,100; slip of the screw 14½ per cent, showing an excess of power over the *Warrior* of 540 horses, and also superiority in the number of revolutions.

The official trial of the *Resistance*—the fourth in commission, and sister to the *Defence*—took place in Stokes Bay on the 25th ult., by the measured mile, and was attended by the most satisfactory results. The vessel drew 23.9 inches forward and 26 feet aft, a little more than the *Defence* drew on her trial. A run was first made out to secure the anchor and clean fires; after this she was taken to the ground and tried with full boiler power. In running west the wind was on the port bow; on the return it was on the starboard quarter; the six runs were made with the appended results:—We give but three. The first hour (65 minutes) the speed was 12.080 knots, the steam was 20 lbs., the vacuum 24 inches and the turns were 67. Third hour (64 minutes), the speed was 12.721, the steam and vacuum the same, and the turns 68. Sixth hour (66 minutes) the speed was 10.256, steam and vacuum the same and revolutions 68 per minute. Mean speed of the six runs 11.832 knots per hour. These trials show a superiority in the *Resistance* over the *Defence* (both precisely the same in build, model and engines) at full power, of a quarter of a knot, and at half power of no less than 1.315 knots, the latter a very important gain. When the above trials were concluded the *Resistance* got up full steam and tested the ship in making circles to port and starboard with the following results:—With helm "hard-a-starboard" the rudder was hove over to an angle of 24½ degrees in 40 seconds with 3¾ turns of the wheel; the half circle made in 3 minutes 11 seconds, and the full circle completed in 6 minutes 19 seconds; the engine revolutions being 59½ per minute. With helm "hard-a-port," the rudder was hove over to an angle of 24¼ degrees full in 38 seconds with 3⅝ turns of the wheel—the half circle made in 3 minutes 17 seconds, and the full circle in 6 minutes 35 seconds; the revolutions being 59 per minute. The additional power required to exert the great force necessary to accomplish the results obtained is produced by the addition of a third wheel to the shaft of the ordinary two; the tiller is a massive piece of wrought iron standing out from the rudder-head and provided with a quadrant by which the angles are obtained. The *Artizan* further adds that "so long as rudder-heads, gudgeons, and pintles stand, this immense power may answer to get the rudder around;" this statement is virtually a confession of weakness. The temperatures in the engine-room were 91°, 96° and 96°; those in the fire-room 110°, 132° and 135°.

The *Resistance* is armed with two 110-pounder Armstrong pivots, two 25-pounder Armstrongs and two 32-pounder smooth-bores; besides a 12-pounder Armstrong field-piece and smooth-bores for boat service; on the main deck are six 95-cwt. guns, throwing 68-lb. shot and four 110-pounder Armstrongs, all on sliding carriages with directing bars.

NEW MODE OF PREPARING BLACK LEAD.

Carbon is one of the most wonderful substances in nature. The various forms, colors and properties of this material excite our wonder and command our admiration. In one form it is the coal which is employed for heating our houses and generating steam; in another condition it is the diamond—the most brilliant of gems, and in another state it is the black lead (also called graphite and plumbago) which forms our pencils, the polish for sheet and cast iron, the powder of the electrotyper and the crucible for the smelting of metals. It is a mystery to all men that the same substance in the form of charcoal is so inflammable, while in the condition of graphite it is so fractious that it can withstand the high heat of an iron smelting furnace without being fused. In the manufacture of coal gas a substance accumulates in thin scales on the inside of the retorts, which is nearly pure carbon and resembles black lead in lustre, but it is not used for any useful purpose. Graphite has usually been found in rounded masses deposited in veins in the primitive formations, particularly in gneiss, granite, mica-schist and primitive limestone. Some years since the best known natural depository of pencil graphite was the famous mine in Borrowdale, England. It is now exhausted. In all instances natural graphite contains some impurities in the form of oxides of iron and manganese. The purest specimens are obtained in Barreros, Brazil; they contain but very minute traces of iron. Artificial graphite may be formed by placing an excess of charcoal in contact with fused cast iron. A portion of the charcoal dissolves on the iron, but separates on cooling in the form of large and beautiful leaves. Very good graphite is obtained in many places in America. At Sturbridge, Mass., it is taken in masses from veins in gneiss, and it is also obtained at Fishkill Landing on the Hudson river; at Brandon, Vt., at Ticonderage; at Rossie, St. Lawrence county, N. Y.; in Buck's county, Pa., and other localities. At Taunton. Mass., the Sturbridge black lead is reduced to powder, pressed into cakes, and then cut out into forms and dimensions suitable for pencils, &c. In France black lead is mixed with clay and lampblack to form different qualities of pencils.

In the present International Exhibition in London there is a good display of graphite from the veins at Greenville, Canada East. The blocks vary from twelve to eighteen inches in thickness. On another page, containing an account of the chemical products in the Exhibition, allusion is made to the new mode of treating plumbago by Professor Brodie. This process deserves the attention of all chemists and metallurgists, as by this discovery chemically pure carbon seems to be obtained. According to Professor Brodie's mode of treating graphite, we have learned that the crude lumps are first pulverized, then boiled in hydrochloric acid to remove the iron and manganese, after which the powder is washed with water, dried and then mixed with heated dilute sulphuric acid and chlorate of potash. By this treatment a considerable quantity of oxygen gas is liberated and absorbed by the graphite, which is washed and dried and then submitted to a high heat when a remarkable change takes place. The oxygen in the graphite is suddenly evolved, and in doing so, it tears the particles of the mineral asunder and they swell up to thirty times their original volume. In principle this operation is akin to that of Claussens' mode of producing flax cotton by liberating carbonic acid in the pores of the flax and thus splitting the fibers. The disentegrated graphite is now shaken in a vessel with water, when the heaviest particles subside to the bottom, and the fine light particles remain suspended in the water, which is poured upon a filter and the powder secured. When dried it assumes the appearance of shrivelled black tea leaves devoid of luster. Upon being slightly pressed, however, these leaves are reduced to exceedingly fine powder, and the slightest friction communicates to it a brilliant luster.

By this peculiar process the most impure graphite may be rendered equal, if not superior, to that which is obtained in Brazil. And perhaps the useless graphite which is formed in the interior of gas retorts may, by treating it as has been described, be rendered applicable for most of the purposes that natural plumbago is employed.

SOLDIER MECHANICS.

Among the many national peculiarities developed by the war, not the least striking is the versatility of our soldier mechanics. But few corps of sappers and miners follow our army, the exigencies of the strife not having permitted their organization; their loss, however, has been scarcely felt, if we may judge by the brilliant mechanical feats performed by the rank and file, under the guidance of their officers. Streams have been spanned and men and their equipments passed over in an incredibly short time, as in the passage of the Chickahominy, when the army was before Richmond; the canal cut by Colonel Bissel around Island No. 10 is another remarkable instance of perseverance, energy and engineering skill in the face of extraordinary difficulties; railroads have been rebuilt, engines put in order, parts missing hunted up and replaced, and, in short, all the arteries of our internal transportation, which had been tapped by treason, were by loyal hands bound up anew, order and vitality infused, and the time tables and other details rendered as perfect as the prevalence of war permitted. Whatever other feelings we may cherish in respect to the conduct of the war, we can only revert to the performances of our mechanics with emotions of pride and sentiments of gratitude.

HOW TO BURN COAL.

At this season, when this important article of housekeeping is so costly, it would be well to practice the closest economy in its use. This is not, by any means, done; coal is either wasted in consumption or else thrown out in the ashes. Nearly all, or at any rate, the greater part of our ranges and stoves have four doors, two large ones opening on the grate, and two smaller ones for lessening the draft and putting in the fuel; now, when the fire is started in the morning, it should be built only in one end of the grate, the other being full of coal; by this means the amount of wood required (which has also increased in price) is much reduced, and the coal ignites more quickly, the fire soon spreading to the green fuel first applied. When the stove is not in use for any especial purpose, such as baking or roasting, rake the fire clean and fill the grate as full as it will hold, then close up the draft openings, oven and all, and throw the small doors wide open, the fuel is then slowly roasted away to ashes and a good, clear fire at all times readily obtained. By far too much fuel is thrown away in the ashes; buy a patent sifter and screen them, picking out all the refuse, white cinders, &c., and you will be astonished at the result, fully one-third of the ashes may be rescued from the pile and re-consumed. These hints should not be neglected; we have tried them and know their value.

THE POLITICIANS AND THE WAR.

In sight of our office-window, in the City Hall Park, is the recruiting tent of Captain Hogan, a brave fighting Irishman who commanded a battery in the seven days' battle in front of Richmond. We met the captain the other morning on his round of duty, and enquired how he got on with recruiting. "Badly" he replied, and assigned as a chief reason that the politicians of both parties were hindering enlistments for fear some of their followers might get off to the war before election. The captain says those miserable fellows would sell out St. Paul and all the apostles if they could only get into office.

It is a sad fact that the life-blood of the country is being bartered away through the machinations of these political cormorants. We were never in greater danger than now. The people must be vigilant or all is lost.