THE

Scientific American.

MUNN & COMPANY, Editors & Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street New York.

☞ Messrs. Sampson Low, Son & Co., Booksellers, 47 Ludgate Hill, London, England, are the Agents to receive European subscriptions or advertisements for the SCIENTIFIC AMERICAN. Orders sent to them will be promptly attended to.

VOL. XI. NO. 17....[NEW SERIES.]....*Twentieth Year.*

NEW YORK, SATURDAY, OCTOBER 22, 1864.

Contents:

(Illustrations are indicated by an asterisk.)

COSTLINESS OF COMPLICATED STEAM ENGINES.

Some men design steam engines without the slightest regard to economy of construction, to say nothing of their duty when at work. Link is piled on link, rod succeeds to rod; devious, winding, tortuous passages, as intricate as the Cretan labyrinth, and as contracted as the mouth of a miser's purse, are found in abundance, and there seems to be nothing but an insane desire manifested to be different from some other builder. The constructor feels this fault and the owner of the engine has to pay for it; in the end the designer loses his reputation

Drawings are sent to the foundry with piece after piece to be cast together, when joints and bolts should be used instead. Air pumps and condensers are cast on bed plates, great long legged columns for cylinders to set upon are also cast in, and each particular piece is often broken or cracked before it leaves the pit from the effects of expansion and contraction, which the foundryman strives in vain to prevent. Crooked cores, and water or steam ways unnecessarily long and inaccessible, are a vexation from beginning to the end. To the pattern-maker who makes the boxes or the sweeps, to the molder who sets the cores in place, to the laborer who cleans the cores out, and to the engineer, who suffers from the injury caused by the failure to remove the sand entirely, these things are alike a vexation and a loss. When steam chests and small valve seats that require to be bored in a lathe are cast on cylinders, very great unnecessary expense is entailed which ought to be avoided. The cumbrous casting has to be turned and laid in all possible positions to get at the job, and to do an hour's work on some special part, the labor of ten men and their time is required to put the casting in position for the machinist. We are not imagining cases. Examples of the bad practice here alluded to are fresh in our mind. Time, which involves more than money in a machine shop, is lost, and means squandered in devising special machines to accomplish some of the tasks presented for the ingenuity of the machinist to overcome.

No engine performs any better or burns less fuel for having a fancy exterior, and every engine loses a notable per cent of the coal put into the boilers to drive the piston, by having cramped steam and exhaust ports, crooked water passages in the pumps, a wilderness of pipes through which the steam and water must pass in and out, and a bristling array of levers, to maneuver which makes a true engineer tear his hair merely to look at. Time was of old when men built engines with as many rods, levers, counter-weights, cranks, bell-cranks and what not, as it was possible to get in the machine. The side lever engine is an example. We regard it as a favorable sign that none of these machines are now built in this country, and creditable to our sagacity that but few of them ever were made. The vertical engine, the oscillating, and the beam are the chief varieties, and with those who regard engineering science in its proper light simplicity of construction and harmony in the design are prime requisites.

WELDING BY PRESSURE.

When a machinist drives a dry key into a dry key seat it sticks fast and cannot be got out, oftentimes, without drilling it. In this case the surface fibers of the material are interlaced, and are as firmly united as if they were one. The same action takes place in drawing metals, and an English company, working a patent for a peculiar method of drawing metal tubes, have found that where one tube has been forced over another a perfect union takes place, and no joint can be discovered when they are cut across. When a blacksmith unites two pieces of iron the heat and the percussion of his hammer effects nothing more than an intimate union of the two parts. If he had sufficient strength, and applied it in the proper way, he might join two pieces of iron quite as well cold as hot.

It will probably be some time, however, before we have machinery sufficiently powerful to unite masses of metal so that they shall be practically welded, and break at any part rather than at the points of junction. Could such machinery be devised or rendered practical in its results, it is easy to see that an immense saving would be gained in point of time. In some kinds of work this cold welding, so to speak, is already done. Car wheels are pressed on to their axles and remain fast without any key. This is not due to merely pushing a large body into a bore slightly smaller, for if the machinist leaves the axle too large the wheel stretches or splits, and the job is not properly done. The wheels stay on the axles because the two metals, although of different natures, one being cast and the other wrought, have an intimate relation with each other, amounting to an absolute surface weld; very many wheels split before they can be removed.

Welding by pressure and by heat in connection with pressure has been experimented with abroad. *Galignani's Messenger* speaks of a case, which we here append:—

"Experiments have lately been made at Paris by M. Duportail, engineer, in the workshops of the Western Railway, to ascertain whether iron might be welded by hydraulic pressure instead of by the sledge-hammer. The latter, indeed, has not a sufficient impetus to reach the very core of the metal, while continuous pressure acts indefinitely to any depth. In the experiments alluded to M. Duportail caused two iron bars, $1\frac{1}{2}$ inches in diameter, and heated to the welding point, to be placed between the piston and the top of an hydraulic press. The bars were welded together by this means with extraordinary ease, the iron being, as it were, kneaded together, and bulged out at the sides under the pressure. The action of the press was suspended when the part welded was brought down to the thickness of the bars. After cooling, the welded part was cut through to examine the inside, which was found perfectly compact. To try it, one of the halves was placed under a forge-hammer weighing 1,800 kil., and it was not until the third stroke that the welding was discovered."

Heavy steamboat shafts are very often hollow at the center from a want of power in the trip hammer, or through an imperfect manipulation of the "pile" they are fagotted from. Masses of hot metal drawn between revolving rolls are indeed subjected to pressure, but the iron thus made is not of so good quality as hammered metal. It is not in connection with preparing iron for market that these remarks are made, but it would seem not at all impracticable to make a neat and perfect weld by heavy continuous pressure for a short time, rather than by the ordinary method of hammering. Time would be gained both in the smith and finishing shops. That it is perfectly feasible there is no question, and for heavy connecting-rods, rudder-posts, keels of iron vessels, or similar parts, a great economy of time would be apparent, while equal, if not better, workmanship would result.

WHY CAKE TASTES OF TURPENTINE.

We are told by a person of experience in cooking, that if in using oil of lemons to flavor her cakes she gets too large a quantity, she will frequently have the exact flavor of spirits of turpentine. It is probable that the oil of lemons is actually changed into oil of turpentine.

An atom of the oil of lemons is composed of 20 atoms of carbon and 16 atoms of hydrogen, $C_{20}\ H_{16}$, and oil of turpentine has precisely the same composition, $C_{20}\ H_{16}$. The two substances are isomeric. Among all of the wonders of chemistry there is none more wonderful than this principle of isomerism. That two substances composed of the same elements in the same proportions should vary so greatly in their odor, flavor and other properties as oil of turpentine and oil of lemons is a puzzling mystery.

The oil of turpentine is isomeric not only with oil of lemons, but also with the oils of oranges, cloves, camomile, thyme and bergamot. All of these are composed of only the two elements, carbon and hydrogen, and all in the same proportions, $C_{20}\ H_{16}$. The great difference in the odor and flavor of these several substances is to be accounted for only on the supposition of a different arrangement of the atoms. It is not difficult to conceive that if an atom of the oil of lemons is subjected to certain influences, that peculiar arrangement of its 20 atoms of carbon and 16 of hydrogen which gives it its peculiar properties should be broken up, and these atoms should receive that other arrangement which produces the properties of the oil of turpentine.

Heretofore chemists have not known what conditions were requisite for effecting the change in these two substances, so as to transform oil of lemons into oil of turpentine, and if our informant is correct in her observation she has made an interesting discovery in chemical science. But in other cases the transformation of one substance into another of the same chemical constitution is not only understood by chemists and practiced in the laboratory, but conducted on a large scale in the industrial arts. An atom of starch is composed of 12 atoms of carbon, 9 of hydrogen and 9 of oxygen, $C_{12}\ H_9\ O_9$, with the addition of water, and sugar has precisely the same constitution. When a kernel of barley or other grain sprouts and begins to grow, the starch which it contains is transformed into the isomeric compound, sugar. It is for the purpose of effecting this transformation that grain is malted. The sugar thus produced is afterward converted into alcohol by fermentation. Thus the production from grain of beer, whisky, and all other fermented and distilled liquors, and therefore the great industries of brewing and distilling, as well as the prevalence of intemperance, with its immeasurable evils, all depend upon the power of transforming one substance into another of isomeric constitution by simply changing the arrangement of its atoms.

THE RUSSIAN MONITORS AT SEA.

One of the Russian monitors has recently had a trial trip and the results are thus described by the *Messenger de Cronstadt*. This journal gives a detailed account of the trip from which we make the following extract:—"The monitor *Vestchoune*, accompanied by the steam-vessel *Vladimir*, and hoisting the flag of Rear-Admiral Likhatchew, chief of the ironclad squadron, left Cronstadt August 3, and, after touching at one or two ports, entered Reval on the 5th, which place she left on the 8th, at 8 30 A. M., and at 4 P. M. reached Helsingfors. In this trip she had to contend against a rough sea, which washed over the deck, and the waves even at times reached the top of the turret. Notwithstanding this the monitor behaved admirably, and did not lesson her speed for one moment. Her engines worked well, as did also the isolating apparatus on which the compass rests, in order to protect the magnetic needle from the action of the iron and to diminish its declination. This apparatus consists of a long copper tube, in the interior of which the compass is fixed with the Mariner's card reversed, but reflected in a mirror. On the 11th the *Vestchoune*, still sailing in company with the *Vladimir*, again set sail, and on the 12th, after a short stoppage at Glasholm, they continued their cruise in the vicinity of that place. However, the wind having freshened, a heavy sea arose, and the waves were