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(Illustrations are indicated by an asterisk.)



## DEFECTIVE IRON CASTINGS.

It is not uncommon to see large iron castings constructed with little or no attention to the expansion and contraction of the several parts. Examples of the practice in question may be found in stationary engine frames. Cumbrous pillow blocks are cast upon them and immediately beneath is a large opening surrounded by sundry "filagree arms, scrolls, and similar articles," which, in the pride of his heart, the designer intended for ornaments. Still other instances of defective castings may be found. In turbine wheels, the step-frame, or that part which carries the weight of the wheel and shaft, frequently has large and heavy parts contiguous to light and thin ones. Large band wheels or pulleys are also examples, for from the solid hub and heavy rim spring light arms very much less in size and weight than the part to which they are attached. Car wheels of some patterns are open to the same charge, and many designs have been originated with a view to correct the fault. That it is not a trivial matter is shown by the results consequent upon malconstruction. Where the drivers of locomotives have cranks cast on them the two arms which run to the eye of the crank are sure to break in a short time, and an outside connected locomotive can hardly be found that has not these two arms broken at the points designated. Even if the the force of the steam were not exerted at that particular point the jar and tremor when running would tend to disrupt the arms from the crank.

Iron bridges are sometimes made, whereof the girders and other parts under strain are cast with such a manifest inattention to the simple and well known law herein before alluded to, that the structure has given way and the public have condemned a system for the fault or ignorance of an individual. Many castings for different purposes, some to be employed in transporting passengers, some for purposes of commerce, are weak and fragile from the moment they are dragged out of the sand, because no regard has been given to a proper distribution of the strain of expansion and contraction. If these castings be struck with a hammer, the light parts will give out a clear high note showing the tension to be great.

It is not only the breaking strain which is a consequence of bad proportion but the difference in the quality of the iron composing the whole. Though the cupola may have been charged with metal of one kind the casting will not be alike when thick and thin parts are contiguous. Large masses of iron cool more slowly than small ones, the crystals are, therefore, coarser and the metal less tenacious than small quantities of it, and it is, therefore, ill calculated to withstand torsion, compression or tension, and many accidents that are apparently mysterious could no doubt be traced directly to defective distribution of the shrinkage.

## PUBLISHING INFORMATION OF GOVERNMENT WORKS.

The London *Star*, of Dec. 20, has a letter addressed to a member of Parliament by a British field officer who was traveling in this country. From the letter we take the following extract:—

I visited the famous foundery for casting Parrott guns, and the whole process was explained to me by the proprietor. I saw a 300-pounder cast, and was told the establishment could produce three guns per day. The strengthening the guns by bands or coils seems to have been so successful that (as I was told) no accident had happened to a "Parrott" in either the military or naval service. I also visited a manufactory of seven-shooters, not revolvers, but rifles, loaded through the butt, each cartridge being forced up by a wire similar to what we see used in carriage lamps. I inquired respecting these guns when I was with the army. In action they lead to a waste of ammunition, especially in the hands of raw troops: but they are very destructive when entrusted to known cool shots, and would enable a very few men to defend a narrow pass, a gateway, etc.

This courtesy to foreigners, and especially to foreign officers, is in accordance with the general practice of our Government, and we think it is perfectly proper. Our institutions demand the utmost publicity in regard to all Government acts, and it would be almost impossible to conceal anything connected with our armories and fortifications if the attempt were made. It is, therefore, just as well to take the benefit of politeness and candor, and frankly explain everything to the officers and engineers of all foreign nations.

But as long as this is done, is it not improper to throw obstructions in the way of our own people obtaining the same knowledge? They are the persons who have paid for all of these things, and who pay the officers for taking care of them. If the construction of our arms and the machinery for manufacturing them is made known to the restless, fertile minds throughout the nation, improvements will be more likely to be suggested than if this knowledge is confined to the army officers in charge and the few who understand the art of conciliating their favor.

These remarks are suggested by the recent order of Gen. Dix, requesting the papers to publish no information in relation to our forts. It seems to us that more mature deliberation must induce Gen. Dix to withdraw this request. If there is any special improvement which it is desired to keep secret, let regulations be adopted so universal and rigid in their application that they will prove efficient, but it is certainly for the good of the service, as well as right and proper, that whatever is exhibited to the agents of foreign governments should be laid open as fully and freely to our own people.

## PETROLEUM AND ASPHALTUM.

Linseed oil, and several other vegetable oils have the property of absorbing oxygen and combining with it chemically to form resin. It is this property of drying oils which renders them suitable for paint.

Petroleum contains no oxygen; it is composed wholly of carbon and hydrogen, being a mechanical mixture of several hydrocarbons. Asphaltum is a resin, being composed of carbon, hydrogen and oxygen, and it has been suggested that asphaltum is produced by the conversion of petroleum into a resin by the slow absorption of oxygen.

But this is a mere hypothesis. No one claims to have succeeded in converting petroleum into asphaltum. After months of exposure the oil remains without any appearance of resin even upon its surface. It is as reasonable to suppose that under certain conditions the vegetable matter is converted directly into asphaltum, as that it is changed first to petroleum and then to asphaltum.

Asphaltum lakes may suggest the presence of petroleum in the vicinity, but they are no proof of its presence.

SWEET BRIAR.—H. Springler, of the U. S. Naval Machine Shop, Port Royal, S. C., writes us that sweet briar is very plentiful in that region, but for want of information how to prepare it no use is now made of it. He solicits information on the subject.

## GROVE ON HEAT.

We recently noticed Dr. Youman's collection of treatises on the Conservation and Correlation of Forces, published by D. Appleton & Co. The first and longest treatise in the collection is that of Professor Grove.

He regards heat as a mode of motion, but takes a simpler view of it, perhaps, than is taken by any other philosopher. He says that all we know of heat is expansion and contraction. A body in cooling contracts, and this expands other bodies in its vicinity, or subject to its influence.

Professor Grove argues at great length against the hypothesis of an ethereal fluid, contending that heat is simply motion in ordinary matter. It seems to us that all of this argument is against a fancied distinction.

If the sun acts on the earth, it must be through the medium of a material connection between the two. Sir Isaac Newton regarded the denial of this as a proof that the mind of the person denying it failed to comprehend the problem. The space between us and the sun is occupied by matter, and this matter is an exceedingly attenuated fluid. Each of the sixty-four elements at present known has properties peculiar to itself. It may be that the fluid filling the interplanetary spaces is composed of the vapor of these elements, or it may be some element lighter than hydrogen; in either case, if Professor Grove chooses to call it ordinary matter, we suppose no philosopher would insist upon calling it extraordinary matter.

Professor Grove not only denies the existence of a pervading fluid, but also takes ground against the vibratory theory of heat; insisting that all of its observed phenomena are simply expansion and contraction. One body in expanding causes others to contract; one body in contracting causes others to expand. A body in what we call giving out heat is contracting; when it is undergoing that process which we call absorbing heat, it is simply expanding, in consequence of the contraction of some other body. Such, if we are able to understand him, is Professor Grove's notion of heat.

## POLISHING LINEN THREAD.

At Mechanicsville, in this state, there is a manufactory of linen thread. For several years after it was started the business was unprofitable, but a new superintendent was obtained who conducts the operations with intelligence and energy, and now the company makes regular dividends. All of the flax is bought in Holland, the Dutch understanding the rotting and preparation of flax for thread better than any other people. We believe the flax for thread is cut before the seed ripens At Mechanicsville the flax is all hatcheled by hand. It is then spun into raving like cotton, and passed through a drawing frame, after which it is placed on a spinning frame to be spun into thread. As it goes from the bobbins upon the spindles it passes through hot water, and the spinning room is dripping with moisture.

A beautiful polish is given to the thread by a curious process. After the thread is reeled in skeins, a stout workman takes a bunch as big as his arm, and catches it upon an iron hook; then, passing a stiff stick through the opposite end of the loop, twists the thread tightly with all his might. Immediately untwisting it, he catches it in another part upon the hook, and gives it another twist. A few repetitions of this process impart to the thread a most beautiful, smooth, silken finish.

### Piston Speed of Screw Engines.

The English iron-clad *Valiant* has double engines of the same kind as those in our sloops-of-war. They are 82 inches in diameter, 48 inches stroke, and make 60 revolutions per minute without difficulty. The screw has a fine pitch ranging between 22 and 27 feet, and can be altered between these two figures without stopping the engines. The engines of the *Re Don Luigi Di Portugallo,* Italian iron-clad, built by the Morgan Iron Works, this city, are 84 inches diameter by 48 inches stroke, and have made 55 revolutions per minute, but the pitch of the screw is 31 feet 6 inches, which is materially against a high piston speed.