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

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Contents:

(Illustrated articles are marked with an asterisk.)

WASTE OF OIL IN SHOPS AND MANUFACTORIES.

It is doubtful if either employers or employés in our manufactories have an adequate idea of the amount of lubricating oil which is sheerly and heedlessly wasted in the different processes of iron, cotton, woolen, and other manufactures. But employers know well that their bill for oil bears a large proportion to their other expenses. It is not likely that employés, generally, wantonly waste the property of those by whom they are employed, but the probable fact is that there is a want of consideration or a lack of knowledge as to the proper use of the material.

Take the machine shop for instance. It would not be extravagant to assert that fully one half the oil ostensibly used in shops is really wasted. If a workman wishes to oil his file for finishing he will pour a stream over its surface, allowing two-thirds or more to drip on the floor, when the file could be sufficiently moistened by a small bunch of waste, or better, a small sponge saturated with oil, without wasting a drop. Some workmen in machine shops seem to think that their status as workmen depends on the amount of "gurry" and oil they can carry about on their persons, so that they may be considered "greasy mechanics" *par excellence*. We believe that it is not necessary for a machinist to be repulsive because of grease on his person; although a finical workman is abhorrent—one who pays more attention to his personal appearance than to his legitimate work.

If a hole is to be tapped in iron, whether cast or wrought, the workman too often prefers lubricating oil to patience and "elbow grease," and pours on the oil until he saturates the substance or fills the pores of the iron. In ordinary cast iron, a tap, properly made and judiciously used, can be run without oil, or with a very small quantity, and in this work, as in many other processes, a saponaceous liquid is equally as effectual and much cheaper. It is an old and worn-out notion that almost every operation on the metals, and almost every use of a tool, must be accompanied with oil; neither is it correct that oil alone is a lubricant. Holes *may* be drilled and tapped and surfaces finished without the use of oil, although some lubricant may be necessary. The addition of oil to an already clogged file, milling tool, saw, or rotary cutter is not only a waste, but is no aid to the progress of the work. Either of them may be quickly and effectually cleaned either by wiping with waste, combing with the card, or heating over the forge fire; when they will do the work required much better than if they had to overcome the resistance of a body of viscid oil.

In the lubricating of shafting, also, great waste is occasioned. Where shafting is suspended in ordinary boxes most of the oil leaves the journal almost as soon as poured into the box, and finds its way, dirty and fouled, into the dripper; once there it is nearly worthless for shop use. Gummy, dirty oil, charged with foreign matter, and half oxidized by exposure to the atmosphere, although often used for tapping and screw cutting, is unfit for even these purposes. It corrodes the taps and dies, and by its adhesive quality, adds greatly to the power required to do the work.

Journal boxes are now made which retain the oil and require replenishing only three or four times a year. Their additional cost over the old style is but trifling, and their use will save a large expenditure. They should be adopted by every "live" mechanic. Pouring oil on heated journals is wasteful; water is much better. Indeed, water is an excellent lubricant so long as it remains in place between the journal and box. If, like oil, it could be kept there, it would afford one of the best means of lubrication. Oil after passing between a heated journal and box is comparatively worthless for lubricating purposes.

These considerations, crudely presented, may serve to direct the attention of our mechanics to a subject well worthy of notice; the qualities of oil, its changes under different circumstances, and its substitutes, comprise a subject of very great importance, on which all managers and workers of machinery should have some theoretical as well as practical knowledge.

SPONTANEOUS COMBUSTION.

It may be that some fires now attributed to the wickedness of human incendiaries might be found to have their origin in the operation of natural laws, and that their attribution to other causes is merely the result of our ignorance of those laws. Spontaneous combustion is undoubtedly a prolific source of fires. This is produced in various ways. It is well known that a spongy, fibrous substance, as cotton waste, or tow, saturated with linseed oil, if exposed sufficiently long to the sun's rays, or even the atmosphere, will take fire. Authenticated instances of destructive fires originating in buildings where rags or cotton waste were stored, are sufficiently numerous to prove the impropriety of keeping these substances piled in mass a long time. Factory waste is always more or less saturated with oil, which oxidizes on exposure to the atmosphere and gives out carbonic acid and hydrogen. If the waste is in quantity sufficient to compress the fibers, the danger of fire by the accumulation of heat is considerably increased.

Bituminous coal in large heaps oxidizes, and undergoes always a slow combustion without being inflamed; but sometimes, when wet by frequent rains, the coal actually takes fire. This is aided by the sulphuret of iron generally contained in bituminous coal.

Quicklime absorbs water so rapidly that sufficient heat is developed to ignite inflammable substances when brought in contact with it. It is therefore a dangerous commodity to store where there is a possibility of its being exposed to moisture, and its carriage by water is always attended with risk.

Newly burned charcoal in mass is liable to absorb moisture so rapidly as to produce ignition; so, also, it is asserted on good authority that wood ashes will ignite spontaneously without the presence of live coals.

It may not be commonly known that iron borings, turnings, and filings are also dangerous when left in heaps or stored in boxes. They are always wet, especially where they have been allowed to remain under lathes upon which water polishing has been performed. We have seen a heap of this material burning with an intensely blue flame. The oily waste, which is not unfrequently thrown into the iron shavings, adds greatly to the danger of fire from this source. The sweepings of the machine shop, if kept on hand, should never be placed in a wooden box or left in the shop.

A knowledge of these simple facts, combined with ordinary care, may prevent the occurrence of some fires which are now deemed mysterious in their origin.

WHAT SHALL BE DONE WITH OUR BOYS?

A correspondent of the Washington *Chronicle* writes to the editor of that journal as follows:

"I wish to call your attention to a great wrong that is now being inflicted on the boys of the present generation. I allude to the difficulty—I might say impossibility—of putting boys to trades. Several instances have recently come to my knowledge of parents in this city trying in vain to apprentice their boys to mechanical occupations. In these endeavors they are invariably told that the rules of the journeymen prevent master mechanics taking apprentices beyond a very limited number. That number every employer within my knowledge already possesses, and still it can be safely said that there are hundreds of boys at present in Washington unable to learn occupations that would enable them to earn respectable livings during their minority, and become useful citizens afterward. What is to become of these boys? Have we any right to interpose obstacles to their efforts to become good and useful men? and will it be any wonder if, in a few years, many of them are useless, or worse than useless, members of society?

"I believe fully in the right of mechanics to regulate their wages and hours of labor; but I do not believe in any of their laws that virtually tell a widow that she shall not bring up her son to the business that son may choose to earn a living at, by which he can support his mother in her declining years.

"This is no fancy sketch, Mr. Editor; and to prove it I refer to any employer to endorse my statement. You will see yourself the inevitable evil that must spring from a continuance of such a state of things. If any master tradesman in this city were to advertise for an apprentice to-morrow, I believe he would have at least fifty applicants for the situation before night. Should this statement be doubted, let the experiment be tried."

We copy the above simply to call the attention of employers, mechanics, and our readers generally, to a state of affairs which is in no wise overdrawn in the letter of the correspondent. We frequently have applications from parents and from young men for counsel or assistance in this matter, and always experience the same difficulty of which the correspondent speaks; the proprietors of our shops evincing considerable reluctance to receiving apprentices. It may be possible that in some localities the journeymen, as the writer intimates, may assume to dictate to their employers as to the number of apprentices they may receive; but we doubt if the practice is very general.

It is not American, and we hope is not in danger of becoming naturalized in this country. We recollect, twenty-five years ago, when the business of designing and engraving for calico printers was almost entirely in the hands of foreigners, that the rules of their trades union prescribed the number of apprentices to be received, thereby often proscribing the would-be apprentice. At that time these employments were highly remunerative, as compared with others, and it was not surprising that those who had served a long apprenticeship and paid for their knowledge should desire to protect themselves and their business. It is not an easy matter, in England, for a young man or boy to become an entered apprentice to any mechanical business. They, or their parents or guardians, are compelled to pay a bonus for the privilege of being taught a trade; and in addition seven, instead of as in this country, three, or at most, five years, is exacted as the term of novitiate. Under these circumstances the apprentice and the journeyman set an adequate value upon the skill they have attained.

Possibly a portion of the difficulty of procuring positions for apprentices is caused by the want of honor among apprentices themselves, and the impossibility of protection to the employer under the loose system, or rather want of system, so prevalent here. Too often apprentices leave their masters soon as they have attained sufficient expertness and knowledge of the use of tools to be of some profit to their employers. If some system were generally adopted which would adequately protect employers, binding the apprentice to the performance of his portion of the contract, it would not be so hard a matter to secure situations as at present. Something, however, should be done to give our boys greater opportunities to become practical mechanics. The ratio of apprentices in most shops is not nearly what it should be, yet to these we must look for the successors of our present workmen.

TUNGSTEN AND TUNGSTEN STEEL.

The metal tungsten is found in small quantities in the form of tungstic acid combined with lime, in the mineral known as *Scheelite*, also in the tungstate of iron and manganese, a mineral known as *Wolfram*, and in the tungstate of lead, or *Scheelenite*. Both wolfram and scheelite are found in the United States, the former at Lane's Mine, Monroe county, near Mine La Motte, Mo., and near Blue Hill Bay, Me.; the latter has been met with at Monroe and Huntington, Conn., associated with wolfram pyrites and native bismuth in quartz. Tungsten was first obtained in the metallic state by the brothers D'Elhuyar, Spaniards, in 1783. In communicating their results to the Academy of Sciences at Toulouse, they described the alloys of the tungsten with gold, platinum, copper, lead, tin, antimony, bismuth, zinc, manganese, and white cast iron, not, however, with malleable iron or steel. All they state in regard to the iron alloy is that "with white cast iron it formed a perfect button, of which the fracture was compact and grayish white; it was hard and easily broken."

Tungsten fuses easily before the oxy-hydrogen blowpipe, but then the larger part burns to tungstic acid. Mr. Riche has succeeded in melting tungsten by means of a current from a battery of 200 Bunsen cells. In reducing tungstate of ammonia in a current of hydrogen gas at red heat, Percy obtained the metal in the crystalline state, with tin white color and bright metallic luster. The specific gravity of the metal ranges from 17·22 to 17·6. It is very hard, a file scarcely scratching it. It is less readily fusible than manganese, and exhibits either a tin white, steel gray, or grayish white color, according to the manner of its preparation.

We are indebted to the Duc de Luynes for a memoir on the manufacture of cast and damask steel, and in nine analyses therein published of various kinds of this celebrated steel, tungsten appears in eight. In six of these, only traces of that metal were met with, while of the other two, one contained one half and the other exactly one per cent. The quality of that highly estimated steel could then, according to these statements, scarcely be attributed to its amount of tungsten, for from one to three per cent of this metal produces but little change in the iron.

Some highly important experiments were made some years since by Bernoulli at the royal foundery in Berlin. We will in a few lines present a short abstract of his report which may be found in the "Annalen d'Physik u Chemie" of Poggendorff. Cast iron fused in various proportions with tungstic acid gave the following results:

"With from 4 to 5 per cent a slight change was perceptible in the iron; not so with from 1 to 3 per cent. With 10 per cent the iron acquired steel-like properties, it was of a light grayish color and possessed an extremely fine-grained, somewhat conchoidal fracture. It was also found to be a little malleable. An alloy of 15 parts of the metal with 85 parts of iron formed almost pure steel, but of little malleability. With 20 per cent it grew still harder and less malleable, and beyond this limit the deterioration in these respects increased until with 50 per cent it can no longer be hammered. A similar series of experiments was made in fusing tungstic acid with white cast iron, but no alloy was produced except when charcoal powder was added.

The conclusions at which Bernoulli arrived are that only the graphite or mechanically-combined carbon in cast iron can reduce tungstic acid, and the combined carbon has no such effect; by melting gray cast iron with a suitable proportion of tungstic acid, cast steel may be directly produced.

Tungsten steel was first made on a large scale in Austria, and was exhibited in 1858 in Vienna in various forms, at the Congress of miners and melters. The steel was remarkably fine, uniform, compact, and of a conchoidal fracture. Swords exhibited were sharp, hard, tough, and elastic. At the international exhibition of 1862 such steel was exhibited, but did not attract much notice. Lately, however, a trial with tungsten steel has been made in Westphalia and elsewhere, and the general conclusion has been arrived at, that tungsten steel furnishes much more advantageous results than the best cast steel employed at the present time in commerce.