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Contents.

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TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 444,

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A MECHANICAL DICTIONARY NEEDED.

There seems to be need for a dictionary of shop terms as well as of accepted scientific mechanical terms as applied to practice. Even in our most popular technical periodicals the terms used by a contributor from one portion of the country are sometimes unmeaning to readers in another portion.

Lack of definiteness is one of the faults of our mechanical nomenclature. In a recent publication of a mechanical paper, the question whether "spline," "key," and "feather" are synonymous was presented. Perhaps this will be as good as any other instance of our lax system or lack of system. In the shop talk where the writer was "raised," a "spline" would mean a fixed projected portion retained in a shaft and not specially connected with the pulley or other hub. Its synonym would be a "feather." A "key" would be a wedge shaped fastener, with or without a head, fitting corresponding channels in the shaft and the hub, intended to secure the latter at some exact point. And yet "spline" and "key" are used indiscriminately by good mechanics. So long as these appellations are understood to have a definite meaning they have their value; but this value may be confined to the shop, to the section of manufacturing establishments, or to the manufactories where persons mainly of one nationality are employed; outside they may be confusing.

In shop use why should a cylindrical rod of metal be at one time a "bar," again a "shaft," a "spindle," an "arbor"? Or if so used, why not have a shop thesaurus or lexicon that would give the derivation of the words and the reasons for their use? A "bar" shows its origin; it means to hinder, and is applicable to iron only in bars which may be used as obstacles. A "spindle" is derived from the spinning flax spindle older than our civilization, which supposes a tapering shaft rotating on its own axis. "Shaft" comes from our Saxon schaft, an arrow, implying straightness. "Arbor" comes from the Latin, a tree, or a piece to which something may be temporarily affixed.

A "mandrill" is a hand (*manus, L.*) drill. Is the clearer of bored holes a "reamer" or a "rimmer"? Is the top of a machinist's hammer a "pœne, "pane," or "pene"? Why a "broatch"? Why "drift pin" and "tamp pin"? The suggested glossary ought to contain the information that the ordinary screw jawed wrench is not a monkey wrench because of any peculiar tricks it plays in use, but simply because Thomas Munkey, an English mechanic, invented it. Many other suggestions might be made to the ambitious mechanic who will undertake to simplify our mechanical nomenclature by the compilation of a dictionary and glossary of mechanical and shop terms.

THE UNION OF IRON AND STEEL.

Old time smiths regarded the union of iron and steel by welding as a feat on which to base a reputation, albeit in the earlier times—fifty years ago—the steel was shear or blister steel, much nearer the component iron in welding characteristics than the present fine cutlery or crucible cast steel. But improvements have been so great in the methods of working that a composite article of steel and iron is not only common, but cheap. In some instances the article is composed of two grades of steel and one of iron, a three-fold combination that when completed is essentially one. The ordinary scythe is an instance. It is composed of Swedish iron, low steel, and fine cutlery steel. The iron is a strap of a length sufficient, when doubled on itself by the middle, to make a length of about five inches, the strap being one and a half inches wide. Side by side, inside this doubled-up strap, are laid a slip of low steel of the same length as the doubled strap, one inch wide and one-quarter inch thick, and one of similar length and thickness, but only half an inch wide, of the finest cast steel.

A flux being introduced and the parts heated together, a trip hammer welds them and lengthens the original four and a half or five inches to twenty-four inches. Passing through rolls elongates it to a length of four feet of the same thickness on back and edge. "Plating" under heavy trip hammers edges the scythe, and spreads its width to about four inches. The blade is so long and thin at this stage that it will bend downward when held by one end, the sides being in a vertical position. But when the back, which contains the low steel, is corrugated by means of a V-hammer and dies, the result is a very stiff blade, resistant to wet grass or the silicious stalks of ripened maize. During the entire processes, the iron, even on the thin edge, is coherent, and is as strongly united, as a mere film, to the steel as when it was one-quarter of an inch thick on each side; and it is finally removed, to lay the steel edge bare, only by grinding. If a finished scythe is carefully examined, the only steel visible is a line perhaps one-eighth of an inch wide along the sharp edge, yet the cross section would show a core of low steel and crucible steel, and an envelope of tough, soft iron, all so united by welding as to be barely distinguished by color.

In implements which are subjected to heavy blows, especially from a leverage, as the ax, entire dependence for the union of the steel and iron cannot be placed on the adhering flux and the heat of the weld. Except for special purposes, the strap poll for axes with the wedge-shaped bit is a style of the past, and ax heads or polls are now made from solid blocks of tough iron, the helve hole being punched cleanly through. The lower portion is opened to receive the bit, which is a block "offset" on each side in a die, so that each side presents two shoulders to bear against the receiving iron poll. When this welding is completed, the ax is in a very crude form, and must be hammered to shape. In this case as in that of the scythe, the union of the fine cast steel and the enveloping iron is so close that it appears to be a chemical one on the surfaces rather than one of a mechanical nature; the two dissimilar materials work agreeably together.

The shanks of garden hoes and the handle sheaths of shovels are other instances of this union that are remarkable, mainly because that at the initiatory processes the materials are thinner than those just mentioned. Yet they withstand the subsequent reheatings and hammerings as though they were purely homogeneous.

NATURAL GAS AS AN INDUSTRIAL FACTOR.

Throughout the region included in the "gas belt," which reaches from the oil regions of Pennsylvania to Moundsville, West Virginia, there is just now a good deal of speculation as to the possibilities of the large use of natural gas for fuel. Pittsburg, with its extensive industries, is advantageously situated to realize the full benefit which may be derived therefrom should the use of this gas be proved practicable, and it is already in use in some large establishments. The largest of these is the Edgar Thomson Steel Works, now using the gas to the value of about 400 tons of coal formerly burnt daily. The Penn Fuel Company, furnishing natural gas, is said to have contracts amounting to $300,000 annually in a single ward of Pittsburg, and there are several other companies owning wells and supplying gas for use as fuel, while others are organizing, and several large yielding wells have recently been opened.

Although it has been known for a long time that gas could thus be had for the boring through all the section where the matter is now receiving so much attention, and it has been employed to a limited extent for some years, it is only within about twelve months past that practical efforts have been made for its utilization in a large way for industrial purposes.

There are some drawbacks to its employment, among which are its great unsteadiness of pressure, and the ever present doubt as to how permanent may be the flow from any given well. It would seem that the first difficulty might be easily remedied by a proper system of valves and holders, and, as the existence of the gas in the earth has been known for an even longer period than we have known of the petroleum, there is probably as good reason for counting upon its continued flow as there is for expecting a steady supply of petroleum. The section of country promising favorably for the boring of gas wells is a comparatively large one, and the successful employment of this natural fuel can hardly fail to have an important bearing upon the future of many of our industries, especially in all branches of the iron manufacture and its related departments.

HOW GLOBES ARE BUILT.

This heading has no astronomical meaning; it refers to mechanical manipulation. Our library and school educational globes have perhaps been a puzzle to many an inquisitive mind—they being so light, so easily turned on their axis, and so smooth as to appear more like natural exact productions than mechanical constructions.

The material of a globe is a thick, pulpy paper like soft straw board, and this is formed into two hemispheres from disks. A flat disk is cut in gores, or radical pieces, from center to circumference, half of the gores being removed and the others brought together, forming a hemispherical cup. These disks are gored under a cutting press, the dies of which are so exact that the gores come together at their edges to make a perfect hemisphere. The formation is also done by a press with hemispherical mould and die, the edges of the gores being covered with glue. Two of these hemispheres are then united by glue and mounted on a wire, the ends of which are the two axes of the finished globe. All this work is done while the paper is in a moist state. After drying, the rough paper globe is rasped down to a surface by coarse sand paper, followed by finer paper, and then receives a coating of paint or enamel that will take a clean smooth finish.

The instructive portion is a map of the world printed in twelve sections, each of lozenge shape, the points extending from pole to pole, exactly as though the peel of an orange was cut through from stem to bud in twelve equal divisions. These maps are obtained in Scotland generally, although there are two or three establishments otherwhere which produce them. The paper of these maps is very thin but tenacious, and is held to the globe by glue. The operator—generally a woman—begins at one pole, pasting with the left hand and laying the sheet with the right, working along one edge to the north or other pole, coaxing the edge of the paper over the curvature of the globe with an ivory spatula, and working down the entire paper to an absolutely smooth surface.

As there are no laps to these lozenge sections the edges must absolutely meet, else there would be a mixed up mess, especially among the islands of some of the great archipelagoes and in the arbitrary political borders of the nations. This is probably the most exact work in globe making, and yet it appears to be easy because the operator is so expert in coaxing down fullnesses and in expanding scanty portions, all the time keeping absolute relation and perfect joining with the other sections and to their edges. The metallic work—the equators, meridians, and stands—are finished by machinery. A coat of transparent varnish over the paper surface completes the work, and thus a globe is built.