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(Illustrations are indicated by an asterisk.)

LEATHER BANDS.

The horse-power of belting or the tractive force exerted by leather bands of a given width, at a certain speed expressed in foot-pounds, or in any other positive way, is not generally known. We do not know what it is, although we have some half dozen rules professing to give a unit for a horse-power, which are obviously incorrect. A horizontal belt of a given length will drive more than a vertical belt of a given length; a long belt more than a short one, and a twisted belt more than either, because in the case of the horizontal and the long belt, the sag and weight tend to produce closer contact and resist strain better than where the belt merely hugs the pulley by its tension; the same is true of the crossed belt, which embraces more of the circumference of the wheel driven.

Eight hundred feet per minute velocity for a one-inch belt is said to give a horse power; four hundred for a two-inch belt will give the same; but these statements appear so crude and unsatisfactory that we place no reliance on them, and we want more facts and less fancy when dealing with such subjects.

The dynamometer affords an easy, simple and cheap method of testing strains, or the transmission of power from one machine to another, and a few experiments by it would settle forever all doubts and uncertainty on this point. The dynamometer merely weighs strain as a butcher weighs meat, and with the same instrument—a spring balance. If a lever be made with a bearing, cap and bolts at one end, and the same fitted to a shaft, and if a spring balance be applied to the other, by weighting the lever until it balances the tendency to raise imparted to it by the shaft, we shall have an exact record of the actual number of foot-pounds of work or strain exerted by the machine tested, when the relations between the diameter of the shaft and the length of the lever are considered. Of course, with such a dynamometer there is great friction, and if the test is continued long, much heating on the shaft occurs, which would interfere with a correct result; one sufficiently correct for practical purposes may, however, be obtained if the experiment be made properly.

There are many other forms of dynamometers for weighing or observing the force of machines, but it seems unnecessary to consume space with details of them, when it is apparent to all persons, who would be likely to undertake the experiments here recommended, what such apparatus should be.

Some things relating to the action of belts are but imperfectly understood, for although Morin's experiments have demonstrated the relative resistances of belts on pulleys of different materials and surfaces, such as rough cast iron, smooth cast iron, wood, etc., he has not informed us of their position, their nature, whether vertical, horizontal or twisted, and whether the ratio of resistance increases in regular progression from a belt one inch in width at 400 feet up to a belt 30 inches wide, at the same velocity. It is obvious that these matters exercise a great influence on the transmission of power by belting.

From an experiment at one of our largest machine shops, it was found that gearing absorbs less power than belts, and that the force required to work the latter is extremely variable, depending upon the tension, the condition of the surface of the pulley, and minor matters. This fact was deduced from observing the working of a fan blower, and is to be received with caution, for it has hitherto been supposed that gears consumed more power than bands, and these results may be due merely to the peculiar arrangement of this special machine. It is a fact, however, that the use of sawdust, resin, or similar substances, to increase the adhesion of the belts to pulleys, as also the employment of idler pulleys, or rollers suspended against belts to keep them up to their work, also the divergence of belts from right lines or carrying them at acute angles about rollers fixed in walls, add greatly to the expense of working them.

Since belts are so universally employed, a series of experiments on this subject would be invaluable, and we hope that those who have the time and the means, as well as others who possess experience derived from actual practice, will send us what information they may possess on this subject.

LETTERS FROM THE PEOPLE.

It is our custom to appropriate each week a liberal space in our paper to the publication of letters from our readers. These contributions we esteem of much value; they are always acceptable. The only complaint we have to make is that so few, comparatively, of the many thousands of readers of the SCIENTIFIC AMERICAN avail themselves of this open medium through which to make known their thoughts and experiences. In all the departments of science, art, and industry, there are practical subjects which ought not to be locked up from the reading public.

Many intelligent manufacturers and mechanics hesitate about writing to the editor of a newspaper for fear of some unfriendly criticism upon their productions; hence, under this mistaken idea, they withhold the expression of their views, and the people are thus deprived of much valuable information. We wish to urge upon our readers, of every trade and profession, to constitute themselves our correspondents. They need not fear captious criticism, but in all cases their contributions will receive careful and considerate attention, and if admitted to our columns the writers will not have to regret that their thoughts are not clothed in good apparel.

We especially urge our mechanics to send us communications, giving the result of their practical knowledge. By adopting this suggestion, they will not only benefit themselves, but will also assist their fellow-workers who may be following the same trades.

PETROLEUM FOR STEAM SHIPS.

The idea of using petroleum for generating steam has appeared to us from the beginning of the discussion so preposterous, that we have incumbered our columns with very little matter in relation to it; but our attention has just been called to it in a way that prompts us to give a statement of the few controlling facts that settle the question, some Spanish gentlemen having called upon us with a letter from a Spanish official requesting information on the subject.

Anthracite coal is worth at the present time about one third of a cent per pound, and crude petroleum is worth about four cents per pound—twelve times as much. For petroleum to be economical, therefore, for generating steam, it must be twelve times as efficient as coal.

According to the nice determination of Favre & Silberman, 1 pound of carbon in burning generates sufficient heat to raise the temperature of 8080 lbs. of water one degree of the centigrade scale. Twelve times this is 96,960, which is consequently the number of pounds of water that must be raised one degree in temperature by the burning of one pound of petroleum, in order to make that substance more economical than coal. Now, the substance that generates in burning more heat than any other, is hydrogen gas, and a pound of this will raise the temperature one degree of only 34,462 lbs. of water.

We find no record of direct experiments upon the heating power of petroleum later than those of Count Rumford, and these gave a result of about 7,000 units; but, though he was a very careful observer, the later experiments of Andrews and of Favre & Silberman were made with so much better instruments, and with so much greater knowledge of the conditions, their determinations in relation to other hydrocarbons will doubtless be received as a better indication of the heating power of petroleum than Rumford's direct observations upon that substance. With five hydrocarbons, composed of the same elements as petroleum and in about the same proportions, Favre & Silberman obtained the following results, the figures being the number of pounds of water raised one degree, centigrade:

Olefiant gas.....	C_2H_4	11,858
Amylene.....	C_5H_{10}	11,491
Paramylene.....	$C_{10}H_{20}$	11,303
Cetene.....	$C_{16}H_{32}$	11,055
Metamylene.....	$C_{20}H_{40}$	10,928

From the similarity of its composition with these substances, it is doubtless safe to infer that petroleum in burning will not raise the temperature of more than 12,000 times its weight of water one degree of the centigrade scale; that is, once and a half times as much as carbon. Therefore for it to supersede coal it must be sold at about one-eighth of its present price—four cents per gallon.

THE ART OF OBSERVATION.

No subject that has been broached in our columns has excited a wider interest among our readers than the question, whether a piece of solid metal will float on a mass of the same metal melted; and one of the most curious features in the discussion is the striking contrast in the result of experiments by different observers. In the report of the proceedings of the Polytechnic Association, published on another page, it will be seen that Mr. Smith, a remarkably capable observer, has just tried an experiment which convinces him that a piece of solid zinc will always sink in a mass of molten zinc, while Dr. Rowell, an observer not less competent, asserts that he has tried the experiment twenty times, and if the temperatures are nearly the same solid zinc will always float on melted zinc.

In a certain stage of intellectual development men are apt to conceive that the highest prerogative of genius is the construction of theories, but Agassiz says, that the last and most difficult acquirement in the culture and growth of the mind, is the art of observation. The longer any man lives and the more intercourse he has with the world, the more will he be impressed with the uncertainty of human testimony; not from the disposition of people to tell falsehoods, but from their carelessness of observation and of statement.

We shall, doubtless, some time receive a paper giving an account of a series of experiments undertaken by some experienced and wholly competent observer, which will settle this question in relation to the floating of metals. In such a paper we shall have a full description of the apparatus employed, a statement of the methods adopted to obtain the metals perfectly pure, and to test their purity, of the means for measuring the temperatures of both the molten and solid masses, and finally of all the conditions which could in any way vary the results. To give such a paper any value among men of science, it must be manifest that the observer's mind was not obscured by preconceived notions, but that he had singly in view to arrive at the exact truth, and that he had sufficient knowledge of the metals, and of the influence of changes in their physical conditions, to conduct his experiments in a way to lead to positive results.

It is impossible in one short article to point out all the numerous sources of error, but it is very certain that whoever enters the field of original research in physical science, will, at every step, discover new reasons for being cautious in regard to his conclusions, and will receive new lessons in relation to the importance of intelligence, method, care and thoroughness in making observations.