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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 419,

For the Week ending January 12, 1884.

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QUANTITY OF WATER PER HORSE POWER.

It is well known that the evaporation of water per pound of coal differs largely in different classes of boilers, and even in those of the same class, but of different proportions. This difference ranges from an evaporation of say 5 pounds of water per pound of coal in a poor or indifferent boiler to about 11 or 12 pounds of water per pound of coal in boilers of a better class well proportioned.

For the purposes of this article, we will assume that 8 pounds of water per pound of coal is a fair average for good boilers as now in use. We will further suppose 150 pounds of coal per hour consumed; then the evaporation would be $150 \times 8 = 1,200$ pounds water evaporated. This is the quantity or weight of steam that the boiler can supply, or the gross quantity applicable to the engine, and if the unit of 30 pounds steam per horse power per hour be assumed, it would be a 40 horse power boiler; but whether the power actually realized be 40 horses, or more or less, depends upon the economy with which the steam is consumed.

Now if this power be supposed to be the gross power of a fall of water, it would be readily understood that the available or useful power to be obtained would very largely depend upon the character and perfection of the water wheel to which the water was applied; whether such wheel should give out 50 per cent or 80 per cent of the gross power of the fall. So it is in the use of steam in the engine; the boiler supplies a gross quantity or weight of steam per unit of time, but what shall be the available or useful power given out by that weight of steam must depend in a great measure upon the character, condition, and perfection of the engine by which the steam is consumed. We have in use: 1st. The plain slide valve engine, working with little or no expansion; 2d. The adjustable cut-off engine, working with a fixed ratio of expansion determined by the amount of work to be done, or by the fancy of the engineer. And 3d. The automatic cut-off engine, in which the ratio of expansion is determined by the engine itself to exactly meet the requirements of load or work of the engine at any given instant of time. The economy in the use of steam in these different classes of engines is in the order named, the first being that of least economy and the third that of the greatest economy.

But there is still the matter of the *condition* of the engine to be taken account in considering the question of economy. If there are losses from leaks at any point between the boiler and the working side of the piston of the engine, either from joints, valves, or piston, all such leaks militate against economy.

Now there being such great variations in the conditions under which the steam is consumed, it is quite evident that no *one* unit of horse power per pound of steam consumed would be applicable to the different classes of engines.

At the Centennial Exhibition of 1876, the committee to whom was referred the testing of steam engines and boilers had this question before them, and after full consideration fixed the unit of one horse power, generated in *the boiler,* at 30 pounds of water evaporated per hour, irrespective of the engine by which the steam might be consumed, and this unit has since been generally accepted by engineers.

It has been ascertained by direct tests that the best class of engines, in good condition, will furnish one horse power from the steam resulting from the evaporation of less than 18 pounds of water per hour; and on the other hand, poorly constructed engines in bad condition have required as much as the steam generated from the evaporation of over 60 pounds of water. But the average experience for the production of one horse power is the unit of 30 pounds of water, or approximately one-half a cubic foot of water evaporated per hour by the boiler.

ALCOHOL FROM BREAD.

In our paper of October 20, in discussing the modes of *raising* bread, and the chemical changes therein involved, we mentioned the fact that alcohol is one of the constant and necessary results of the process of yeast fermentation, and that it is safe to estimate that at least 1,000 gallons are wasted daily by evaporation in the baking of the bread for New York alone. Is there not here an opportunity for money-making by saving that which now goes to waste?

We alluded to the attempt made some years ago by a company formed in London to do this, which attempt was a failure. But the fact that one trial fails does not imply at all that another may not succeed. That company saved their alcohol easily, but they spoiled their bread, and we printed a note from a correspondent recently who remembered the attempt made in England, and the dryness and of course the tastelessness of their bread.

Now there can certainly be no occasion for this, that is, none excepting human greediness. Why is there need of looking for any more alcohol than that which regularly and normally goes off in the daily process of baking? If we will be content with that, we surely may save it, and we shall have just as good bread as that which we bake in our ordinary modes. But if we are bound to get all the alcohol possible, it is true we may do it, but we shall have bread which has lost its sweetness. We cannot have both at the same time.

We can scarcely deem that any special process is needed for doing the work; any opportunity for inventive skill. It is too simple for that. We are told that the London company expended $100,000 on their works, and it is not impossible that the very elaborateness itself was involved in the failure.

The plan which seems to us perfectly practical is this: A baker's oven is of course a closed chamber. A pipe conducted from the crown of its arch would be constantly carrying away, during the baking, whatever vapors passed off from the bread, which would be a mixture, aqueous and alcoholic. If this pipe were led through cold water, like the worm of a still, those vapors would be condensed. What opportunity here for expense? The cost of the pipe is the only thing. The oven remains precisely as it was, the baking goes on as before, and without the slightest reference to the distilling process. When the bread is baked, it is taken from the oven; the fact that a pipe was attached above has made no difference. We were baking bread, and we have done it, and as good bread as we knew how. If as a collateral product we have condensed any alcohol, very good; so much the better, and we have not injured our bread. But if in our greediness we try, because alcohol is worth money, to run our bakery as a distillery, we shall fail; and serve us right too.

THE DEMAND FOR SKILL.

Notwithstanding the present slackness in business, there is a demand for skill in the mechanic arts now, as there usually is. The proprietor of a manufactory of machine tools recently supplemented a jeremiad on the dullness of the times by an inquiry for several first-class workmen. In explanation he said he had more than he needed of the qualities of "main strength and stupidity" in his establishment, but still had room for cultivated eyes and hands guided by judgment; in short, skilled workmen were in demand.

There is reason for this condition of affairs. The more nearly absolutely automatic machinery can be made, and the more exact hand tools and appliances can be made, the more exacting are the demands for personal skill and judgment. Machines are made, they do not grow, and they are made by the intelligent and skillful mechanic. They will not even keep in useful operation and continue in useful life except by constant care and the oversight of the skilled mechanic.

The time has passed when the idea of working materials was to hammer and bang them into shape somehow, with crude tools and cruder appliances. In the case of the metals, especially, the workman uses good judgment with fine tools. No finer work is done and no more perfect results are obtained in any department of human production than in that of the working of metals, and to accomplish such results the most exact of tools must be wielded and guided by the most skillful hands and the most careful judgment.

THE PONS-BROOKS COMET.

This interesting comet is approaching its brightest phase. As soon as the full moon of the 12th is out of the way, it will be in a most favorable condition for observation until it reaches perihelion on the 26th, and its course may be easily noted on every clear night. It was not plainly visible until the 21st of December, when it faintly beamed forth in the constellation Cygnus as a small nebulosity with a very small tail. Every clear night since, it has been distinctly seen, increasing in size and brightness, while its tail is lengthening into respectable dimensions. This is the naked-eye view. In the telescope, it is a beautiful object, a round nebulous mass larger than the full moon, with a bright nucleus in the center, and with a large tail extending east. Observers who watch it from night to night marvel at its rapid race over the sky. Making its way through Cygnus on the 21st, when first permanently visible, on the 23d it was between Gamma and Epsilon in the southern arm of the Cross. On Christmas night it was close to Epsilon, and on New Year's night it had passed the boundaries of Cygnus and entered those of Pegasus. Making its way through Pegasus, and passing near Zeta of that constellation, it will soon be found in the vicinity of Beta in the constellation Pisces. Traveling rapidly to the southeast, it will pass into Cetus, taking Phœnix next in its course, then Eridanus. On the last week in March it will be found in Horologium, when its luster will be about the same as at the time of discovery. After that time, it will soon be beyond the reach of the most powerful telescopes, and be seen no more until its return in the year 1955.

We give the following ephemeris taken from *Ciel et Terre,* by means of which observers in the possession of star maps or charts can easily follow the comet's course.

EPHEMERIS OF PONS-BROOKS' COMET.

DATE. 1884.	R. A. h.	m.	D	LUSTER.
Jan. 2.	21	53	+22° 1′	3, 5
" 12.	23	1	+ 2° 5′	4, 1
" 22.	28	53	−15° 2′	3
Feb. 2.	0	34	−28° 3′	2, 3
" 11.	1	2	−37° 2′	1, 5
" 21.	1	23	−43° 7′	1, 0
Mar. 2.	1	43	−48° 5′	0, 6
" 12.	2	2	−53° 0′	0. 4
" 22.	2	26	−56° 2′	0, 4

It will be seen that, according to the Brussels ephemeris, the comet reaches perihelion at an earlier date than that given in the American ephemeris. In the matter of luster, 1 or unity corresponds to the brightness of the comet when it first became visible to the naked eye in 1812. It will be remembered that right ascension corresponds to terrestrial longitude, and declination to latitude. Any observer with a star-map, finding the right ascension and declination, as here given in the ephemeris, will find the approximate place