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(Illustrated articles are marked with an asterisk,)

CAUTION.

It has become necessary for us to state very distinctly that the Scientific American Patent Agency Offices are at No 37 PARK Row, and not at No 39.

GAS METERS---WET AND DRY.

The employment of illuminating gas as an artificial light is so general throughout the country that all information relating to the subject must prove of universal interest. Especially should the construction and management of gas meters be familiar to every consumer, for its testimony is the only provision made for showing the standing relation between producer and consumer. A few weeks since we referred to the report of a committee from the Boston Common Council, appointed to investigate the gas manufacture, giving our readers some general facts on the subject gathered from the great mass of testimony therein presented. From the same source we draw the following in relation to meters:

That payment should be made by the consumer according to the amount of gas actually used, is eminently just and was recognized as such from the first general introduction of illuminating gas. The apparatus first contrived accomplished its object in a very crude and imperfect manner, and improvements have been made, from time to time, for the last fifty years, during which period perfection has been sought for two classes of instruments known as the wet and dry meters. As the older form, the construction of the water meter should first claim our attention The main principle extending through all its varied forms may be thus explained. When a number of vessels of a certain capacity—for example, 1 cubic foot—are so arranged that, without loss of gas in the interval, one after another shall be filled by the gas in passing, it follows that just as many cubic feet will have passed as there are vessels that have been filled. As usually constructed, the meter is arranged similarly to an inverted overshot water wheel, its buckets being replaced by a revolving drum having four compartments of equal and known capacities. The gas coming in at the bottom of the meter rises through the water, which occupies a little more than one-half of the drum—fills one of these chambers, by its pressure turns the wheel and escape into the upper part of the apparatus whence it is conducted as desired for supplying the burners. While one partition is rising another is being brought under the water, thus rotation is produced and the revolution of the buckets gives motion to a series of toothed wheels adjusted so as to register on the dial plates the number of cubic feet passed through. For accuracy in the instrument the water level must be perfectly preserved, for if the meter is inclined backwards it will measure in favor of the company from thirty-five to fifty per cent constantly; if tipped forward, gas is burned that is not paid for. If the meter is set with too little water originally, if it is afterward evaporated, or if drawn off by accident or fraud, the registration of the meter would be too slow and the company would be the losers. Another serious objection to the use of the wet meter is the liability of its freezing in the winter, thereby entirely shutting off the gas supply. Substituting alcohol or spirituous liquors would overcome this difficulty, but in addition to their costliness, all these liquors evaporate so readily that the change would be in the end of no permanent benefit. The ease with which fraudulent means may be employed by dishonest consumers for underestimating the amount of gas burned, and the difficulties attending the use of this meter above specified, have caused the construction of a variety of measuring instruments in which the employment of any liquid is dispensed with.

The dry meter measures the gas by the number of times that a certain bulk will fill a chamber capable of undergoing expansion and contraction by the passage of the gas. The apparatus consists of a box divided in two compartments. The gas from the main pipe enters one of these and finds its only outlet through a slot which opens into a flexible bag of leather called a diaphragm. When filled by the gas the expansion, by a suitable connection closes the inlet, at the same time a valve is opened into a second compartment outside the diaphragm into which the gas passes and by its pressure upon the diaphragm drives the contained gas through a third slot into the outlet pipe. That the supply to the burners may be uninterrupted, two or three diaphragms are employed the arrangement being such that a certain number of movements of these shall correspond to a certain amount of gas, the number of cubic feet being registered on the dial plate. The dry meter is preferable in this respect that it needs no care to be taken of it even in the coldest weather. On the score of accuracy one meter is equally as good as the other when both are new and properly adjusted, but the dry meter will continue in order much longer than the wet.

The same reliableness in working is not experienced with meters standing idle for some time as with those constantly in use, for in the former case particles of dirt and tarry matters clog the valves and the gas passes through unrecorded; loss must also accrue to the company if any rent should be made in the diaphragm. On the other hand the consumer suffers when from the action of the coal tar upon the leather the latter becomes so stiffened that a full stroke is registered when the diaphragm does not entirely fill. Instances are given when from this cause the meter of the house which had been closed during the summer months, measured too fast or against the consumer, from thirty to forty per cent. Neither class of instruments, then, are perfect and both are susceptible of vast improvement, but the dry meter is unquestionably the better one for both parties concerned, and the whole community are interested in securing the most accurate apparatus, for it is nothing in favor of a meter that it benefits the individual at the expense of the company, in this case the amount burned and not paid for being charged by the company upon the corporation and thus the individual gain is public loss.

That there is abundant room for improvement in both styles of instruments is evident and the attention of inventors is called to the existing need. When at length we have been put in possesion of a perfectly accurate instrument, one fruitful and unfailing source of grumbling on the part of careful householders will be forever removed.

A TRIAL OF CUT-OFFS.

We have received a report of the performances of two marine engines with different cut-offs, which may be interesting to marine engineers and others, the main facts of which we will briefly rehearse.

The New York and Virginia Steamship Company built, over a year ago, for their line—the vessels of which ply between New York and Richmond, Va.—two ships, each a counterpart of the other, the hulls being built by Westervelt, of New York, at the same time, from the same molds and patterns. It was designed to make them twin vessels as nearly alike as possible. The machinery of both vessels was made at the Allaire Works, New York, from the same patterns and at one and the same time, the only difference between the two engines being that one—that of the *Niagara*—had the Stevens cut-off, and that of the other—the *Saratoga*—the Winter's cut-off.

The two vessels have been running regularly for a year on the same route and engaged in the same business. These conditions appear to have been well suited for a satisfactory test of the relative value of the two cut-offs. The Stevens cut-off hardly requires an explanation, as it is so extensively used that there are few machine engineers or builders of marine engines, who do not thoroughly understand its construction and operation. It is conceded as giving excellent results. It is operated by two eccentrics on the main shaft, one to move the steam valve rock shaft and the other the exhaust, each independent of the other, thus permitting the setting of the toes and wipers on the rock shaft, so that the steam can be made to cut off at any desired part of the stroke without disturbing the exhaust motion.

The Winter variable cut-off may not be so generally known, although it is in use on a great many vessels—naval, mercantile, and pleasure yachts. It is called a "rotary cut-off," and is operated by one eccentric on the main shaft. This eccentric gives rotative motion to a shaft on which are secured four cams, two for the exhaust and two for the steam inlet valves. The motion of the steam valves is made variable by interposing between the cam and valve-lifter swinging toes which are alterable while the engine is working, so that the steam can be cut off at any point of the stroke without affecting the exhaust, which exhaust motion is so arranged that it gives the quickest possible action in lifting the valves, and retains them in an open position as long as may be desired. Thus the steam may be utilized under the ordinary amount of lead without having back pressure on the piston.

The two vessels used coal from the same heap and a strict account was kept of their performances. The result was that the *Saratoga* with the Winter cut-off, in forty round trips between the two points, going and returning, used less coal by four hundred tuns than the *Niagara* having the Stevens cut-off and made the shortest average time, beside forcing her way over the bar in the James River when the *Niagara* could not, thus saving the expense of a steam tender, and in a heavy following sea the engineer could keep the engine from hanging on the centers by allowing the steam to follow the piston to any required point of the stroke.

The trial extended through a period of over seven months, the average amount of coal burned per trip being on the *Saratoga* in round numbers, 70 tuns, and on the *Niagara* 80 tuns. It is but fair to say that both vessels improved in the economy of coal during their thirty trips, but the result shows rather favorably for the *Saratoga* with the Winter cut-off. Our engineers must draw their own conclusions.

HOW STEAMERS ARE BURNED AT SEA.

An able contribution anonymously published in a daily paper of this city, so well sums up the criminal defects common among our steam craft of all descriptions, in regard to the hazard of fire, that we need make no apology for repeating in brief the catalogue. A list of 336 American ocean and coasting steamers of every grade is printed, with their fire rates annexed, purporting to be as recorded on the books of the underwriters in the United States and Europe. Of all these only the small minority of 73 are rated "good" in point of security and provisions against fire. The other 263 are all rated "indifferent", or "insufficient."

A steam vessel becomes from the nature of the case one of the most inflammable structures in the world. Fervid heat from the furnaces dries and chars the very portions of woodwork most exposed to danger, until they are ready to take fire like tinder from a spark or the proximity of unusual heat. In such circumstances the most minute and complete precautions ought to be religiously observed, and neglect of this plain duty is the cause of nearly all marine disasters by fire. Boilers with external furnaces of brickwork should rest entirely on their standards, and the brickwork should be cased with accurately fitted plate iron, so that fire working down into cracks and crevices cannot possibly get through, and no woodwork should be allowed within one foot of them, while that directly over them should be sheathed with metal closely nailed. All boilers should be jacketed with felt or hair cushioning, else the accident of low water and overheated surface may at any time set on fire the hot and half charred wood nearest; whereas the covering of animal fiber will quickly reveal by its peculiar odor the commencement of over-heating in any part. Boilers with internal furnaces should certainly have water bottoms; otherwise openings which will at some time or other appear will deposit fire beneath, or over-heating will take place from the bottom surface. Natural draft should always be secured, and blowers be outlawed altogether. Blowers urge every spark and flame to every possible outlet, crevice or joint of door, and many steamers have been thus destroyed by them. Whenever the passenger hears the deep thrumming roar of a blower, let him mark the name of that steamer in his note book as one to be avoided in future if possible. Woodwork around boilers, steam chimneys, etc., should be well set off, sheathed with metal within, the laps upward, and *not* employed as a closet for brooms, buckets and other combustible articles. Chimney rooms should be large enough to admit the passage of a man around the chimney, and should be without floors to obstruct free ventilation of heated air. All steamers should be provided with one or more independent steam fire and bilge pumps, placed on the main deck so as to be in no case inaccessible or unmanageable in time of danger, and fitted with abundance of hose to reach all parts of deck or hold. It is stated that scarce a week passes without some vessel being saved from burning or sinking solely by the services of one of these pumps, or lost by the want of them, under circumstances where the engine pumps are from their position inadequate or powerless. Store rooms should be located away from the fire room and boilers, instead of being placed, as they often are, to utilize a space too hot for passengers, freight or anything else, except the oils and cotton waste of the engineer! All these combustibles should be kept in a room by themselves, in fixed metallic tanks, where artificial heat and light need never come, and lighted at night by a fixed light outside. Movable lamps should be entirely dispensed with in engine and fire rooms by ample provision of light from fixed lamps. Why should not these and other securities suggested by experience, be embodied in a general law and enforced upon the owners of all steam vessels?

PATENTS IN "THE DOMINION OF CANADA."

The British North American Provinces, shortly to be united together under the name of "The Dominion of Canada," are as follows:—Canada, New Brunswick and Nova Scotia. The union of these Provinces will doubtless be perfected during the present year when a general Patent Law will be passed; but whether under its stipulation foreigners non-resident in the dominion will have the privilege of obtaining patents for their inventions, is uncertain. At the present time patents are granted in Canada, only to British subjects, who must be residents in the Provinces as well as the discoverers of the invention. In New Brunswick, however, all foreigners resident or non-resident, may obtain Letters Patent for their inventions for a period of fourteen years, renewable for an additional term of seven years.

Under the act of Union all patents previously granted in each separate Province prior to the Union, will, when confederation takes place, extend over the entire dominion. We have received this information from an eminent patent soliciting firm at Montreal, and regard it as correct.

We are prepared to take out patents in New Brunswick, in anticipation of the union of that Province with the Canadas. Particulars furnished on application at this office.

Patents in Prussia.

We have received a communication from a Commission appointed to prepare a system of Patent Law and Practice for the enlarged Kingdom of Prussia. We have responded to the committee in detail, and we trust ere long to be able to announce the introduction of a Prussian patent system