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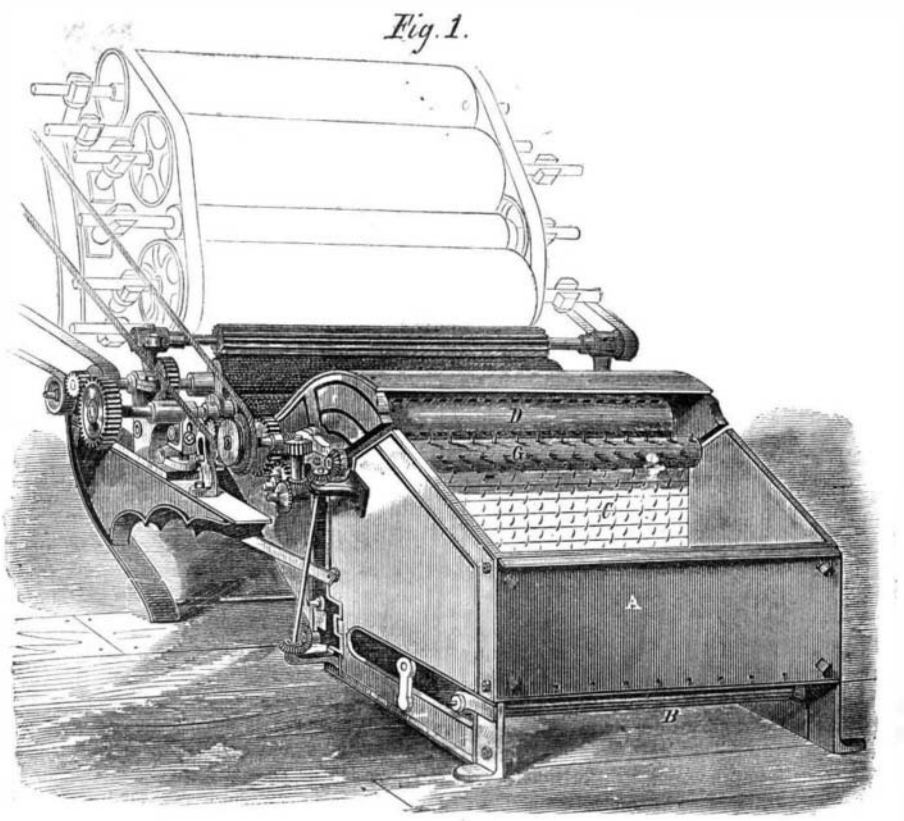
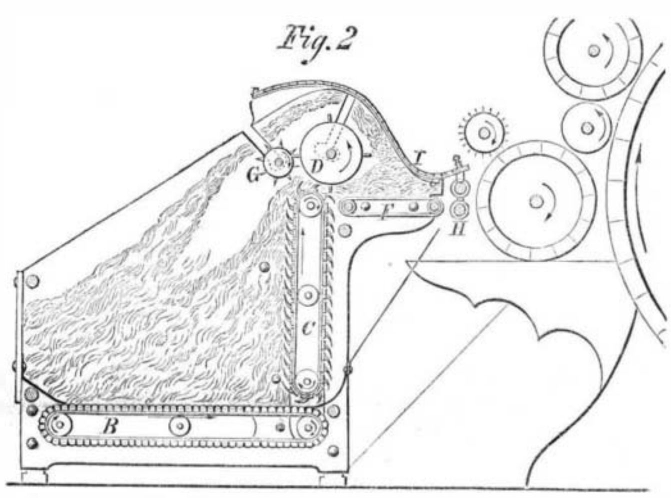
Improvement in Feeder for Wool Breakers.

This machine supplies what has long been a great want of the woolen trade, and will doubtless be received as such by those interested. It feeds the wool on to the first breaker card evenly, thus saving a large amount of labor and insuring uniformity of work, which has been impossible by hand feeding. In the accompanying engravings, A is a box into which the wool is loosely thrown, B is an ordinary slat apron, carrying the wool forward toward a vertical apron, C, which is furnished with spikes or forks, which continually lift the wool from the apron, B, to the shorter apron, F, which carries it forward to the feed rolls, H. G is a picker roll, which performs the double function of preventing any large locks of wool from passing on to the apron, F, unopened, and also of keeping the fan, D, clear of wool. I is a movable plate of sheet iron, which with the apron, F, forms a throat for the reception of the wool, and the size of this throat can be enlarged or reduced by raising or lowering the iron plate, I, which is readily done. The operation of the machine is briefly as follows: The wool thrown into the box is carried forward and upward by the two aprons, B and C, to the short apron, F, and is delivered in larger quantities than is required by the card. At this point it is blown by the fan, D, into the "throat," which is thus always kept full, and the surplus is returned to the box, as shown in Fig. 2. It will be manifest to all who examine the subject that the size of the throat will regulate the quantity of wool delivered to the card, which has hitherto been entirely controlled by the speed of the feed rolls. This can still be governed in the same way if preferred, so that any weight of roping can be produced.

This machine was patented August 23, 1864, and is offered for sale by Harwood & Quincy, 25 Bromfield street, Boston, Mass., who will supply all information regarding it.



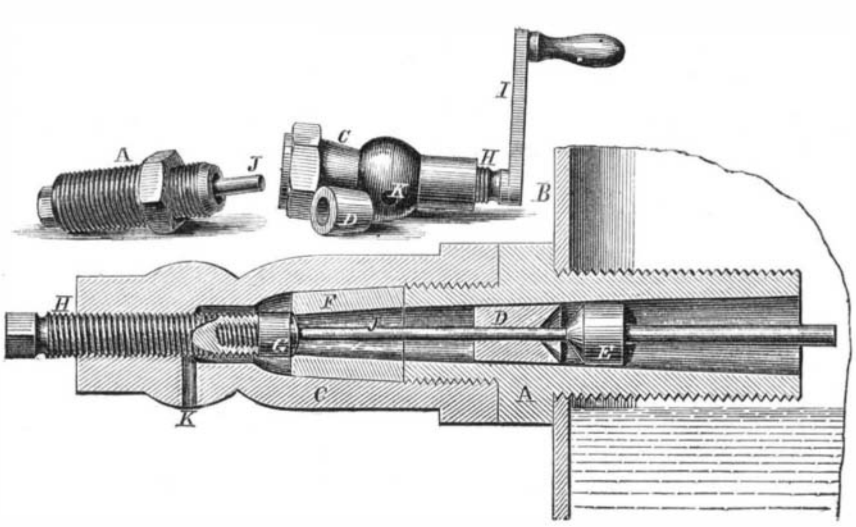


THE BOLETTE FIRST BREAKER FEEDING MACHINE.

Improvement in Steam Boiler Gage Cocks.

Sometimes the gage cocks of a boiler become worn and leaky, and it is necessary to re-seat their valves. This can be done only when the steam is down. The object of the peculiar construction of the cock shown in the accompanying engravings is to allow this necessary work to be done at any time, when there is a full head of steam on as well as when the boiler is cold. This is effected by forming the cock in two parts, both of which are furnished with valves, one opening outward and the other inward.

The part, A, has a threaded stem with nut formed on it for seating it in the boiler head, B. The outer end of A is of reduced size and also threaded to receive the part, C, the shoulders of A and C coming together when the parts are united. The bore of A is slightly conical and receives a valve seat, D, in which fits the inward opening valve, E. The part, C, has also a valve seat, F, in the outer end of which is seated the valve, G, operated by the screw, H, and handle, I, in the usual manner. The valve, G, is seated in the screw, H, by means of a thread, as seen. The inner valve, E, is provided with a stem, J, of such a length that its end bears against the inner surface of the valve, G, except when the latter is moved out much further than is necessary to try the steam or water, or the part, C, is wholly removed from the fixed portion, A. In such a case the pressure of the steam closes the valve, E, preventing the escape of steam or water from the boiler. This allows the removal of the part, C, for repairs or re-seating the valve, when the remaining valve, E, can be operated as a try cock by pressing on its projecting stem, J. In ordinary use, when the parts are joined, this stem prevents the closing of the valve, E, and allows the steam or water to escape through the opening, K.



THOMAS' BISECTED GAGE COCK.

The advantages of this gage are sufficiently apparent without further description. We consider it to be a valuable improvement.

Patented January 21, 1868, by William G. Thomas, who may be addressed relative thereto at Centralia, Pa.

GAS MEASUREMENT.

In the entire range of articles in ordinary use, there is probably not one that is measured with greater average accuracy than illuminating gas, and probably there is not another, in the accurate measurement of which the public at large have so little confidence. There are many reasons for the origin of such doubts, most of which must be charged to the consumers, some of them to the gas-manufacturing companies, and the balance to the defective method of selling gas, at a given rate per thousand cubic feet, as is generally the case, without regard to quality.

Most people who use gas do not take any pains to inform themselves in regard to the manner of its measurement, do not understand even the fundamental principles of a gas meter, and have not the least idea of its construction. Some might, no doubt, be found who can not even read the ordinary dial correctly.

The effect of such ignorance is suspicion and doubt. In vain may meter inspectors test, and meter manufacturers labor to convince the public of the accuracy of gas meters while it exists. The dissatisfaction engendered by want of information is increased by the irregularity of amounts consumed in different periods of time without (to the consumer) any apparent cause. Were the bills constant in amount, or only increased as the nights lengthen, to be again diminished as the demand for artificial light decreases with the approach of summer, many would be content to believe in the justness of the measurement without further question; but such is not the universal experience. A merchant, perhaps, having paid a bill for gas used in his warehouse in January, is surprised and indignant to find that it is as large, or nearly as large, for April. An individual complains that the gas bill last presented to him is as large as the one for the previous month when "he had sickness in his family and gas was kept burning all night for a week." Indeed the opinion of many sufficiently intelligent to judge fairly about ordinary business transactions, is that gas meters are a humbug and a blind, used only to give a show of fairness in assessments, and that gas bills, like doctor's bills, are made out upon the principle of about how much, from the apparent character of their residences, and other indications of wealth or poverty, people will submit to without protest. These opinions are erroneous, as we shall proceed to show: the fact being, that the errors of gas meters, when errors exist, are mostly in favor of the consumer. In order to corroborate our statement, it will be necessary to explain the construction and operation of gas meters. In doing this we shall, as much as possible, avoid technical terms, and shall use the simplest illustrations, our object being not to enlighten those who are already informed upon the subject, but to show, in the plainest manner, to those who have not correct ideas of gas meters, the principles upon which they are constructed.

Gas meters are of two kinds—wet and dry. Wet meters are so called because it is essential to their operation to keep a certain level of some liquid (water or glycerin), within the case. Dry meters do not require any such appliance, hence the name applied to them. Dry meters are the more commonly used on account of their requiring less attention than wet meters, which have, when water is used, to be kept supplied with it and protected from frost. The use of glycerin obviates the replenishing and care to prevent freezing, as that liquid is non-volatile, and not liable to be frozen.

To understand the principle of the wet gas meter, it is only necessary to imagine a wheel, having buckets attached to the perimeter, the top of each bucket placed toward the bottom of the next one in order, forming a series entirely around it. Imagine, further, the wheel immersed in a tub of water to somewhat more than half its diameter, its axle being supported by bearings attached to the sides of the tub. Let a pipe pass through the side of the tub near the bottom and turn up under the series of buckets on that side where the buckets are bottom side up. Now invert another tub of equal size to the first one, over it, close the joint air-tight, and insert a tube in that, and you have a rude wet gas meter. If gas is forced into the lower tube, the upper one being left open, it will bubble up through the fluid and fill the inverted buckets of the series, which, being thus rendered buoyant, will rise to the surface, and in so doing, revolve the wheel to which they are attached, and bring other buckets of the series over the mouth of the pipe. Thus a continuous rotation would be kept up provided that the buckets could be so arranged that less power is required to force the buckets under the surface of the fluid than their buoyancy upon the opposite side is able to overcome. In actual practice this is accomplished by a very ingenious arrangement. The pipe in the upper inverted tub permits the discharged gas to escape from the meter. Now, the number of buckets in the series being known, and the amount which they will each hold, it is an easy matter to determine the amount of gas discharged at each revolution of the wheel, or for any number of revolutions. Suppose it to be a cubic foot for each revolution: then a pinion of six teeth, attached to the axle of the bucket wheel, working upon a wheel of sixty teeth, would, in revolving once, move the latter one tenth of a revolution. If to this wheel a pointer and dial were attached, and upon the dial the nine digits and zero were placed at equal intervals, this pointer would mark units of cubic feet. If to the axis of the units wheel a pinion of six teeth were attached, working into another wheel of sixty teeth, the latter would be a wheel of tens, and so on. The level must be kept at a constant point, and in wet meters there is generally a device for stopping the flow of gas the instant the level becomes too low.

Dry meters consist of a series of bellows inclosed in a case, and so arranged that they are alternately filled and discharged, the filling of one furnishing the necessary power for the discharge of another, and so on, each being successively filling and discharging. The reciprocal motion thus obtained is converted into a rotary motion by cranks set at right angles to each other and so arranged that a rotation is made for every time that the bellows are filled and emptied once. The cranks alluded to perform two offices, the first of which is to open and shut the valves which direct the flow of gas into the different bellows, and second, to give motion to a system of wheels and pinions having the number of their teeth in a tenfold ratio to each other, and impelling pointers over dials, precisely as described, for wet meters.

Now let us notice the obstructions to which the two kinds of meters are liable, and we shall see that their effect is against the producers of gas and in favor of the consumers. We premise, of course, that the meter is a perfect one when it is connected with the service pipe, and we will here state that the apparatus for testing meters is as certain and reliable as any used for sealing weights and measures, and that the sealing is performed by an officer bound and sworn to perform his duty faithfully, not in the employ of any company, and that his seal, according to law, must be upon every meter before it is used. The inspector's seal is evidence that, either himself or one of his deputies have tested the meter upon which it is placed and found it to be correct in its measurement. Wet meters may vary in their measurement by the axle (spindle) becoming fixed. In such case the gas would bubble up from beneath the fluid, the flow would not cease while the registering would stop—the producer, and not the consumer, losing the amount thus passed and not registered. They may vary from leakages, which sometimes occur in the buckets. In this case all the gas which leaks is lost to the producers. They may vary from the water level getting too low. When this occurs, the construction of the bucket wheel (drum) is such that the gas does not pass under the buckets, but gurgles up by the side and passes out without being registered. This fact alone would render a wet meter worthless (as it would place the sellers of gas at the mercy of the honesty of consumers), were it not provided against by an apparatus above alluded to, which closes the mouth of the service pipe and shuts off the flow of gas whenever the level becomes too low for correct registering. This apparatus consists of a hollow ball which floats upon the surface of the water. The ball is connected by a wire with a plug (valve), and when the level becomes, by evaporation or other causes, too low for accurate measurement, the plug stops the mouth of the pipe and obliges the consumer to supply the requisite amount of liquid to restore the level. The wire attached to the plug may sometimes stick in its guides. When this takes place the effect is evidently in favor of the consumer. Another cause of error may be the sticking of the axle of the bucket wheel, caused by tarry deposits from the gas. This must also favor the consumer, as the harder the meter works the more compression of the gas takes place in the buckets, so that more gas of a given density is required to rotate the drum than would otherwise be required. Of course, leaks through the outer case, or through pipes, cocks, or burners, which are supplied through the meter, are losses to the consumer, but he is solely to blame for such losses, and ought to sustain them. Dry meters are subject to variations from all the causes which we have enumerated, except those which depend upon the maintaining of the water level. Both may vary on account of temperature, and this is probably the only way in which the consumer can lose by their irregularities, as the gas, at an elevated temperature, will measure more for the same amount of illumination, than it will at a low temperature. It is therefore for the interest of the consumers to have meters set up in cool places.

The differences in the amount of gas bills may be attributed partly to the consumers. Burners which have been used long will generally pass more gas than new ones, as the apertures are frequently enlarged; and unless the flow of gas is stopped through the day, and at such times as the gas is not required, more or less leakage is liable to take place, and this leakage will be registered by the meter along with that which is burned. The great source of difference in gas bills is, however, the fault of the producers, who can vary the quality of the gas at pleasure. More poor gas, that is such gas as is poor on account of its deficiency in illuminating power, can be passed through burners without "blowing," than rich gas, or gas of high illuminating power. When such gas is furnished, the consumer unconsciously uses more volume for a given amount of light. In Europe, gas companies are obliged by law to supply gas of a specified richness; but in this country, if any such law exists, it is practically a dead letter, as the gas furnished by most companies is not kept up to any standard quality. This is the prime cause of the trouble. The meters are not to blame—they only measure quantity, and they do that well. If you purchase a quart of ostensible milk which has been diluted by a gill of Croton water, you do not blame the measuring cup.

The selling of gas by quantity only is an anomaly in domestic commerce, rendered possible simply because people in general cannot test its quality; other than by the effect it produces upon their pockets, after it is used, and the demand for payment cannot be evaded. The preventive is in the yet uninvented gas meter that shall register for quality as well as quantity, or in stringent laws that shall compel gas companies to make gas of a standard quality.

ICE—ITS COLLECTION, STORAGE, AND DISTRIBUTION.

This substance, from time immemorial, in the countries of the Eastern Hemisphere, an article of luxury, has become one of prime necessity the world over. It enters into almost every house and place of business, contributing its grateful coolness to the water, rendered insipid and tasteless by the fervid heats of summer; it operates by its antiseptic power in the preservation of meats, vegetables, and fruits in a fresh condition, unchanged by the action of salt or brine; it freezes the creams and cools the mineral water of the confectioner, and aids the pharmaceutist in the condensation of distillates, the preparation of freezing mixtures, and the cooling suppositories and ointments, and furnishes a substitute of no mean value for distilled water. So varied and important are its uses, and so valuable is it in the operations conducted in the laboratory of the chemist and pharmaceutist, and so extensive the business and capital concerned in its collection and distribution, that a few notes respecting it have not been deemed as misplaced in this journal.

Fifty or sixty years ago Mr. Frederic Tudor, of Boston, entered upon the enterprise of exporting ice to the West Indies. He encountered the greatest difficulties in starting the business, among which was one which would bring a smile upon the face of any twelve-year-old boy of to-day. It was as difficult to charter a vessel to carry ice then, as it would be now to get one to carry nitro-glycerin, and he was obliged to purchase the vessel he at first employed, in order to show that ice is a safe cargo. For several years he continued operations in the face of difficulty, discouragement, and pecuniary loss, and it was not until twenty years after that he succeeded in making it remunerative. Since then the business has gradually increased, and within the last twenty years the growth has been very rapid, especially in that department devoted to the supply of the home consumption. The amount of capital employed, and the extent of the ice trade in the United States is something enormous. Full statistics are lacking, but occasional notices appear in the current news of the day which are extremely suggestive. A communication in the New York *Commercial Advertiser*, written by one who appears to know whereof he affirms, estimates the amount laid up for the consumption of the city trade in 1866, at 580,000 tuns, and during the past winter a statement appeared in some of the papers that there was stored for the consumption of 1868, 750,000 tuns. The writer is informed that the Knickerbocker, the largest ice company of New York, has a million of dollars invested in the business; and from the statements contained in the communication quoted above, the demand for ice will make room shortly for a dozen more like it. These amounts are independent of all that is invested in this trade and the ice that is laid up in Philadelphia, Baltimore, Boston, and other large cities of the Union, and a little consideration will show that the ice business in the United States ranks in importance with almost any one that can be named.

In dealing with the subject on the present occasion, it is proposed to offer a few succinct remarks upon the mode of collecting and storing this commodity, arranging it on board ship for export, leaving the question of statistics to a future opportunity.

Ice houses vary in size and capacity from two to fifty thousand tuns. Allowing forty cubic feet of ice to the tun, the smaller size mentioned would require internal dimensions of one hundred feet in length, fifty feet in width, and twenty-four feet in hight to the eaves. Houses for ten to thirty thousand tuns are often built in several sections, of these, or even increased dimensions, giving one the idea of half a dozen large barns cemented together at the sides, each section having its own individual roof, reminding one of the board fences one sometimes sees, where the upper edge of the fence is sawn out into pickets, looking like saw teeth. The capacity of the houses is of course determined by the amount of business the proprietor has or anticipates. As a general thing they are entirely clear in the interior, no space being taken up by beams or ties, or anything which would interfere with the regular filling up of the whole space with ice, or anything which can possibly act as a heat conductor in the summer season.

The walls are constructed with a double row of stanchions or studs, the interior ones being perpendicular and the exterior slightly inclined, so that the space between the boarding may gradually diminish from twenty-four inches at the bottom to sixteen at the top. The boarding is put on between the inner and outer stanchions, to secure it from being burst off by the pressure of the filling, and the inner and outer shells are bound together at regular intervals by iron bolts, to prevent them from spreading from the same cause. The space thus left is filled with spent tan preferably, but sawdust may be used, or what are called short shavings. The whole is surmounted by a roof with a steep double pitch, and the building is often whitewashed, roof and all, more perfectly to reflect the rays of the sun. One *sine qua non* is, that all round the foundations the whole building shall be perfectly air tight; not, as one would at first imagine, to prevent the access of air, but to prevent the cold air at the bottom from rushing out, and giving up its place to the comparatively warm air at top, which would endanger the whole stock stored in the house. This, with the requisite doors, and hoisting and storing apparatus, may be taken as the general type of a well-constructed ice house.

Ice houses are constructed preferably entirely above ground; the underground construction having been abandoned, as a general thing, for the reason that during the summer days the earth absorbs the heat of the sun, and does not yield it up at night, so that, continually absorbing heat in this manner, it is believed that the ice wastes more rapidly by underground than above-ground stowage.

When the season has been favorable, and the ice has attained the requisite thickness—the thicker the better—the ice men proceed to work. As horse power is much employed, and as ice less than five inches in thickness will not bear the weight of a horse, in an open winter it is sometimes late before the ice cutters can commence operations. If there is loose snow upon the surface of the ice, this is removed for any desired distance by means of a scoop. A space of 66 feet square, will give 108 dozen cakes. If good, clear ice is reached, the work of marking and cutting commences. If the surface of the ice is in that granular condition known as snow ice, the ice plane is required. Previous to its use the hand plow is run along one side of the space in a straight line, to form a groove, which acts as a point of departure, and regulates the motions of all the implements subsequently employed in cutting the ice.

The preliminary groove having been made by the hand plow, the swing guide marker is brought into use, and, the guide taking the groove, the marker makes a second one parallel with it. Upon turning around at the end of the course the guide is swung over so as to take the groove last made, and on the return trip a third is made. This process is repeated until all the grooves required are made, equally distant from and parallel with each other.

The right ice having been reached, the process of cutting now commences in good earnest. The large ice plow extends the depth of the grooves already made to twelve or fourteen inches. The same operation is repeated now at right angles to the former grooves, and the cakes are ready for separation from each other.

The rows thus cut are slightly bevelled, narrower below than at the top. Before doing this, however, it is necessary to take measures to prevent the water from entering the grooves and freezing therein, thus filling them up. This is done by calking them with snow, and this is done by an instrument called the calking bar, a bar with a broad chisel like end, and so made as to enter the grooves, and drive the snow to the very bottom. The two outside rows having been sawed out, the blocks lifted upon the adjacent ice, and the grooves behind the next row of blocks having been caulked as before, a bar called the breaking bar is used, generally in pairs, to pry the blocks apart, giving double the purchase attainable with a single one. The calking process must be used behind every row of blocks to be separated, else the plow would, on one of our freezing days, prove a Sysiphæan labor, having to be repeated again and again *ad infinitum*. The blocks are now floated, through a channel cut in the ice, to the ice house, which brings us to the storing and packing.

The blocks once arrived at the house, which is, whenever it is possible, built so that the ice can be floated up to it, is then seized by a huge pair of tongs made specially for the purpose, as the cakes are heavy, weighing three or four hundred pounds apiece, and hoisted up at once where they are wanted. The ice is disposed in regular tiers, the blocks being placed as closely together as possible, though no particular pains is taken to fill up the interstices. This proceeds until the house is filled. One of the most important particulars relates to the covering over all. The material preferred before all others is the long pine shavings of the carpenters. These are cleanly, durable, and not subject to decay, are easily handled by a common pitchfork, and may be used for more than one filling of the house. The objection to hay or straw is that it is liable to decay, or becomes musty. Sawdust is disagreeable, from constantly sifting down and covering the cakes of the successive tears, as the upper ones are removed.

The houses being filled, the proprietors await the summer demand for their commodity, or else proceed at once to load up for tropical markets. The ice which is stored commences to melt at the upper tier, and here is where the greatest waste occurs. The resulting water, percolating through the interstices of the ice, reaches the lower tiers, and, finding a temperature below its freezing point, congeals again, cementing the cakes together in the lower tiers so as finally to form a solid mass, if left undisturbed for a sufficient length of time. An ice house in this city was filled, and left undisturbed for four years. During the fifth year the proprietor, finding his stock of ice running low, examined this house, and found that, by melting, the ice had lowered from twenty feet to four feet in hight, and was one solid cake. He was compelled to employ his plows, and get the ice out of it in such pieces as he could; but it carried him through the season.

In the first part of the present paper allusion has been made to the difficulties encountered in the earlier efforts to transport ice to southern and eastern markets. The first cargo was despatched by Mr. Tudor in February, 1806, to St. Pierre, Martinique. He shipped about 130 tons, and of this only five tons arrived at its destination; and this trip was attended with a loss of about $4,500. Details of the different expedients resorted to, to avoid this loss would be interesting, but the mention of one must suffice. On one occasion he purchased several large cases of flannels, and endeavored by winding the pieces in and out around the ice, to protect it from its natural enemy, a high temperature; but this expedient proved unsuccessful. At length, as ice houses were erected, and the correct principles for their construction were gradually developed, it became apparent that the same principles must obtain in preparing a ship to carry a cargo of ice, converting it, in fact, into a floating ice house; and this is the way it is now done.

The first thing is to make an even floor in the hold of the ship, by filling up the furrows, so to speak, each side of the keel, with what sailors term "dunnage," consisting of fragments of lumber or ballast of some kind. This gives a toler-