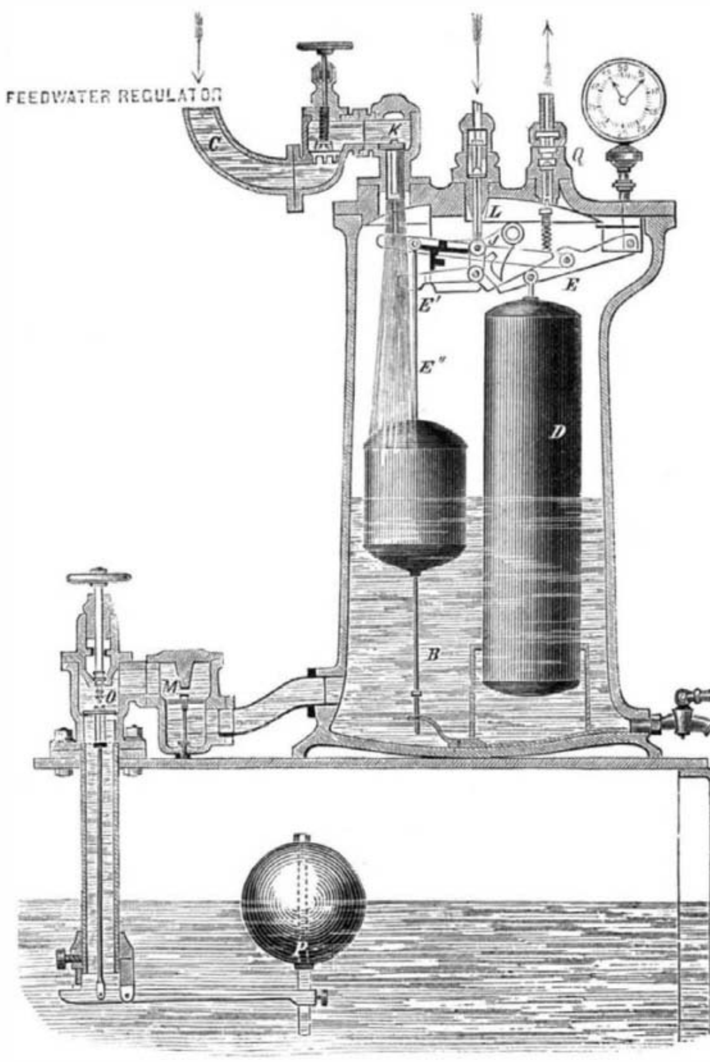
IMPROVED BOILER FEED REGULATOR.

Messrs. Bede & Co.,of Verviers, Belgium, have recently introduced a new device for automatically controlling the supply of water to a steam boiler, which, they claim, insures a uniform hight of water in the boiler, thus avoiding danger of explosion and diminished pressure from too sudden or over feeding. It consists, principally, in the water cistern, B, which communicates with the boiler through check valve, M, and stop valve, O, and it is fed by the pipe, C, through the valve, K. When the water in cistern, B, rises so as lift the smaller float, E'', the extension lever, E', is moved so as to disengage the larger float, D, which has previously been held down by the lever, E; and the float, D, lifting the lever, E, actuates the bell crank, J, to open steam valve, L. The entrance of the steam at L closes the valve, K, shutting off the water supply.

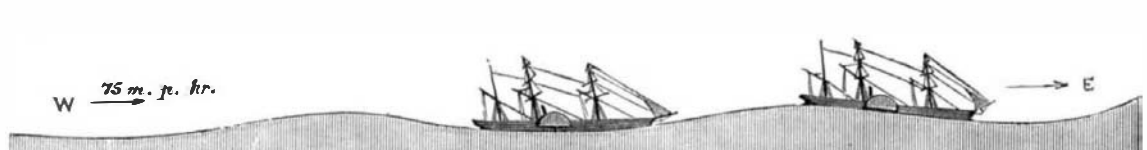
Equal pressure is thus established in the receptacle, B, and the steam boiler, and the water may then pass through the valves, M, O, into the latter. The valve, ●, is regulated by the boiler float, P, so as to be opened or closed, to maintain a uniform hight of the water in the boiler. The smaller float of the receptacle, E'', follows the falling water, and strikes a pin or stop at the lower end of its guide rod when the receptacle is nearly empty. The weight of the small releases the large float, D, which presses on the link, J, closes the valve, L, and opens the water supply valve, K, and an exit valve, Q. The steam escapes through the valve, Q, into the reservoir, where it is condensed, while the water fills the receptacle, B, through valve, K. The supply is thus kept continuous through the alternate action of the apparatus, which is also provided with a registering device, indicating how often the receptacle is emptied and filled, and consequently what amount of water has been used. By comparison with the quantity of fuel consumed, a simple and reliable test of the operation of the boiler and engine is afforded, the control of the engine by the attendant is facilitated, and economy in the use of fuel necessarily follows. The regulator was exhibited et the Vienna Exposition in 1873, and received a premium medal at the Paris Exposition in 1867. A number of these appliances are in use in Europe.



BEDE'S FEED WATER REGULATOR.

HIGHT OF WAVES.

J. W. Black, in a recent letter in *Nature*, says: "Dr. Scoresby's observations in the North Atlantic record 24 feet, 30 feet, the highest 43 feet, and the mean 18 feet in westerly gales; and the frigate Novara, 20 to 30 feet off the Cape Promontory. French observers in the Bay of Biscay state a hight of wave of 36 feet; Capt. Wilkes, U.S.N., writes of 32 feet in the Pacific, and Sir J. Ross of 22 feet in the South Atlantic. Hights of waves in N.W. gales off the Cape of Good Hope were computed at 40 feet, those off Cape Horn at 32 feet, in the Mediterranean Sea at 14 feet 10 inches, and in the German Ocean at 13½ feet; but in British waters they are only found to average 8 to 9 feet. The velocity of ocean storm waves was observed by Dr. Scoresby in the North Atlantic to be about 32 miles per hour; Capt. Wilkes recorded it at 26½ miles in the Pacific, and French sailors in the Bay of Biscay at 60 miles an hour. Dr. Scoresby has estimated the distance between or breadth of his Atlantic storm waves at about 600 feet from crest to crest, which is only about half of that stated in the letter, and with a proportion of only $\frac{1}{20}$ for hight to breadth. Dr. Scoresby states that his waves of 30 feet in hight move at the rate of 32 miles per hour.



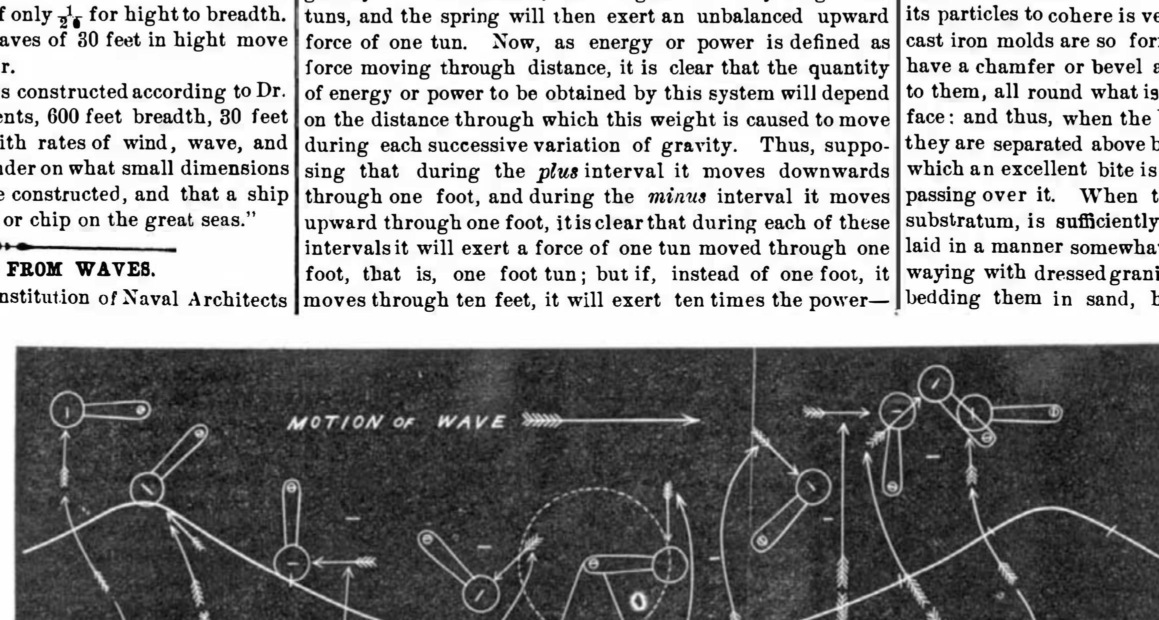
The accompanying diagram is constructed according to Dr. Scoresby's scale of measurements, 600 feet breadth, 30 feet hight, and 220 feet vessel, with rates of wind, wave, and vessel; and from it one may ponder on what small dimensions these terrific-looking waves are constructed, and that a ship after all looks only like a cork or chip on the great seas."

MOTIVE POWER FROM WAVES.

At a recent meeting of the Institution of Naval Architects a paper was read by Mr. B Tower, on a method of obtaining motive power from wave motion. He said that this inquiry originated with Mr. Deverell, whose proposition was to suspend a heavy weight on board a ship by means of springs, and to obtain motive power by the oscillation of this weight through a distance not exceeding the hight of the waves.

It however appeared to Mr. Tower that, since the centrifugal force of wave motion in a vertical direction is alternately added to and subtracted from the force of gravity, thereby causing a virtual variation of the intensity of that force, the question might be broadly stated as follows: Supposing the force of gravity to vary in intensity at regular intervals, that is, to become alternately greater and less than its normal amount, what is the best means to obtain the maximum amount of energy from a given weight oscillating under the influence of these variations? For example, supposing the force of gravity to be for three seconds one fifth greater, and for the next three seconds one fifth less, than its natural intensity, and suppose that we have a weight of five tuns suspended by a spring, with an infinitely open scale, so that the spring will continue to exert a uniform upward force of five tuns, no matter how far the weight moves up and down, it is clear that, during the three seconds' interval, during which gravity is one fifth more than its normal intensity, the five-tun weight will virtually weigh six tuns, and will thus exceed the upward force of the spring by a downward force of one tun; in the same way, when the force of gravity is one fifth less, the weight will only weigh four tuns, and the spring will then exert an unbalanced upward force of one tun. Now, as energy or power is defined as force moving through distance, it is clear that the quantity of energy or power to be obtained by this system will depend on the distance through which this weight is caused to move during each successive variation of gravity. Thus, supposing that during the *plus* interval it moves downwards through one foot, and during the *minus* interval it moves upward through one foot, it is clear that during each of these intervals it will exert a force of one tun moved through one foot, that is, one foot tun; but if, instead of one foot, it moves through ten feet, it will exert ten times the power—that if, ten foot tuns; or if moved through one hundred feet, it would exert one hundred foot tuns during each interval of three seconds.

The first experiments Mr. Tower made, with a model apparatus constructed on these principles, showed him that the best arrangement would be to put a weight on the end of a revolving arm, whereby the centrifugal force of the wave motion might be utilized as well as the rising and falling motion.



The diagram shows the position of the vessel and of its revolving arm at all parts of a wave; the arrows show the direction of the centrifugal force of the wave motion according to the generally received theory. This force is upwards at the crests, downwards in the hollows, and horizontal midway between the crests and hollows. If the weighted arm is compelled to assume successive angular positions, so that it is always at right angles to the force, it is evident that the force will be continually acting to cause the arm to rotate. It is easy to see how the work is taken out of the waves; for when the vessel is descending, the weight is performing the upper half of its revolution, and is consequently exerting an upward centrifugal force; and when the vessel is ascending, the centrifugal force is pushing down and resisting the vessel's ascent, so that the revolving weight affords a resistance against which the vessel can push just as if it were a fixed point in space. The shaft of the revolving weight can be made to turn a screw in the stern of the vessel by means of a proper system of gearing; and by a delicate arrangement of electric brakes and hydraulic accumulators, Mr. Tower proposes to regulate the revolving arm so as always to keep it at right angles to the centrifugal force of the waves.

New Asphalt Paving.

A specimen of street paving has just been laid in Glasgow, the material employed being the rock asphalt which is obtained in the Val de Travers, near Neufchatel, in Switzerland. During last autumn several portions of wood paving, on the same system, were done in Glasgow by a London company; and as they were well executed, they seemed to give very general satisfaction. Profiting, apparently, by the experience gained by witnessing the system of wood paving in operation, the Scottish Val de Travers Paving Company determined upon attempting something similar.

According to this system, a foundation is first formed of Portland cement concrete, about 9 inches in depth, and on this the paving proper is laid. The rock asphalte from the Val de Travers, the material employed in the paving, contains about 12 or 13 per cent of bitumen, and the remainder of the rock consists almost entirely of hard limestone, through which the bitumen is very uniformly diffused. This material is first broken into pieces of convenient size in a crushing mill, and is subsequently put into a disintegrator, in which it is reduced to a very fine state of division. When it has been treated in this way, the asphalt is thrown into a revolving cylinder, in which it is subjected to a temperature of about 260° Fah., which brings it almost to a pulverulent condition. While it is in the state of hot powder it is filled into cast iron molds, in which it is pressed and made to assume the form of bricks, about nine inches long by four inches broad and two inches in thickness. The tendency of its particles to cohere is very great at that temperature. The cast iron molds are so formed that the bricks cast in them have a chamfer or bevel about half an inch broad imparted to them, all round what is intended to become the upper surface: and thus, when the bricks are placed in the causeway, they are separated above by a series of grooves, by means of which an excellent bite is secured for the feet of the horses passing over it. When the cement concrete, forming the substratum, is sufficiently well set, the asphalt bricks are laid in a manner somewhat similar to that of ordinary causewaying with dressed granite or whinstone setts. Instead of bedding them in sand, however, they are laid in a thin stratum of liquid rock asphalt, just as ordinary bricks are laid in mortar, bottom, sides, and ends all being coated with the agglutinating material. The bricks are placed about a quarter of an inch apart, and the space thus left is filled in with a hot liquid, which consists of Trinidad pitch and crude shale oil, and which long remains very tough and elastic, in addition to which it most effectually prevents any water from passing through the pavement.

The portion of roadway executed in Glasgow in the above manner seems to give satisfaction, and will apparently be very durable. Of course there is no actual information available regarding the durability of the particular specimen of paving under notice; but the experience gained from the Rue Bergère, in Paris, which was laid in 1865 with Val de Traverse asphalt, is quite sufficient on the point in question. After having been in use for fifteen years, a portion of it was lifted in 1869, when it was observed that its thickness had only been reduced from two inches to one and three eighth inches: but while it had diminished in thickness only five-eighths of an inch in fifteen years, it had undergone considerable compression, inasmuch as the actual loss in weight was not more than five per cent. The special feature of the new paving in Glasgow is the almost absolute immunity from slipping which horses enjoy when passing over it.

Correspondence.

Invention of a New Numerical System.

To the Editor of the Scientific American:

In our common decimal system, distinct characters are given to the numbers from one to ten; and it is very well known that, instead of ten, any other number—for instance, eight, or twelve, or sixteen, or even two—may be selected for a base. Such systems have actually been calculated, but they have not come into use: the advantages not being sufficient to counterbalance the inconvenience of changing one system into another.

The subject may be treated, however, in quite a different manner. There is no necessity for taking any base at all, and the numbers may be made to progress in their own natural succession; or, to express it in other words, every number, even one, may be made to serve as a base for a certain time. This can be accomplished as follows:

Instead of dividing off the original units in sections of ten, as in our common numerical system, we divide them in the natural succession of the numbers themselves, first one, then two, then three, etc., and for each division we make a mark in the second column. If, in the first column, a rest should remain, such rest can never be greater than the number of marks in the second column, because if the rest were one greater, a new mark would be made in the second column.

There is no necessity at present for going through the whole process, which would require a great deal of writing and many diagrams. It has taken me nearly twenty years to construct the first twenty numbers. Suffice it to say that the final result is very simple, and can be readily understood by everybody without studying the details.

The whole theory is based upon the fact that the rest in any column can never be greater than the number of marks in the next column. If the marks in the second, third, and all following columns, and all the rests, are divided in the same way, that is, in the natural succession of the numbers one, two, three, and so forth, the numbers will appear in a very simple form, each consisting of a base and a rest; this rest, however, is sometimes naught.

Of course there must be certain characters for the numbers, and the characters of our common numerical system are neither suitable nor sufficient; there must be twenty new characters instead of ten. Hence we have either to invent new characters or use the common letters. The first would require new types for printing, which is too expensive, hence we use letters.

Let the first twenty letters, excluding *j*, represent the first twenty numbers, so that *a* stands for 1, *b* stands for 2, etc., until *u* stands for 20; and let one of the last letters, for instance, *x*, stand for 0. Let us write these numbers in the following triangular shape:

					*u*20
				*o*14	*t*19
			*i*9	*n*13	*s*18
		*e*5	*h*8	*m*12	*r*17
	*b*2	*d*4	*g*7	*l*11	*q*16
*x*0	*a*1	*c*3	*f*6	*k*10	*p*15

These letters and numbers mean:

x stands for 0, *a* stands for 1, *b* stands for 2, etc.

It will be seen that the vowels *e, i, o, u* stand at the head of their columns; if the letter *j* were used, this order would be disturbed.

These letters and numbers are to be used as follows:

Naught	with	the rest	naught	equals	naught,	equals	*x*
One	"	"	naught	"	one	"	*a*
One	"	"	one	"	two	"	*b*
Two	"	"	naught	"	three	"	*c*
Two	"	"	one	"	four	"	*d*
Two	"	"	two	"	five	"	*e*
Three	"	"	naught	"	six	"	*f*
Three	"	"	one	"	seven	"	*g*
Three	"	"	two	"	eight	"	*h*
Three	"	"	three	"	nine	"	*i*
Four	"	"	naught	"	ten	"	*k*
Four	"	"	one	"	eleven	"	*l*
Four	"	"	two	"	twelve	"	*m*
Four	"	"	three	"	thirteen	"	*n*
Four	"	"	four	"	fourteen	"	*o*
Five	"	"	naught	"	fifteen	"	*p*
Five	"	"	one	"	sixteen	"	*q*
Five	"	"	two	"	seventeen	"	*r*
Five	"	"	three	"	eighteen	"	*s*
Five	"	"	four	"	nineteen	"	*t*
Five	"	"	five	"	twenty	"	*u*

This shows that every number may be supposed to consist of a base and a rest. After 20, the progress of the numbers is very easily seen, and may be stated as follows:

Six	with	the rest	naught	equals	twenty-one,	equals	*fx*
Six	"	"	one	"	twenty-two	"	*fa*
Six	"	"	two	"	twenty-three	"	*fb*
Six	"	"	three	"	twenty four	"	*fc*
Six	"	"	four	"	twenty-five	"	*fd*
Six	"	"	five	"	twenty-six	"	*fe*
Six	"	"	six	"	twenty-seven	"	*ff*
Seven	"	"	naught	"	twenty-eight	"	*gx*
Seven	"	"	one	"	twenty-nine	"	*ga*
Seven	"	"	two	"	thirty	"	*gb*
Seven	"	"	three	"	thirty-one	"	*gc*
Seven	"	"	four	"	thirty-two	"	*gd*
Seven	"	"	five	"	thirty-three	"	*ge*
Seven	"	"	six	"	thirty-four	"	*gf*
Seven	"	"	seven	"	thirty-five	"	*gg*

The general rule for writing these numbers is: The second part is to be increased until it equals the first part, and then the first part is to be increased by one.

This table shows the construction of the numbers from 0 to 359026206.

x=0	*q*=16	*gd*=32
a=1	*r*=17	*ge*=33
b=2	*s*=18	*gf*=34
c=3	*t*=19	*gg*=35
d=4	*u*=20	
e=5	*fx*=21	
f=6	*fa*=22	*uu*=230
g=7	*fb*=23	*f x x*=231
h=8	*fc*=24	
i=9	*fd*=25	
k=10	*fe*=26	*u u u u*=26795
l=11	*ff*=27	*f x x x*=26796
m=12	*gx*=28	
n=13	*ga*=29	
o=14	*gb*=30	
p=15	*gc*=31	*u u u u u u u u*=359026205
		f x x x x =359026206

FERDINAND EISSFELDT.

Room 30, 33 School street, Boston, Mass.

An Invention Wanted---Five Thousand Dollars Reward Offered.

To the Editor of the Scientific American:

Believing that the horse has served his time before the street car, and that American ingenuity should allow him to retire before our Centennial anniversary, by inventing some improved motor for street passenger railways, we offer five thousand dollars reward to any person or persons who will invent, perfect, and present to this company any satisfactory device that will propel our cars and can be used on the streets of Philadelphia, provided it is acceptable to this company and its control placed exclusively with us.

R. W. FLOWER, JR., President.

West End Passenger Railway Company of Philadelphia, No. 206 South Fourth Street, Philadelphia. May 7th, 1875.

Useful Recipes for the Shop, the Household, and the Farm.

In using Paris green to exterminate the potato bugs, the poison should be mixed with the cheapest grade of flour, one pound of green to ten of flour. A good way of applying it to the plants is to take an old 2 quart tin fruit can, melt off the top, and put in a wooden head in which insert a broom handle. Bore a hole in the head, also, to pour the powder in, and then punch the bottom full of holes about the size of No. 6 shot. Walk alongside the rows, when the vines are wet with dew or rain, and make one shoot at each hill.

In some parts of the country, there have been large numbers of the orchard or tent caterpillars which have left their rings of eggs on the young twigs. If these are now cut off with a clipping pole, it will prevent in every instance a large nest of caterpillars, and be much more easily done than after the latter have grown.

Equal proportions of turpentine, linseed oil, and vinegar, thoroughly applied and then rubbed with flannel, is an excellent furniture polish.

Tin can be removed from copper vessels very thoroughly by immersing the objects in a solution of blue vitriol.

The German washerwomen use a mixture of 2 ozs. turpentine and 1 oz. spirits of ammonia well mixed together. This is put into a bucket of warm water, in which ½ lb. soap has been dissolved. The clothes are immersed for twenty-four hours and then washed. The cleansing is said to be greatly quickened, and two or three rinsings in cold water remove the turpentine smell.

Five parts of sifted whiting mixed with a solution of one part glue, together with a little Venice turpentine to obviate the brittleness, makes a good plastic material which may be kneaded into figures or any desired shape. It should be kept warm while being worked. It becomes as hard as stone when dry.

Artificial malachite which is susceptible to a fine polish is made by precipitating a solution of sulphate of copper in the cold by carbonate of soda or of potash. The precipitate, which is voluminous, should be allowed first to cohere, and is then dried and washed.

Water containing about seven grains of salt in each pint, is, when used continuously, a poison to the weaker forms of vegetation.

The alloy popularly known as oroide, from which a large number of cheap watches, chains, and trinkets are now manufactured, is made of pure copper 100 parts, tin 17 parts, magnesia 16 parts, sal ammoniac ½ part, quicklime ⅛ part, tartar of commerce 9 parts. The copper is first melted, then the magnesia, sal ammoniac, lime, and tartar in powder are added little by little and briskly stirred for half an hour. The tin is lastly mixed in in grains until all is fused. The crucible is covered, and the fusion maintained for 35 minutes, when the dross is skimmed off and the alloy is ready for use.

A simple way of preparing paper for bank checks, bills, etc., so that no writing can be erased without leaving plainly visible marks, is to pass the sheets through a solution of gallic acid. One milligram (0·01543 of a grain) is dissolved in as much pure distilled water as will fill an ordinary soup plate to a moderate depth.

Sandarac varnish is the best material for mending plaster models. Saturate the broken surfaces thoroughly, press them well together, and allow them to dry.

Silver ware may be kept bright and clean by coating the articles (warmed) with a solution of collodion diluted with alcohol.

Dampness will cause honey to become thin and watery.

The Suet Butter Manufacture.

In spite of the prejudice which exists against suet butter, it is a fact that the manufacture has of late made great progress: and the quantity of the material now consumed is certainly now larger than ever before. We illustrated the mode of making the butter many months ago. The process then described is the same as now practised in this city and other places, under the original patent granted to M. Hippolyte Mége.

There is a large factory in Hamilton, Canada, from which some 2,000 lbs. per week of imitation butter are shipped to all parts of the world. Another and still larger establishment in Boston, Mass., turns out a very great product. In many cases, it is said, this butter finds its way directly to the butter producing districts of New York and New Jersey, and then is sent to market as genuine spring butter. It is certain that immense quantities of the oleomargarin are sold by dealers as true butter, and that the profits of the trade are very large. We see it noted in a daily contemporary that the suet compound is in use in some of the principal hotels and restaurants in this city, and that the frequenters of these places have as yet not discovered the fact. We do not pretend to the skill of the professional butter taster; but we have no difficulty in instantly recognizing the artificial compound. We may add that, not long ago, we discovered it on the table of one of our New York hotels; and after satisfying ourselves as to its identity, we taxed the proprietor with its use. He strenuously denied the charge; but at a subsequent meal, we found the "ox butter" (as the Harvard students have named it) replaced by "cow butter."

We do not mean to say that the oleomargarin is unsavory or unwholesome. On the contrary, it is made with the utmost nicety from the cleanest of materials. Neither is it unpleasant in any marked degree to the palate, nor to the stomach. It certainly is infinitely better than the abomination sold by grocers under the generic name of "cooking butter." Still most persons have a prejudice against suet butter, and that feeling, so far from being weakened, has been strengthened by the knowledge that the reprehensible practice of selling the imitation as the genuine is so widely practised. If the material were advertised and sold uniformly for what it is and on its merits, we have no doubt but that the prejudice against it would in a great measure subside. For shipping to hot climates, it is, no doubt, far better than the butter usually sent to southern ports.

Parliamentary Signal Light.

The gas signal light on the clock tower of the Houses of Parliament is now shown from its new position, 30 feet higher than formerly. The new lantern is constructed to run in and out of a loophole in the roof of the tower—similarly to a ship's gun—so that during the daytime nothing is seen of it, and it is now no disfigurement to the appearance of the tower. The illuminating power is a Wigham's patent gas light, as used for lighthouses, and at present is shown naked, no lenses being used. The light is only visible while the House of Commons is actually sitting. Immediately on an adjournment, the light is extinguished. This light is fully described on page 403, volume XXVIII, and page 40, volume XXIX.

A New Indication of Death.

Is the patient really dead or not? is at times a very anxious question. A medical practitioner of Cremona proposes a simple method by which the question may be answered with certainty. It is to inject a drop of ammonia beneath the skin, when, if death be present, no effect, or next to none, is produced; but if there be life, then a red spot appears at the place of the injection. A test so easily applied as this should removed all apprehension of being buried alive.

ELECTRIC science occupies a place of no mean importance in the new opera house in Paris. A special room is set apart as a battery room, in which 360 Bunsen's cells, arranged in sets of 60 on rough plate glass tables, are manipulated to pass a current to any part of the stage, so as to direct the electric light upon any point of the scenery. The sunlight and startling effects produced by French scenists are really beautiful. The rainbow in the opera of *Mosè in Egitto* is wonderful.

AN agreement without consideration is void.