duced from a tun of coal. An average specific gravity of gas obtained from eight varieties of coal (Fyfe) is 0·629, air being 1. A cubic foot of air may be estimated as weighing 527 grains, nearly enough for our purpose, from which we compute the volume of gas corresponding to 466 lbs. as being 9,839 cubic feet. This amount is considerably lower than the best coals will produce. The cost of this gas in New York would be $3·50 per thousand cubic feet, or $34·44 for 9,839 cubic feet.

The heat developed by the combustion of an average tun (2,000 lbs.) of coal, as determined by experiments upon seventeen varieties, made by Playfair and De la Béche, is 26,088,000 H. U., or about two and one half times the amount produced from the combustion of the gas that can be distilled from it.

It is quite evident, therefore, that if the heat be as completely utilized in the one case as in the other, that gas cannot compare in economy with coal. The heat from the combustion of gas is without doubt utilized more fully than that of coal; but, admitting that its percentage of utilization is twice, or even three times as great as that of coal, the latter would appear the cheaper fuel, at present prices, if we fail to take into account another consideration which greatly tends to reduce this disparity in cost. In coal fires, considerable expenditure of fuel is required before a degree of heat is obtained sufficient for cooking or other domestic operations; and after these operations are completed, still more is expended before the fire is extinguished, both of which expenditures are a total loss in warm weather.

With gas, however, the maximum heat is at once obtained and all expenditure may cease at once when the fire ceases to be required. This obviates the necessity of keeping fires up in the intervals between their employment. In this way large savings are made, so that even in point of economy gas may compete with coal during warm weather, while in convenience it is infinitely superior.

Thus the use of gas for minor culinary operations, heating sad-irons, etc., in the kitchen and laundry, and its application to light metallurgic and other operations in the laboratory, are constantly becoming more popular and extended; but it must be obvious that its application to the generation of steam for motive power, as has been proposed, cannot be economical, even were its price reduced to one dollar per thousand feet.

In a paper recently read before the British Association of Gas Managers by Mr. G. Goddard, he strongly urges this application, and describes an invention designed to effect the generation of steam by the combustion of gas.

The invention consists of a vertical tubular boiler, so constructed as to possess great power of generating steam, but of very small dimensions; the tubes are not more than one inch bore, and are placed very close to each other, so that an enormous heating surface is obtained; beneath the tubes on a revolving plate are a number of atmospheric burners, each supplied with a cock so that the heating power is completely under control and can be increased or diminished at pleasure, as more or less power may be required.

We have but to take the statements of Mr. Goddard to verify our opinions as to the cost of this application. He gives as the average consumption of gas per horse-power per hour, in the boiler described, 100 cubic feet. This in New York would cost for one horse-power per day of ten hours exactly $3·50. Allowing ten pounds per horse-power per hour of coal, with coal at eight dollars per tun, the same power would cost, if coal were used to produce it, only forty cents. The convenience of gas must be very great to compensate for such an increase of cost.

In a subsequent article we shall endeavor to point out some defects, and suggest some improvements in gas furnaces and stoves for domestic use.

HYDROPHOBIA AND DOG MUZZLING.

The hot weather is again upon us, and the newspapers considering it to be in season, begin to dilate upon the immense dangers of hydrophobia, and the importance of muzzling dogs. City authorities are also announcing their determination to extinguish the vital spark of heavenly flame in the bosoms of all such of the canine race as shall appear on the streets without muzzles. Nervous people are working themselves up into a state of trepidation for fear they shall be bitten.

We recently heard it proposed by an elderly, respectable-looking gentleman on board a ferry boat, to lynch even a good-natured dog who sat lolling through the meshes of a wire basket which decorated his broad nose. We are glad to say the proposition was rejected with scorn and disgust, and the respectable gentleman in the fear that the said dog—that looked as though he could not be coaxed to bite anything more animated than a well buttered beefsteak—would immediately spring at his throat, left the cabin amid the derisive laughter of his fellow passengers.

This foolish fear is very far removed from wise caution, and is certainly as baseless as it is foolish. Cases of genuine hydrophobia are extremely rare. One runs much more risk of being struck by lightning, and the latter risk is not great.

There is no doubt, however, of the wisdom of properly providing against even this small risk. This can be done without cruelty and with little trouble. Dogs do not run mad instantaneously. They show that they are ill some time before their paroxysms are dangerous. A dog that is sick should at once be attended to, and should receive humane care, or be put out of his sufferings by a kindly shot.

We are not of those who believe the season has much to do with the generation of this disease; but as there are many nervous people who do, it is perhaps well to allay their fears by some precautions. Let the dogs be muzzled but don't use a strap. A learned Irish veterinary surgeon states that the origin of this system was its supposed efficacy in preventing one dog biting another, as well as security to people. It is believed that dogs are liable to become rabid during the summer months, and hence the muzzle. The putting on of a peculiarly constructed strap upon the nose and mouth of a dog (be he ever so viciously inclined) is an effectual remedy for biting, but he declares the act to be one of great cruelty.

"If to prevent one evil another of perhaps greater extent is to be substituted, it is well to consider whether there is not still another and better remedy at hand—one devoid of cruelty. The structure and function of the nasal organ of the dog show that the ordinary mode of muzzling dogs is an act of great cruelty, and if placed in such a manner that it ceases to be cruel, then the wearing of a muzzle is a delusion and a snare. When a dog is in a passive state during hot weather, he will of necessity open his mouth and protrude the tongue. This becomes more manifest during exertion. The only way to make an ordinary muzzle bearable is to secure the actual repose of the animal. The moment the dog is called into active exertion, that moment cruelty commences. Placing a log of wood to its neck amounts to an absurdity, because it cannot possibly check his vicious propensity, should he possess any. A log of wood to be of service should be of great magnitude, or of considerable weight. There are three remedies at hand for the treatment of our canine friends, either of which may be tried, and two out of the three will be found easy of application, within the reach of all, and without objection. A wire muzzle open at the bottom will protect the public from injury, and it will at the same time enable the dog to use his respiratory organs without let or hindrance; and, further, it will not annoy him after he is accustomed to it. The second remedy is that of leading dogs when out of doors, which is perhaps the most effective remedy of the twain. The third is that of keeping them at home."

Now these remarks contain some common sense, which it would do well for people to heed. We are not ashamed to say we like a nice dog, and always feel indignant to see him ill-treated. There is nothing very new in the directions here given for the treatment of dogs, but their reiteration is justifiable in view of the fact that the public are slow to right the wrongs of dumb slaves.

PROGRESS OF INVENTION ABROAD.

Among the most interesting of the new inventions announced in our European exchanges is a new method of raising the screws of propellers—an English invention. The stern length of the propeller shaft has its inner end supported in a pivoted bearing, and a passage or way is constructed in the stern of the vessel, through which the pivoted shaft may swing upward, when lifted by a chain attached to its outer end. The inner end of the portion of the shaft which swings up in this way, extends beyond its pivoted bearing, so that raising the outer end in the manner described uncouples it from the other part of the shaft. The blades of the screw are made so that they can be folded together, and, when the screw is raised as described, they are stowed away in a recess. The shaft passes on one side of the stern part, and a sort of shutter closes the opening in the run when the shaft is down.

Another English invention, which, if we are not mistaken, was tried some years ago in this country, is an arrangement of stone-cutting and dressing machine, in which the dressing operation is performed by rotating disk cutters having conical edges, these cutters being mounted so that they revolve freely on inclined axes carried by a revolving cutter-head. The arrangement is such that the cutters make a kind of rolling cut, and their action is thus very similar to that of the "magic diamond," with which our readers are all familiar.

A London inventor has devised a method of securing sheets and panes of glass in metallic frames, so that they shall not be broken by expansion and contraction of the frames, through changes in temperature. In applying this invention to a lantern, a metal frame is constructed, which is composed of an upper and lower band, united by bars at the corners of the lantern. The panes or sheets of glass are placed upon the outside of these corner bars, and are then secured by metal bars or clips of a V-shaped or concavo-convex sectional form. These clips extend from the top to the bottom of each pane, and are secured to the upper and lower bands of the frame by means of sockets, screws, pins, or other devices which will hold them firmly, but will also allow them to be readily removed when desired. The bottom of the frame is provided with a fillet to receive the lower edge of the panes of glass, and this fillet is perforated at the bottom to permit the escape of any water that may be caught therein. By thus securing the panes or sheets of glass within, or between strips or bars of metal, without putty or other adhesive substance, they are held with sufficient firmness to prevent any vibration or displacement in their frames, while at the same time the said frames permit them to freely expand and contract under the sudden changes of temperature to which they are exposed.

A Birmingham inventor has made an improvement in water tweers for forges, which consists in forming the water tweer for hot blast with the entrance and exit air and water passages in one casting, and in affixing it directly to the water cistern and to the air-heating box or chamber without the use of separate connecting pipes. One part of the tweer passes through the water cistern, and another part passes through the center of the said heating box or chamber, and the tweer is secured to both cistern and chamber by means of flanges and screw bolts and nuts. The joints of the parts are made air and water tight by suitable packing. The air passage of the tweer is so formed that the entering air is conveyed by it through the water cistern, and then by a curvature of the passage is conducted into the air chamber where it becomes heated; the heated air from thence passes by means of another curved passage to the nose part of the tweer into the forge fire. Surrounding the air passages is the water space which opens by two openings into the water cistern, one above and the other below the entrance air passage, and the openings are so situated as to cause a circulation when the water becomes heated against the nose of the tweer.

A Manchester mechanic has invented a very ingenious method of joining the ends of old warp to the ends of a new warp in weaving. The ends of the old warp to which the ends of the new warp have to be joined are held in a clip, and the ends of the new warp are similarly held in a clip. The two sheets of warp are then placed in the machine. The sheet of old warp being placed over the sheet of new warp, they are then acted upon by the machine as follows: 1. The warp threads are laid evenly by means of brushes. 2. A pair of clips or nippers take hold of both warps after they have been laid evenly by the brushes. 3. These nippers take the threads into a pair of rollers set at an angle to tighten the warp threads. 4. The end thread of the old warp and the end thread of the new warp are detached from the other threads of the warps by a reciprocating pair of nippers. 5. The threads so taken by the reciprocating nippers are laid by other nippers over the side of a tube, by which the two threads are formed into a loop. 6. A hook passed through the tube takes hold of the ends of the two warp threads, and draws them into the tube, so forming a knot, the ends of the threads having been severed by a cutting blade or scissors to allow of this. 7. The knot is tightened by the threads being drawn through a narrow nick, which will not allow the knot to pass, and the threads are cut close to the knot.

THE STEVENS INSTITUTE OF TECHNOLOGY.

The late Mr. Stevens, of Hoboken, N. J., left $500,000 in addition to the lot and building, for the purpose of founding an institution in which technical education could be conducted on a plan analogous to that pursued at the Technological Institute, of Boston. The Trustees of the fund very wisely selected Professor Henry Morton, of Philadelphia as President and to him has been confided the important trust of putting into practical shape the will of the testator. The building is in process of construction, and is after an imposing and attractive design. It is to be built of trap rock with brown stone facing, and will eventually occupy the entire block, bounded by Fifth, Sixth, Hudson, and River streets, and will cost, when finished, $150,000.

Martha Institute, which was completed a few years ago, and has been a flourishing and useful school, will be supplementary to the Stevens Institute, and in a measure enable Professor Morton to dispense with the elementary classes.

It is not intended to make the Stevens Institute a free school, but by a judicious use of the income it is hoped that the tuition can be placed as low as $75 or $80 a year, covering all the studies of the course. A few scholarships will be established in connection with the public schools and the Martha Institute. A school of design for women is also included among the terms of the bequest.

The establishment of schools of technology is a favorable sign of the times, and will meet with the hearty support of the citizens of our country. They have become a necessity, and it is therefore with pleasure that we witness the prosperous beginning of a new enterprise in New Jersey. We shall be glad to record the opening of the Institute in the fall with a goodly number of pupils under the direction of professors of approved learning and experience.

SCIENTIFIC INTELLIGENCE.

GLYCERIN CEMENT.

Professor Hirzel of Leipzig has discovered an important use of glycerin that ought to be more generally known. He finds that when glycerin is mixed with fine and well-dried litharage, it yields a cement that is capable of a large number of applications.

All metals and nearly all solid bodies can be bound together by this cement; it is said to harden under water as readily as in the air, and to resist a temperature of 500°. It is especially recommended for such pieces of apparatus as are exposed to the action of chlorine; hydrochloric acid, sulphuric acid, sulphurous acid, and nitric acid; also the vapor of alcohol, ether, and bisulphide of carbon, as none of these agents act upon it. The cement can be used in steam engines, pumps, foundations for machinery, and, finally, as a substitute for plaster in galvano-plasty and electro-plating. The preparation of glycerin and litharge to be taken must depend somewhat upon the consistency of the cement, and its proposed uses. An excess of glycerin would retard the setting, as it does not readily evaporate. This new use of glycerin adds another application to a substance that only a few years ago was thrown away.

INFLAMMABILITY OF ROTTEN WOOD DUST.

Dry wood dust blown into a candle gives a clearer and more intense flame than resin, and the wick becomes covered with a resinous crust, so that the burning of the candle is greatly retarded. As this kind of dust when coming in contact with a candle takes fire, it is unsafe to conduct manufactures in which it plays a part at night when a light is required, and it is equally dangerous to strike a match. It appears that an accident occurred in a factory in Silesia, where wood dust was employed, by which five workmen were fatally injured.

CORK AS A NON-CONDUCTOR OF HEAT.

Cork is such a poor conductor of heat that it is largely employed about steam engines to prevent the cooling of cylinders and the consequent larger consumption of fuel. According to careful experiments, the economy in fuel amounts to