and carry away boats, cooking-houses, and deck spars; but so long as a vessel keeps tight, and the water is carried off through the washboards and scuppers, there is no danger to the hull. The mischief arises when the water from above falls below in quantities that cannot be pumped out fast enough to keep the ship buoyant, as in the case of the *London*. Mr. Greenhill, her second engineer, states that, when the sea broke aboard, some of the glass and teak fell into the engine-room, which affords strong evidence of the power of a body of water, when projected violently against an object, to sweep all before it. It may be argued that the skylight of this ship was weak; but, it we compare it with other vessels of greater tunnage, we shall find that is above the average strength. The *London* might possibly have made many voyages, and even been worn out in the service, without her engine hatchway being put to such a severe test. But where a ship is caught in a hurricane at sea, she is sure to be well battered with the waves, and there is no provision that can be made to prevent the seas from breaking against her and falling over the rail. Everything on deck, therefore, that acts as coverings to keep the water from the hold, should be firmly fixed. The cargo hatches are always covered and battened down, and, not rising many inches above the flooring of the deck, there is very little leverage for the rolling water to act upon. It is different, however, with lofty saddle skylights. They are struck from the sides, and the seas at times fall perpendicularly from a great hight.

Mr. G. J. Gladstone, sen., Surveyor to the Port of London, when questioned, said that he considered the bars of the skylight and the tarpaulin a sufficient protection, and that it did not occur to him to have slides or hatches. Mr. Maxwell, the foreman of Messrs. Humphrey & Tenant, the makers of the ship's engines, in reply to a question, said that hatches flush with the deck could not have been used in the *London*, without interfering with the action of the piston rod; and Captain Harris read an extract from a letter of a gentleman connected with a shipping establishment, in which it was stated that there was nothing superior to the tarpaulin, for there had never been an instance of any of the skylights of the Company's ships being injured by a sea. The Surveyor, Engineer, and Superintendent are representatives of their classes. One did not look to engine-room fastenings for hatches; the second tells us of the piston rod being in the way; and the third belongs to a fortunate company who have never lost a ship from the fires being put out, and reasoning therefrom, cannot bring himself to believe they ever will. Perhaps Mr. Gladstone is now of opinion that some security of the character here alluded to is demanded. As for the piston rod preventing slides from being drawn flush with the deck, such an objection is frivolous. The *London* had pumps sufficient to throw out 4,000 gallons per minute. If an aperture had been left open to admit of the head of the rod and crank working through, the engine power would have freed the ship faster than it could have flowed down such an opening. But a box frame over the piston rod would have shut out the water taken in that way. There may be a difference as to the way protection should be given to skylights, but there is no insuperable difficulty in the way. It were better to put out the fires and trust to canvas, where there is plenty of sea room, than to lose a ship and all on board, because the air is excluded on an emergency from the engine room. But there are methods of obtaining artificial drafts of wind by mechanical aid, if the furnaces cannot be kept alight when the skylight is closed. On board the American iron-clad monitors, fans are used for this purpose, and likewise "blowers." Sufficient air can be generated to get an up draft, enough to supply combustion in the furnaces by a light iron rod, with a wheel for carrying a coupling band and a few vanes. In a strong gale of wind, however, a couple of iron pipes, with mouths like a wind-sail, would convey sufficient air down into the engine room to create a current to the fires. Those who have been on board the *Great Eastern* will remember that her engine-room skylight is a space of enormous extent, with nothing but glazed sashes. When this ship was under construction she was to have defied the elements; but this monster can roll, in a beam sea, and there may be occasion for a covering to her skylights. But managers will say, "The seas don't break the skylights of our ships," and therefore, steamers will now and then go down and create a panic. True economy lies in giving security at sea to those who have to travel by ships. A trifling outlay will make all the difference between a safe and an unsafe vessel.—*Mitchell's Steam-Shipping Journal.*

NOTES ON NEW DISCOVERIES AND NEW APPLICATIONS OF SCIENCE.

PEROXIDE OF HYDROGEN.

Peroxide of hydrogen is a compound of hydrogen and oxygen and containing just twice the proportion of the latter element that water contains. As it is a very unstable compound, readily giving off its second equivalent of oxygen, it would be of considerable use in some of the arts, as an oxygenant, if it could be obtained tolerably cheaply. Hitherto it has been produced only by the aid of peroxide of barium, and the process of producing it has been at once costly and exceedingly tedious, When peroxide of barium is added to a dilute solution of hydrochloric acid, kept cool by the vessels containing it being surrounded by a freezing mixture, the barium of the peroxide unites with the chlorine of the hydrochloric acid to form chloride of barium, one of its two equivalents of oxygen combines with the hydrogen of the hydrochloric acid to form water, and the other equivalent of oxygen combines either with the water thus formed or with an equivalent of the water originally present, forming therewith peroxide of hydrogen. To obtain by means of peroxide of barium, however, an at all strong solution of peroxide of hydrogen, after neutralizing with peroxide of barium a dilute solution of hydrochloric acid, the barium must be precipitated from the resulting chloride of barium by means of sulphuric acid, added drop by drop until slightly in excess; the precipitate of sulphate of barium must be separated by filtration, more peroxide of barium must then be added to the filtrate, the barium of the fresh portion of chloride of barium thereupon formed must be precipitated and separated as before, and these successive operations must be repeated very many times—the hydrochloric acid used being finally separated by means of sulphate of silver, and the sulphuric acid by means of caustic baryta. Hofmann has just found that a strong solution of peroxide of hydrogen may be obtained by a much simpler method than this, if peroxide of potassium be used instead of peroxide of barium. This method, indeed, involves only a single operation, consisting simply in adding peroxide of potassium—formed by directing a current of air, by means of a bellows, on to metallic potassium in a state of fusion—to a somewhat concentrated solution of fluosilicic acid. Silicofluoride of potassium, which precipitates, and a strong solution of peroxide of hydrogen, are the results. This process is very simple, but unfortunately, its involving the use of metallic potassium cannot but prevent it from yielding peroxide of hydrogen cheaply enough for use in the arts.

THE SPECIFIC GRAVITY OF ALCOHOL.

A Russian chemist, M. Mendelejeff, has just published the results of a series of very laborious researches with respect to the specific gravety of absolute alcohol, and of the various compounds of alcohol with water. Curiously enough, these results go to show that of all previous determinations of the specific gravity of alcohol and its hydrates, the oldest being those made by Gilpin, in 1794, are the most accurate.

M. Mendelejeff's experiments far transcend in accuracy all previous ones upon the same subject, their author having taken into account every possible source of error, and having bestowed the utmost pains upon ascertaining the magnitude of each. They show that at the zero of the Centigrade scale the specific gravity of absolute alcohol is 0·80625 at 5 deg. 0·8027, at 10 deg. 0·79788, at 15 deg. 0·79367, at 20 deg. 0·78945, at 25 deg. 0·78322, and at 30 deg. 0·78096.

TESTING MINERAL OILS.

The mineral oils used for illuminating purposes are usually tested, either by directly measuring their inflammability or by determining their density. Both these methods are inconvenient, and MM. Salleron and Urbain propose to substitute for them the measurement of the tension of the vapor of the oils—the tension of the vapor of any oil being of course proportional to its volatility, and therefore to its inflammability. In a recent communication to the Academy of Sciences of Paris, these gentlemen describe an apparatus by which the tension of the vapor of a mineral oil may be very readily determined, and they accompany this description with "a table of the elastic forces of one and the same oil taken as a type, so that knowing, on the one hand, the tension of the oil to be tested corresponding to a given temperature, and, on the other, the tension at this temperature of the typical oil, by comparing these numbers the value of the specimens examined can be deduced." This method is simple and convenient, and at the same time much more delicate than the methods previously in use.

FOREIGN INTELLIGENCE.

THE *Spectator* insists that to secure house-room for the working class, their dwellings in great cities must be built into the air. The cost of the site must be distributed among many floors. Inside corridors can be superseded by broad, continuous outside balconies. Each tenant would thus possess a separate house, and the sense of living in a barrack, which workmen so much dislike, would be obviated. Such balcony streets, moreover, would be thoroughfares, and allow of supervision much more easily than corridors, while they would also allow the hard-working poor to open little shops above the ground floor—an impossibility with existing architecture.

TRIPOD MASTS.—A model of Captain Coles' tripod masts has been shown at Lloyd's. It does away with shrouds and stays, as the mast is supported by two smaller ones. The advantages claimed are as follows:—Saving of wear and tear of ropes, improved ventilation of ship, increased speed. Quicker voyages may be made in consequence of a vessel fitted with these masts being able to sail closer to the wind. The masts may be as readily cut away as wooden masts.

CONSIDERABLE difficulty is encountered in procuring suitable timber in South Australia for durable telegraph poles, and it is recommended that the lines which require repairs should be re-poled with Swan River mahogany, as the local timber will not last, on an average, more than six or seven years in the ground. Contracts have been accepted for this purpose, at 17s. 10d. per pole 23 feet long.

THE consumption of oil as a lubricator is immense. There are some railroad companies whose annual expenses are more than $25,000 for lubricators alone. A single manufacturer in England (Young) testified in court to having manufactured and sold over 400,000 gallons of lubricating oil in one year, at about one dollar per gallon. This oil was distilled from coal.

EXPERIMENTS have been made at the Hythe School of Musketry on gun cotton as applied to rifle practice. Excellent diagrams have been made at a range of 1,000 yards, hardly inferior to those obtained with the small-bore rifles of the day. The charge used, was 25 grains, and ten consecutive shots fired at 1,000 yards gave a mean radial deviation of 1·65 feet.

THE *Journal Du Havre* states that during the violent hurricane of the 11th, 200 enormous blocks of stone, placed in front of the breakwater at Cherbourg to protect it from the action of the sea, were lifted by the waves and thrown over the wall into the harbor. Forty cannon planted on the pier were thrown into the sea. Such a storm had never before been experienced in that place.

THE following is a good method of bronzing tin castings:—When clean wash them with a mixture of one part each of sulphate of copper and sulphate of iron in twenty parts of water; dry and wash again with distilled vinegar eleven parts. When dry polish with colcothar.

IRON CHURCH AT CREWE.—The directors of the London and North-Western Railway Company have just completed the erection of an iron church, to accommodate 300 persons.

CHLORATE of potash is now extensively used in dyeing as an oxidizing agent, in brightening what are technically termed "steam colors."

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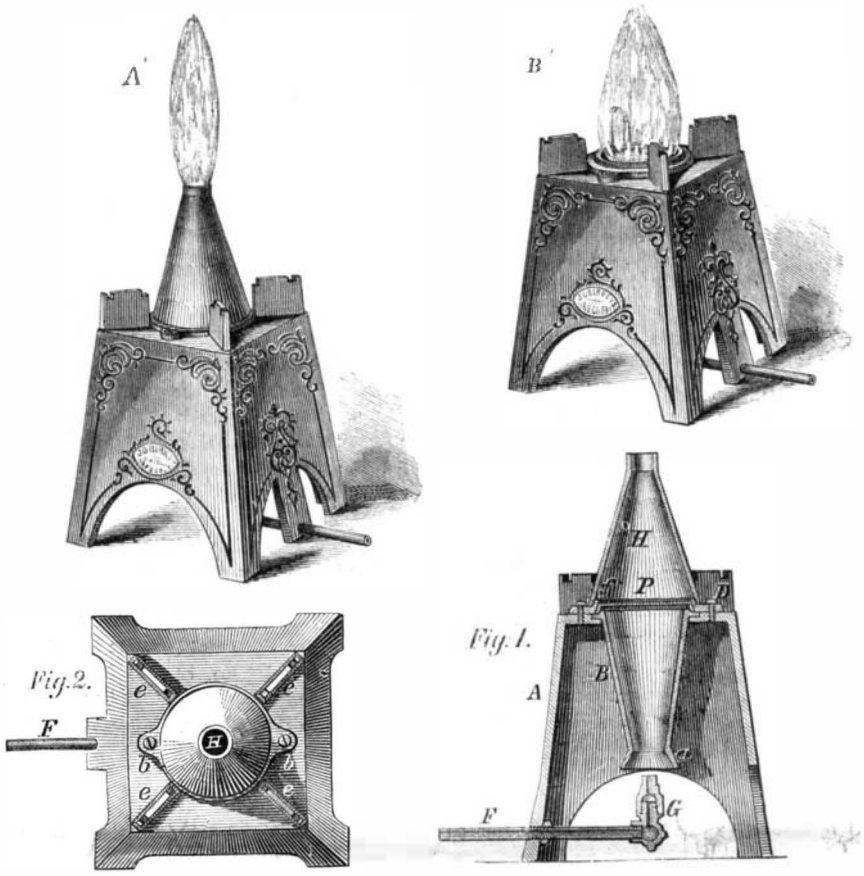
Improved Gas Heater.

The universal application of gas, in cities, for domestic and manufacturing purposes, has called forth a number of inventions for improving and perfecting the apparatus in which it is burned, and we here present an engraving of a new one which is said to be very satisfactory in its operation. The peculiarities of the heater consist in its simplicity, economy, durability, intensity of heat, and power of producing two distinct flames—either concentrated or diffused. It is convenient in size, simple in its construction, and it is always ready for use; and formed in such a manner that it does not smoke. It gives a great amount of heat, consuming at the utmost but six feet per hour, thereby making it most economical and desirable. Having two distinct flames—either to be used at pleasure—gives it a superiority. For common purposes, as the culinary department, the diffused flame will produce all that may be desired; but when a powerful, direct heat is wanted, as for many manufacturing concerns, the object is gained in a few seconds. In the engraving A is a cast iron casing, square and tapering from the base upward. In the top of this casing is let the upper flanged edge of a tube, B, which is in the form of a truncated cone inverted, and which terminates at the lower end, in the flaring mouth, *a*. This tube, B, is confined to its place by an annular plate, D, through lugs in which pass set screws, *b*, into the casing, A, and this annular plate, D, contains a diaphragm, P, of wire gauze, or perforated metal. F is an ordinary gas pipe, passing through and secured to the casing, A, and terminates in an ordinary tip, G, which is central with, but situated below the flaring mouth, *a*, of the tube, B. On the top of the casing, A, are four projections, *e*, on which rest objects to be heated, and on the plate, D, is an annular projection, *f*, on which rests the cone-shaped tube, H, which can be removed and replaced at pleasure.



BIRKEY'S GAS HEATER.

These are the details, and the operation of them is apparent to all.

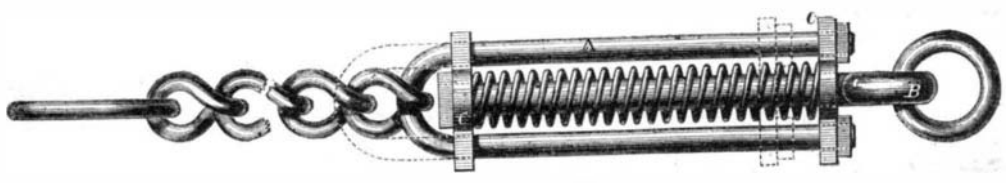
This apparatus will answer admirably for small steam boilers. There are many who use such things, both for pleasure and for business, and it is much more convenient than kerosene oil, which is sometimes employed.

For further information address the inventor, John Q. Birkey, at No. 245 South Sixth street, Philadelphia, Pa., by whom it was patented Oct. 31, 1865.

Improved Jar Arrester.

Every one who has ridden over city pavements must have noticed the frequent shocks and blows horses are subjected to from the wheels falling into ruts, thereby bringing the pole around with great violence. Many animals have been badly injured from this cause, and omnibus horses are not unfrequently so injured as to be laid up a long time.

The engraving published herewith represents a new invention designed to mitigate the evil, and so relieve the jerk that its effect will be lost. The mildest-mannered beast in the world soon becomes cross and fretful when twitched about as described. The instrument consists of a spring confined between a bent bar, A, attached to a ring bolt, B. The latter is fastened to the collar and the chain is connected with the pole, so that any sudden strain on it is immediately taken up on the spring and not felt by the horse except in a limited degree. Testimonials from persons who have used this invention agree in considering it a useful one. The inventor will sell the entire patent or will allow it to be manufactured at a royalty. To those desiring an interest in this invention rights will be sold at a moderate price and on liberal terms. It affords a splendid chance to those wishing to make some money with small capital. The article is easily made, requiring scarcely any machinery to start the business, sells readily, and pays a fair profit, and requires no trial, which most other inventions do, besides it is portable.



M'NAMEE'S JAR ARRESTER.

For further information address J. McNamee, of Easton, Pa., by whom it was patented through the Scientific American Patent Agency on July 14, 1863.

RECENT IMPROVEMENTS IN MARINE ENGINEERING.

This subject, a most important one, doubtless, to our readers, and especially to those more directly connected with marine engineering and steam navigation, has been handled in a very creditable manner by Mr. Charles Smith, a short time since, in the paper following his opening address as President of the Association of Assistant Engineers in Glasgow. He states that, though he has adopted the title given, it must not therefore be supposed he is also to use the trite phrase, and say that he is almost overwhelmed with the great advances that have been made in marine engineering within the last ten years, for really, although the efforts towards improvement have been innumerable, and acting in almost every available direction, yet unfortunately, the success that has attended these efforts has been very limited indeed. Whatever may be the cause of this, it is certainly not that there is no room for improvement, for that, in this respect, there is still a vast field for the marine engineer is known to the merest tyro. We find these efforts toward improvement displayed in the almost endless variety of the marine engine. We have in paddle engines, the side-lever engine (now, however, fast falling into disuse), the oscillating, the diagonal direct-acting engine, the trunk, and the steeple engine. For screw engines we have the inverted-cylinder engine, the direct-acting horizontal, the horizontal return connecting-rod engine, the trunk engine, and, lastly, the geared engine, which last, in fact, any of the screw engines enumerated may be, but which is a kind of engine that is also fast falling into disuse, although, like the side-lever paddle engine, it has its own peculiar advantages which its advocates will be loth to sacrifice. The internal arrangement of gearing in many ways may be considered the best form of this kind of engine. The engines which have been enumerated, for paddle and screw ships, are the best known as being the most extensively used, but are far from including the whole of the varieties. And, even in its best form, the marine engine is a most wasteful machine, when we consider that 9-10ths of the heat developed in a furnace (or which ought to be developed) is absolutely lost to us, and only the remaining fraction utilized, and an equivalent in power obtained from it. That this statement is correct the valuable researches of Joule in thermodynamics go far to prove. It may be that we are on the wrong track altogether, and instead of endeavoring to obtain the equivalent of heat in power through the medium of water, that we should be rather obtaining that power by more direct operation on the heat itself. Be that as it may, it certainly will not be very surprising if, in the next century, our modern steam engine be considered a more antiquated and wasteful machine than we have ever regarded the Savery or Newcomen engines. But to commence with the boilers of marine engines, of which in a paper such as this there is really little to say further than that there has been little or no improvement of a permanent character that has been successfully applied to any of the various kinds of them. We find, however, that the tubular boiler being now so generally adopted, we may consider it to be the boiler best suited for marine purposes The grand principle to be attended to in all boilers is one too often neglected, viz: that the boiler be of such an internal arrangement as will best promote the most rapid circulation of the water, by which not only is the value of the heating service much increased, but the boiler plates are rendered less liable to be over heated. Perhaps there have been more attempted improvements on boilers, however, in the way of smoke-consuming than in any other way; but we may call the result of all attempts failures so far, seeing it has been found that the admission of cold air for the purpose of burning the smoke has, in an economical point of view at least, proved injurious rather than beneficial, and it has been in this direction that most smoke-burning apparatuses have tended. And all that can yet be said of smoke burning is that it can be best effected on a well constructed fire grate, by careful firing, with plenty of space between the bars for the admission of air. The result of a deficiency in the latter respect is the formation of carbonic oxide, which is often seen in flame at the mouth of the funnel, where it catches fire on meeting with the oxygen of the air in its exit.

The author states, the most perfect smoke-consuming furnace he had yet seen was that according to Wilson's patent, a furnace with which he had something to do in adapting it to steam boilers. It may, with some modification, be yet adopted for marine purposes, with great economy only, however, for those working with low pressures. Besides being a smoke consumer, it likewise possesses the double advan-

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