air to the exterior of the flame. The wick carrier, D, Fig. 2, page 355, is formed of two concentric shells connected by ribs, and the outer shell, Fig. 3, isspecially grooved, in order that it may fit the projecting thread on the pipe, C. The central air pipe, A, has a groove extending longitudinally along its outer surface, and the inner shell of the wick carrier has a projection which fits in said groove. The carrier is thus prevented from turning when the pipe, C, is rotated to elevate or depress the wick. The direction of the air currents toward the flame is indicated by the arrows.

In applying the cylindrical wick to the burner, the part intended to project below the ribs of the wick carrier is slit to allow of its passage. This does not impede the flow of fluid through the wick or affect the flame. It is claimed that perfect combustion of the fluid is accomplished, and a brilliant white light produced, free from smoke and unpleasant odor. Patented March 26, 1878. For further particulars relative to manufacturing on royalty, address the inventor, Mr. Charles M. Lungren, 708 Lexington street, Baltimore, Md.

GAS MOTORS.

The name of gas engine is now generally applied to any motor wherein a detonating mixture is employed as a source of power. This mixture is commonly composed of air and illuminating gas in proportions varying between extended limits, starting from seven parts air to one of gas, this ratio furnishing the necessary oxygen to consume the combustible elements. The effect of the heat suddenly produced at the moment of inflammation is to expand the gaseous products of combustion, increase their pressure, and render them capable of exerting considerable effort. The temperature after explosion depends upon the composition of the mixture. Gas motors have many points of similarity to steam and hot air engines, as in all the movement is due to the expansion of a gaseous fluid, the essential differences residing in the manner in which heat is communicated to the intermediary agent. While in the steam engine the heat is devoted to the transformation of water into steam in an exterior apparatus, and in the hot air engine the dilatation of air is produced in a furnace independent of the cylinder; in the gas engine the heat is developed within the cylinder itself, and in the midst of the gaseous mass which serves as the motor fluid. The energy is produced at the moment needed, and there is no storing up of heat. Hence it will be seen that the gas engines find a special applicability in cases where continuous work is not required.

Simple as is the principle of the machine, its practical realization is a complex difficulty. The heat developed by the inflammation is rapidly communicated to the air in excess and to the products of combustion, so that instead of a gradual expansion an explosion takes place, the violence of which cannot be reduced by augmentation of the air cushion. Hence the sudden shocks incompatible with the regular and equable motion which the motor should have. In addition to this obstacle is the rapid heating of the cylinder, and consequent radiation of heat which is thus lost.

The first successful gas engines made abroad were those of Hugon in 1858 and Lenoir in 1860. The Otto & Langen machine, subsequently constructed, reduced considerably the expenditure of gas, but it was insupportably noisy, and therefore came into no extended use. Of the most improved gas motors existing abroad at the present time, M. Armengaud gives full details in a paper recently read before the French Société des Ingénieurs Civils. In the Lenoir engine the mixture of gas and air is admitted into the cylinder at atmospheric pressure, which is maintained until the piston has made half its stroke; the admission of a spark determines the explosion. In the new systems of Otto and of Simon, the detonating mixture is compressed first; and exploded by an ignited gas jet when under this pressure. The inflammation is thus gradual, and a progressive explosion is caused. Without going into the details of the separate machines, it will suffice here simply to point out the essential features. In the new Otto engine the piston advancing first draws in the mixture of gas and air. The valve is then shut and the piston returns, compressing the mixture (to about two atmospheres). As soon as the end of the stroke is reached a gas jet ignites the compressed gas, and the piston is thus caused to advance. On the return stroke, the cooled and expanded products of combustion are driven out. An important feature is the arrangement of the valve, so that at first a mixture of 15 parts of air to 1 part of gas is admitted, and afterwards one composed of 7 parts of air to 1 of gas, this causing slow or retarded combustion, the more explosive material being nearest to the gas flame at the moment of ignition. The loss of heat due to radiation in this engine is stated to be but 42 per cent as against 85 per cent in the Lenoir machine, and its efficiency three times as great. The expenditure of gas does not exceed, the inventor says (in high power machines), 23·9 cubic feet per horse power per hour.

The Simon engine, while based on the same principles as the foregoing, is differently constructed. The compression of the mixture is done in a separate cylinder, and the air and gas, after compression, are led to the motor cylinder. There the mixture at once meets an ignited jet, which inflames it. It does not enter the cylinder, however, all at once, but in small quantities, which are successively ignited, thus determining true gradual expansion. The heat developed is small, and a very limited quantity of water prevents overheating of the cylinder. The movement is regular and even. According to M. Simon, the expenditure of gas is 17·6 cubic feet per horse power per hour.

The Bisschop engine belongs to that mixed class which utilize the explosion to cause the ascent of the piston, and atmospheric pressure to determine its descent. The chief advantage of the machine is the mechanical arrangement, which allows of high piston speed. No water is used for cooling, this being effected by radiating surfaces representing five times the exterior surface of the cylinder. Up to the present time only small engines of this type have been built, chiefly suited for running sewing machines. According to M. Armengaud, the cost of operation is 2 cents per hour for the $\frac{1}{8}$ horse power, and 5 cents per hour for the $\frac{1}{4}$ horse power machine.

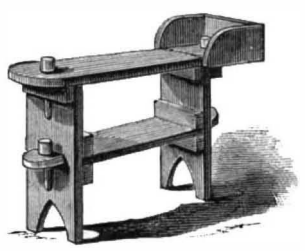
In the Ravel engine, the explosive force of the mixture is employed to move the piston, which is inclosed wholly in the cylinder, motion being taken from the cylinder and not from the piston, a paradoxical arrangement easily understood from the following. In each end of the cylinder is a chamber where explosion takes place, and the cylinder itself is hung on trunnions, which rest in journals, and which, prolonged, carry the pulley from which the power is taken. When the gas is exploded by a flame, the piston is driven to the opposite end of the cylinder. Its weight at the extremity then causes the latter to overbalance, and hence the cylinder rotates on its trunnions; as soon as that end reaches the lowest point of revolution, another explosion sends the piston to the further extremity, and thus the cylinder keeps on rotating. No data of the efficiency of the machine are given, but it is said to be quite economical.

The above constitutes but a brief summary of the more important European improvements made in the gas engine during the last two years. To these may be added a new application of the motor suggested by M. Dupuy de Lôme in impelling balloons. He states that his balloon could be driven at the rate of 13·2 miles per hour if a gas engine of 8 horse power could be contrived, the weight of which should not exceed that of eight men *plus* that of the mechanical device by which their power might be applied to a rotating shaft. The volume of the gas in his balloon is 121,926 cubic feet, the expenditure of which, supposing a portion were used to drive the engine, would be but 282·4 cubic feet per hour, or only about $\frac{1}{431}$ part of the total contents. During his experiment of February 2, 1872, M. de Lôme remained two hours in the air, using a propeller driven by hand. With the engine he might have traveled 26 miles in this period. For flying machines where large volumes are to be avoided, detonating mixtures of oil vapor and air would probably be found better suited as the source of power.

New Inventions.

Mr. Jonathan Miller, of Trenton, N. J., has made several improvements in Apparatus for Making Extracts, such as coffee, tea, etc., pursuant to the method patented by him May 2, 1876, one of which consists in providing a floating cover over the liquid to prevent evaporation, and the others tending to make the mechanical details more convenient.

The accompanying illustration represents a convenient Ironing Table, in which the ironing board proper is hinged and pivoted in such a manner that one end may be raised and turned to one side, for convenience in ironing shirts and similar garments. A hinged tray or extension is pivoted to the frame, serving to hold the water cup, sponge, hot irons, etc., and since it remains horizontal, whatever the position of the ironing board proper, there is no danger of such articles being overturned. Patented April 16, 1878, by Mrs. Emily A. Hill, of Princeton, Ind.



An ingenious Revenue Registering Device, the invention of Mr. S. J. Tucker, of Richmond, Va., is one of the results of the new liquor law of that State. It is intended for registering alcoholic drinks, but is applicable to other counting purposes. The mechanism for causing a full movement of the numbered disks and preventing them from being turned backward is complete, and in addition to the usual bell, a polygonal roller having faces of different colors is made to rotate so as to exhibit a new face through the outer case each time the revenue account is increased.

Mr. Wm. Riker, of Newark, N. J., has invented an improved Process of making Finger Rings, by which with few manipulations he is enabled to produce a solid gold ring having inlaid designs of different colors of gold, while its groundwork, edges, and internal periphery are of uniform color and quality.

An improvement in Boot Uppers has been patented by Messrs. S. W. Allen and Isaac Cook, of Tonica, Ill. The object is to furnish boots which will not wrinkle or shrink, which will enable the leather to be cut with less waste, and which will not need to be crimped. The forward part of the leg is made in two pieces, seamed to each other at their forward edges, and seamed at their lower ends with a lap seam to the vamps.

Mr. F. Feike, of Middletown, Mo., has invented an improved Fence, to be used in the beds of streams and rivers, which is claimed to resist the action of floods, and which may be cheaply and easily constructed. It consists of a number of slats or bars supported by suitable framework so as to present an upwardly inclined surface to the current.

In a new device for Fastening Bottle Stoppers, patented by Mr. G. F. Outten, of Norfolk, Va., the stopper is stiffly fastened to a sliding bail, and the lower end of the latter is connected with a stationary collar about the neck of the bottle by a pair of toggle arms, whose middle joint is thrown in, to lock the stopper down, or out to allow the bail to be slid up to disengage the stopper, a lever latch being employed to throw the toggle out, and a guide link being employed in connection with the bail to cause the latter to move to its proper position when the stopper is removed.

An improvement in Cigar Moulds, made by Mr. G. W. Hamilton, of Fredericksburg, Va., consists in casting the matrices in two parts, and in holding them together upon the bed plate by means of elastic blocks, which allow them to yield slightly when the dies descend. The invention further relates to the use of a temporary binder for wrapping the tobacco and for lining the moulds, and preventing contact of the tobacco therewith. The ends of the matrices have flanges for the purpose of securing them to the bedplate.

Mr. W. Parkin, of Taunton, Mass., has patented a convenient Beverage Holder, for ice water, coffee, tea, etc., which is adapted for use on family dining tables or in restaurants. It is a vessel of cylindrical form and ornamental appearance, provided with a pump, and also having a lining or inner cylinder, between which and the shell of the holder is a dead air space to prevent the conduction of heat.

A simple Self-Lighting and Extinguishing Lamp, invented by Mrs. E. G. Haller, of Philadelphia, Pa., is constructed upon the general principle of utilizing a self regulating hydrogen gas generating apparatus provided with a stopcock and vent tube, arranged in the burner so that the flame from the vent tube serves when ignited to ignite the wick. The ignition is effected by the peculiar property of "spongy" platinum, and the apparatus is so simplified as to be convenient in use.

Mr. Z. N. Morrell, of Luling, Tex., has devised a portable Fire Proof Lint Receiver for the lint discharged from cotton gins. This lint is so combustible as to cause frequent accidents. The receiver is rectangular, constructed of sheet iron, and provided with doors, one of which is adapted to close automatically when the receiver is removed away from the gin. The body of the receiver rests upon a wheeled platform, to which it is secured by iron bars or rods passing through brackets affixed to the top of the receiver, so that they will support the top and prevent collapse of the receiver, in case it becomes red hot from ignition of the lint.

An improved Curry Comb, recently patented by Mr. L. A. Griswold, of Marshfield, Ohio, is made double, and is so constructed that the combs may be exchanged, thus forming four curry combs in one.

Mr. T. C. Thompson, of Evanston, Ill., has invented an improved Gaff for Vessels, which is provided with an end socket having locking devices to secure the gaff to the boom when lowered, thus preventing chafing of the sail.

In a new Pen, patented by Mr. W. M. Prince, of Pittsfield, Mass., there are two distinct nibs, which are so arranged that the same amount of pressure upon both nibs will produce a heavy and a light line, for convenience in ruling.

Mr. J. Homrighous, of Royalton, Ohio, has invented an improved Burial Casket, which is capable of being adjusted with facility to the required length. It is made in two parts, of which the foot section, being smaller than the other, is adjustable to a certain length in the head section, and the parts are connected by side and bottom screws.

A Coin Pocket Book, patented by Mr. A. L. Thurston, of West Salem, Wis., is formed with a flat frame, having recesses corresponding to the different denominations, and spring-cushioned caps moving in the recesses and working in connection with catches, which retain the coins at one side, but allow them to be slipped out easily at the other.

BOILER CORROSION.

There is an evil which is very often confounded with, or improperly considered in connection with, the formation of scale or crust in boilers. This evil, perhaps of equal magnitude, but proceeding from entirely different causes, is corrosion.

As it very frequently attacks the external surface of boiler plates, it can readily be seen that it is not always inseparably connected with impure feed water, and as it is perhaps most marked in conjunction with the use of so-called "pure natural waters" (that is, those leaving no solid residue on evaporation and having no action on test paper), it will be seen that to rush blindly into the use of such "pure" waters as a remedy for incrustation is not always safe.

Careless setting in too much lime (perhaps impure lime) often badly corrodes the plates of land boilers externally. This trouble calls for very simple prevention. Where the foundations are too damp and undrained, moisture sometimes reaches the plates through the lime or through the ashes. As ashes frequently contain strong alkaline salts, they can by long cold contact, if moist, badly corrode the plates.

It is known that when wood or soft coal is imperfectly burned, there is a distillation of pyroligneous acid; and by injudicious use of wood in starting fires, or by too heavy charging of coal, such distillation may take place, the soot in the flues and tubes becoming so impregnated with acid as to attack the metal. Even the fine dust of ashes, containing sulphuric acid derived from the pyrites in the coal, may produce the same effect.

Where brass cocks or connections are bolted to or screwed