Science and Art.

Heat in the Water of Pumps.

Messrs. Editors—At the close of an article upon heat and cold in your issue of October 31st, you express a desire to hear more upon the subject of heating water by friction, which has called out an article from Joseph E. Holmes, Esq., and the result at which he arrives for observing the action of the Gwynne pump (and in which you appear to coincide) is that owing to a large suction pipe being used, and the water forced through a smaller opening, a compression of the particles of air contained in the water ensues, that results in evolving heat, which, being taken up by the water, raises its temperature. My experience leads me to a different opinion. I have had running, during the late Fair of the American Institute, several centrifugal pumps; one had a suction pipe of 5 inches diameter, with a discharge 2¾ inches, through which, at an elevation of some 3 feet, 750 gallons of water per minute were forced; and the pump was kept running during the whole time the Fair was kept open, whenever the engines were operating, pumping the same water without change from first to last, except to replace the loss from evaporation, and at no time did the temperature approach blood heat, though perceptibly hightened after several hours' constant running. I had also another pump, with a 9-inch suction, and 6-inch discharge pipe, elevating its water about 5 feet, and discharging 3,000 gallons per minute, running for three weeks, under the same circumstances as the first, which did not raise the temperature to the same extent, although the whole quantity of water used was less, in proportion to the quantity discharged, than in the first instance. These facts, in my opinion, would show that the increased heat was due to the increased friction of small pipes.

I account for the different results in Mr. Holmes' experience and my own as follows:—The discharge pipe, in the case he instances, being smaller, and discharging about the same proportionate quantity, caused an increased friction, and the angles at which the water passes through the Gwynne pump causes a large increase of friction—there being no angles in my passages, the water being passed around curves, which become easier as the size of the pump is enlarged. To these causes may, perhaps, be added, as you suggest, an increase of temperature from the friction of the parts of the pump, as I find, by the manufacturers' published tables, that to raise water 15 feet with the Gwynne pump, through a 4 inch suction, and 2½-inch discharge pipe, at the rate of 100 gallons per minute, requires a velocity at the periphery of the rotating wheel of 3,750 feet per minute; while with a 3-inch suction and 2-inch discharge pipe, my pump discharges 75 gallons per minute, 17 feet high, with the periphery of the wheel running less than 2,000 feet per minute. I should be pleased to hear the opinion of yourselves, or some of your scientific correspondents, upon the facts as stated. W. D. Andrews.

New York, November 27, 1857.

[The fact seems to be established, that the water which passes through centrifugal pumps is elevated in temperature. What is the cause of this? is the question. The water in these pumps, it seems, is not compressed, but is driven at a high velocity. If the air in the water is not compressed, then the rise in temperature cannot be due to this cause. Is it due to the friction of water on the metal? This idea is opposed to that hitherto entertained respecting the friction of fluids on solids. There is no question respecting the fact that the friction of the solid parts of these pumps generates frictional heat, which must be carried by the water; but Mr. Andrews is of opinion that the friction of the water on the metal also generates heat. This is an interesting point, or rather question; for if it be established that the friction of fluids on solids generates heat, then the temperature of the water discharged by such pumps will afford a very good test of their efficiency; as the one which raises the temperature of the water highest must require the greatest amount of power to operate, and thus be the least effective.—Eds.

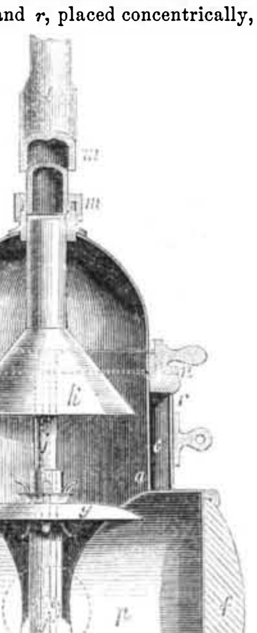
Apparatus for Illuminating Objects under Water.

The *London Engineer* publishes a description of a lamp for this purpose, invented by Mr. Heinke, of London, a gentleman well known in connection with diving apparatuses.

This invention consists firstly, in an improved mode of supplying the lamps with air and also of carrying off the products of combustion; and, secondly, in adapting to such lamps reflectors, condensers, or lenses, which throw the light with great intensity in the direction required.

The first of these objects is effected by placing the lamp (which may be of any suitable construction, provided it gives a considerable amount of light) within a double cylindrical or other conveniently shaped casing, which is provided with an annular chamber or space, formed by piacing one casing of smaller diameter within another of larger diameter, leaving an annular space.

The illustration shows a vertical section of the lamp. It is preferred to make the casing or body of sheet copper, and it is composed of two cylinders, *a* and *r*, placed concentrically,

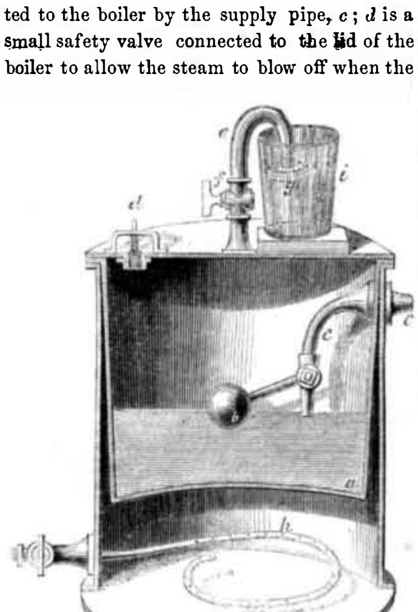


one within the other, so as to leave an annular space, *c*, between them. The foot of the lamp is composed of the same material, and is also made hollow; as at *d*, *d*. The internal part of the hollow foot is perforated with small holes, *e*, *e*, for the purpose of admitting air from the annular space, *c*, to the interior of the lamp. The casing has any convenient number of condensing lenses fitted to suitable openings made in the casing, as shown at *f*, *f*, *f*; and if required, reflectors may be adapted in such a manner to the lamp as to throw the light through the condensing lenses.

It will be seen that there are two lenses, *f*, *f*, adapted to the sides of the casing, for the purpose of throwing the light forward in a horizontal direction. There is also another condensing lens, *f*, adapted to the foot of the apparatus, and above the light is placed a horizontal metal reflector, *g*, which will throw the light down through the condensing lens, and thereby cast a brilliant light on anything below. The lamp, *h*, is of the ordinary argand kind, and is supplied with oil from the resevoir, *i*, which is made of an annular form, for the purpose of allowing the light from the flame of the lamp to pass through to the condensing lens, *f*, below. The lamp is secured in vertical slotted guides, *j*, *j*, fixed to the sides of the casing; it is of course provided with a glass chimney for the purpose of steadying the flame, and the reflector, *g*, is placed on this glass chimney, and may be secured at any suitable altitude by means of spring clips, as is well understood. The gaseous products of combustion pass up the glass chimney from the flame in to the trumpet-mouth, *k*, of the vertical tube, which communicates with the hose or flexible pipe, *t*, above, the connection between the two pipes being effected by means of a screw joint at the top of the dome cover of the apparatus, as seen at *m*. This cover is screwed on to the top of the apparatus, a leather or other washer, *n*, being placed on the flange, by which the two parts are united. Air to support combustion is supplied to the lamp down the flexible tube or hose, which is adapted to a short conical branch pipe secured to the sides of the casing and made to communicate with the annular space between the inner and outer casings. The two circles of this branch pipe, *p*, *o*, are dotted in the figure, being in front of the lamp. The apparatus is suspended by means of cords or chains.

Apparatus for Heating Fluids.

This invention consists in an improved apparatus for heating wine, beer, spirits, &c. The illustration represents a section of the improved apparatus. *a* is the boiler, which is made sufficiently strong to resist the pressure of the steam generated therein; *b* is a tap and float to regulate the quantity of water admitted to the boiler by the supply pipe, *c*; *d* is a small safety valve connected to the lid of the boiler to allow the steam to blow off when the



pressure becomes too great; *e* is a tube to convey the steam from the boiler, *a*, into the fluid to be heated; *f* is a tap in the tube, *e*; and *g* is a rose at the end of the tube to distribute the steam in the fluid to be heated; *h* is a circle of gas jets for heating the water in the boiler. The patentee prefers to use gas for heating the water in the boiler in apparatuses of small dimensions. In some cases the boiler may be placed in another apartment, and heated by coal or otherwise; the tube, *e*, would then be conveyed to the table or counter where it is required. The fluid to be heated is placed in a glass or other vessel, as shown at *i*, and the steam is admitted by turning the tap, *f*; the steam imparts its heat to the fluid, and becomes condensed immediately on entering it. By this apparatus wine and beer may be mulled, and spirits and water heated in a very short time and with the greatest cleanliness.

We copy the above from the *London Engineer*.

The Victoria Tubular Bridge.

The first tube of this bridge over the St. Lawrence river, at the Montreal side, has just been placed in position. It weighs, we understand, nearly one thousand tuns, and when left to support itself was only deflected about one and a half inches. Calculations were made for a deflection of four inches, but the small depression is proof of its great strength. When finished, this will be the most gigantic structure of the kind in the world.

Paper Impervious to Water.

Take 24 oz. of alum, and 4 oz. of white soap, and dissolve them in 2 lbs. of water; into another vessel dissolve 2 oz. of gum arabic, and 6 oz. of glue in the same quantity of water as the former, and add the two solutions together, which is now to be kept warm, and the paper intended to be made water-proof dipped into it, passed between rollers, and dried; or without the use of rollers, the paper may be suspended until it is perfectly dripped, and then dried. The alum, soap, glue and gum form a kind of artificial leather, which protects the surface of the paper from the action of water, and also renders it somewhat fire-proof. This is a preparation for water-proofing paper intended for packages exposed to the weather, recommended by Professor Muschamp, of Wurtemburg, Germany.

Instinct.

This principle, common to all animals, is the spontaneous impulse by which they perform certain actions. Under this term should be distinguished the *instinctive faculty*, which leads the duckling, untaught, into the water, and the chicken, equally untaught, to avoid the water; the bird to fly, a child to try to walk; and the *instinctive motion*, such as the involuntary action of the muscles, as in laughter for pleasure, tears for grief, the act of swallowing, and the methods of locomotion in the various forms of animal life.