

**IMPROVED REFRIGERATING MACHINE.**

We give a perspective view of the refrigerating machine exhibited by Messrs. J. and E. Hall, of Dartford, at the Nottingham Show of the Royal Agricultural Society. In this machine, which is constructed under Windhausen's patent, carbonic anhydride is used as the working fluid, a material which can now be manufactured at a low cost, and which is not only non-inflammable, but incapable of supporting combustion, while in the small quantities in which it is used is not deleterious to health. In fact, at the Gambrinus Brewery, Charlottenburg, Berlin, the whole charge of a largemachine (160 kilogrammes) was lately purposely discharged freely into the engine room, the doors and windows of which had been closed, but no inconvenience was experienced by the persons present, and candles placed about 20 in. above the floor remained burning.

The machine consists of a compressing pump which draws the carbonic anhydride from the refrigerator, and delivers it into the condenser, where it is cooled and its liquefaction effected, after which it passes again to the refrigerator, where it produces intense cold by its evaporation.

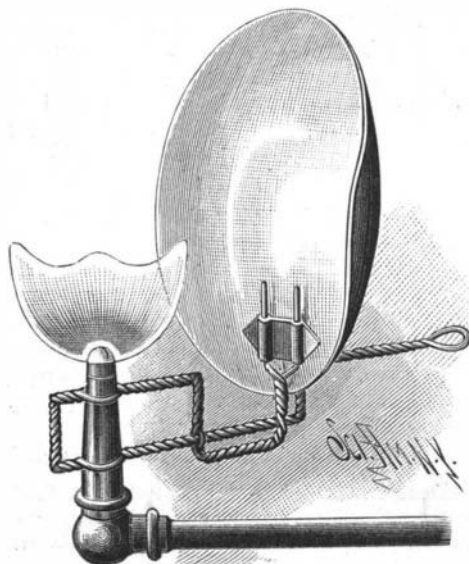
In the machine under notice the parts are very compactly arranged. The compressing pump is placed vertically and is driven direct by the prolongation of the piston rod of the steam cylinder above, while the condenser and refrigerator are also arranged vertically, the former being on the left and the latter on the right hand side, as seen in our engraving. As shown at Nottingham the machine cooled brine, which circulated in the refrigerating chamber shown on the rear.—*Engineering.*

**French Naval Ballooning.**

Experiments with the marine captive balloon at Toulon, before referred to, have been continued. On July 21, Lieut. Serpette and his aide made another ascent in the early morning from the deck of the Implacable. The end of the pendent cable from the car was afterward taken by a launch on board the armored battle ship Indomptable, belonging to the evolutionary squadron in the roads, and two smaller balloons were then attached to the car, to serve as reservoirs for a further supply of gas, to meet the probable depletion in the larger machine. At 9 A. M. the Indomptable weighed anchor and steamed away to the southward, to soon disappear below the horizon, while the balloon remained in sight to mark the position of the vessel for some time afterward. The inspecting committee went with the Indomptable to ascertain the range of vision obtainable from lengthened distances at sea.

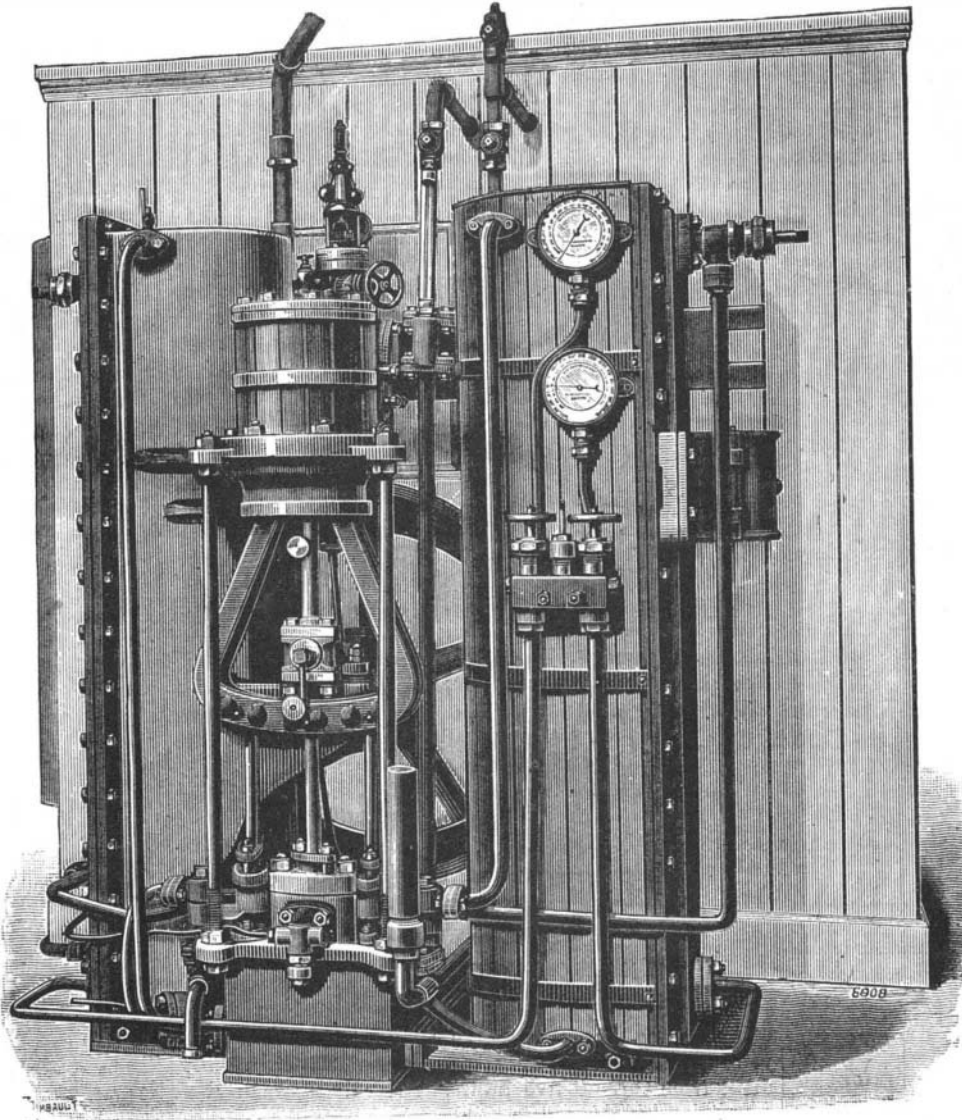
**AN IMPROVED LAMP SHADE.**

A simply formed and convenient holder for shades for gas jets, lamps, etc., preferably made of twisted wire, is illustrated herewith, and has been patented by Mr. Louis Michael, of Leavenworth, Kansas. In construction, the wire is bent at its middle to form a loop or hand hold, it is then twisted to a point where it is desired first to engage the lower portion of an ordinary tapering gas burner, where the twists are opened or spread, forming a lower loop, the twisted



MICHAEL'S LAMP SHADE.

wires being extended and bent twice to extend horizontally back, the twists being again opened or spread, forming an upper loop to embrace the upper portion of the burner, after which the twisted wires are extended and bent as shown, being twisted twice around the lower arm, and separated at their upper ends to form prongs adapted to fit in bearings on the shade.

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The loops may be made smaller or larger, to fit different sized burners, or of a proper size to fit on different parts of lamps, and a special form of shade holder for lamps is also provided, in which the jaws are formed of spring or elastic wire to clasp around the lamp chimney or burner.

**The Cheapest Pig Iron in the World.**

We believe that the distinction of having the lowest record of cost belongs to the Ilsede Works at Grossilsede, Germany. The figures have been lately published by Fritz W. Luermann, a very well known engineer, in *Stahl und Eisen*, the data submitted being interesting also from a technical point of view, since they trace the effect of improvements in practice over a protracted period, both on increased product and lowered fuel consumption.

The works have three furnaces equipped with Ggers stoves, one stack always being in reserve, two blowing engines with 540 c. m. piston displacement per minute together, and three with an aggregate displacement of 1,460 c. m. The heating surface of the boilers is 2,053 sq. m. The ores are argillaceous and calcareous, from mines in proximity to the furnace plant, some of them being washed. Coke is produced now in 156 ovens at the furnace, the purchase of outside coke having steadily diminished since 1872, while the steam required has been raised almost entirely of late by the waste heat from the ovens, the quantity of steam being steadily decreased by improvements in machinery.

While the cost of ore has more than doubled since 1867, the output per day has been trebled, labor per ton has declined heavily and the cost of repairs and of materials other than ore and fuel has fallen to one-half. The general result is that the cost of pig iron has fallen from 41.96 marks per metric ton in 1869 to 23.01 marks in 1887, or, taking the mark at 24 cents, \$10.23 per gross ton in 1867 to \$5.62. It may well be questioned whether there is any other plant in the world which produces pig iron so cheaply. It is not surprising that under the circumstances the works declared a dividend of 20 per cent, especially since the product is particularly suitable for basic steel manufacture, the iron carrying 3.22 per cent of carbon, 2.92 per cent of phosphorus, 2.38 per cent of manganese, 0.049 per cent of sulphur, and 0.108 per cent of silicon, while the cinder analyzed 30.24 per cent of silica, 0.82 per cent of protoxide of iron, 11.90 per cent of alumina, 9.31 per cent of protoxide of manganese,

40.5 per cent of lime, and 1.9 per cent of magnesia. Mr. Luermann in reviewing these figures draws a comparison between the work at South Chicago and that at Ilsede in favor of the latter. At Ilsede the two furnaces produced in 1887, 113,997 metric tons of pig iron from 320,489 tons of ore and cinder and 11 tons of scrap. Deducting the latter, the yield was 85.57 per cent, the

fuel consumption being 96,961 tons of coke, showing a charge of 330 pounds to 100 pounds of coke, in spite of low blast temperatures. He cites in comparison with this South Chicago, where the yield of No. 7 was 54.3 per cent of iron, but smelted daily only 368 tons of ore with 173.4 tons of coke, while Ilsede No. 2 worked daily 443 tons of ore, consuming only 134 tons of coke. The record of Ilsede stands 330 pounds of charge to 100 pounds of coke, as against 190 pounds of charge at South Chicago. We believe, however, that in the case of the former the ores were self-fluxing, while at South Chicago a considerable quantity of limestone must be added.—*Iron Age.*

**A Sand Storm at Sea.**

The British steamship *Glenshiel*, from the East Indies, recently arrived at New York, reports a sand storm which occurred on the evening of July 10, while the vessel was making for Suez. When half way up the Red Sea a most terrific sand storm, which lasted nearly ten hours, suddenly swept down. It was impossible to see anything a ship's length away. The wind blew a gale, and it was found to be a dangerous experiment to stay on deck for any length of time. The sand was hot, and when it came into contact with the body, would sting like the point of a knife.

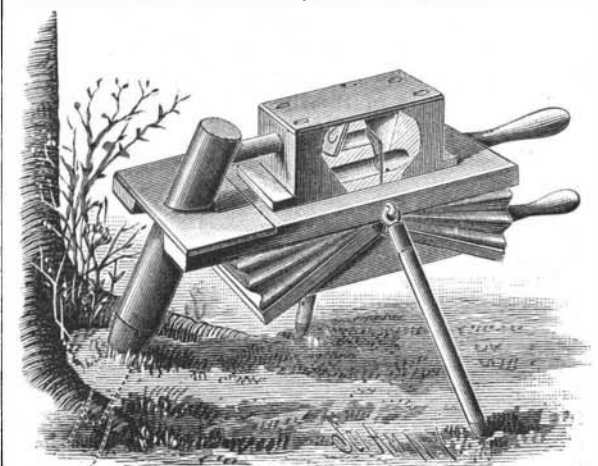
**A Wrinkle about Varnish.**

Varnish made with alcohol will get dull and spongy by the evaporation of the alcohol, which leaves water in the varnish, as all commercial alcohol contains water. It is therefore advisable to take a thin

sheet of gelatine, cut it into strips, and put it into the varnish; it will absorb in the thin sheet most of the water, and the varnish can be used clear and bright till the last drop. The gelatine will get quite soft; it can then be taken out and dried, and used again.—*Carriage Monthly.*

**A FUMIGATOR AND ANIMAL EXTERMINATOR.**

A device specially adapted for smoking out squirrels and similar animals, whereby the smoke and gases may be delivered directly into the animal's burrow, and not trouble the operator, is illustrated herewith, and has been patented by Mr. Amos Spidler, of Moscow, Idaho Territory. Upon a table having pivoted or hinged legs is secured a block, within which is a horizontal inverted U-shaped port, the lower openings of which communicate with passages from the bellows beneath the table. Intersecting the port is a recess, with a diaphragm constituting a valve for each of its outlets, the recess also communicating by a spring valve and horizontal channel with a cylindrical fire chamber, adapted to be held in any suitable manner in the forward end of the table, but projecting downward and outward, so that its lower end may be conveniently inserted into the burrow of an animal. Sulphur is placed in the cylinder, with leaves or straw, and the fuel lighted, when the lower conical end of the cylinder is introduced into the burrow and the bellows operated to supply air and drive the smoke out directly into the burrow.



SPIDLER'S FUMIGATOR.