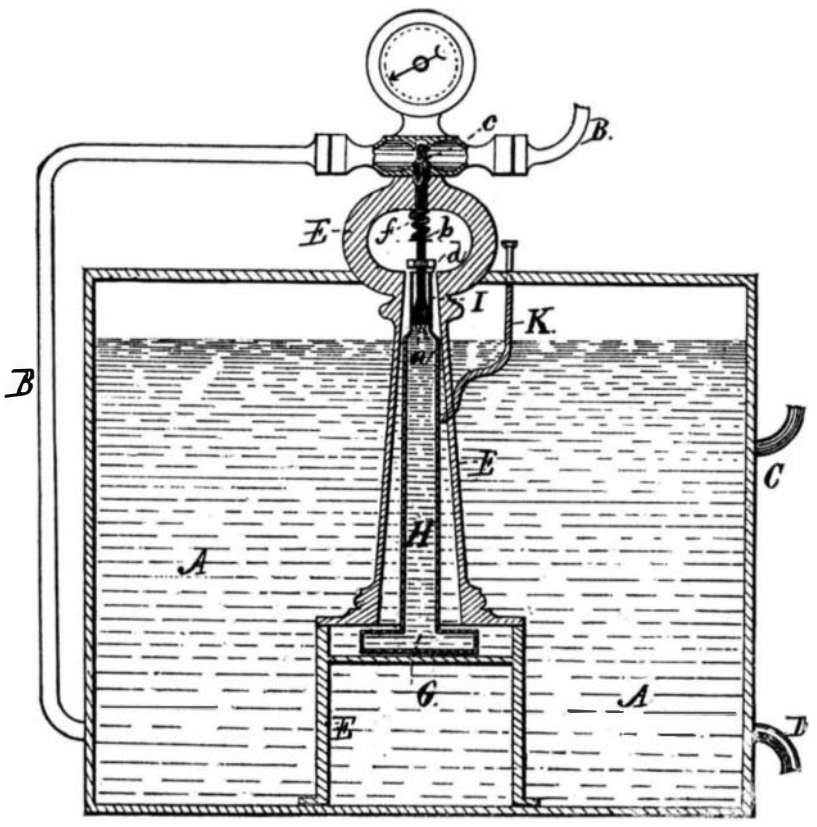
THERMOSTATIC APPARATUS FOR CONTROLLING VALVES.

We illustrate herewith a novel device designed for automatically operating and controlling valves in steam or other pipes, which has for its object the retaining at a stated temperature either water or air. A represents a boiler of water, to be heated by the introduction therein of live steam, and an even temperature of the same maintained. B is the steam pipe, through which the steam is conducted. C is the inlet and D the exit pipe, by means of which water is introduced and withdrawn from the boiler or tank. These parts may be of any ordinary form of construction, and therefore call for no detailed description. E is a hollow stand. G is a hollow disk made from brass; and extending upwardly from its center is a brass tube, H. This disk and tube are made of as thin sheet metal as is possible, so as to be very sensitive to the variations in temperature. At the upper end of the tube, H, it is reduced to a less diameter, as shown at I, so as to confine the action of expansion and contraction of the fluid, with which the disk and tube may be filled, to a small column, thus increasing its sensibility and rapidity of action. The upper and reduced end, I, of the tube reaches just above the water line, as shown. Into this reduced tube a piston, *a*, is inserted and attached to a connecting rod, *b*, which extends upwardly through the upper frame of the boiler to the valve, *c*, in the steam pipe, B, to which it is attached. It is provided with a check nut, *d*, which may be adjusted to control the extent of motion. The disk, G, and tubes, H and I, are completely filled with an expansible fluid before insertion in the supporting frame in the boiler. A light spiral spring, *f*, is attached to the connecting rod operating the valve, *c*, and operates to force down the plunger, *a*, as the fluid in the tube, I, contracts.

The boiler being filled with cold water, the expansible fluid in the disk and tube, H, is contracted so as to drop the plunger, *a*, to the full extent of its downward motion, opening wide the valve, *c*. Live steam then being admitted to pipe, B, it freely passes through the open valve and enters the water in the boiler, heating the same to the degree of temperature desired. This heating of the water conveys its action to the fluid and expands it in the disk and tube, forcing the plunger or piston, *a*, upward, thus closing the valve, *c*, and shutting off the supply of steam, or so much of it as may be necessary. As the temperature of the water falls, the fluid in the disk and tube contracts, and the piston drops with it, again opening the valve and admitting a new supply of steam.

The operation of the plunger, *d*, may be so adjusted that it will rise and fall at a certain degree of heat, or close the valve and open the same at specified degrees of heat, which points may be indicated upon an indicator located above the apparatus and connected with the lever operating the valve, and actuated thereby. It is evident that this indicator will, as the valve rises or falls, indicate the changes and present temperature of the water in the boiler.

This apparatus was patented March 7, 1876, by Mr. H. R. Randall, of Brooklyn, N. Y.

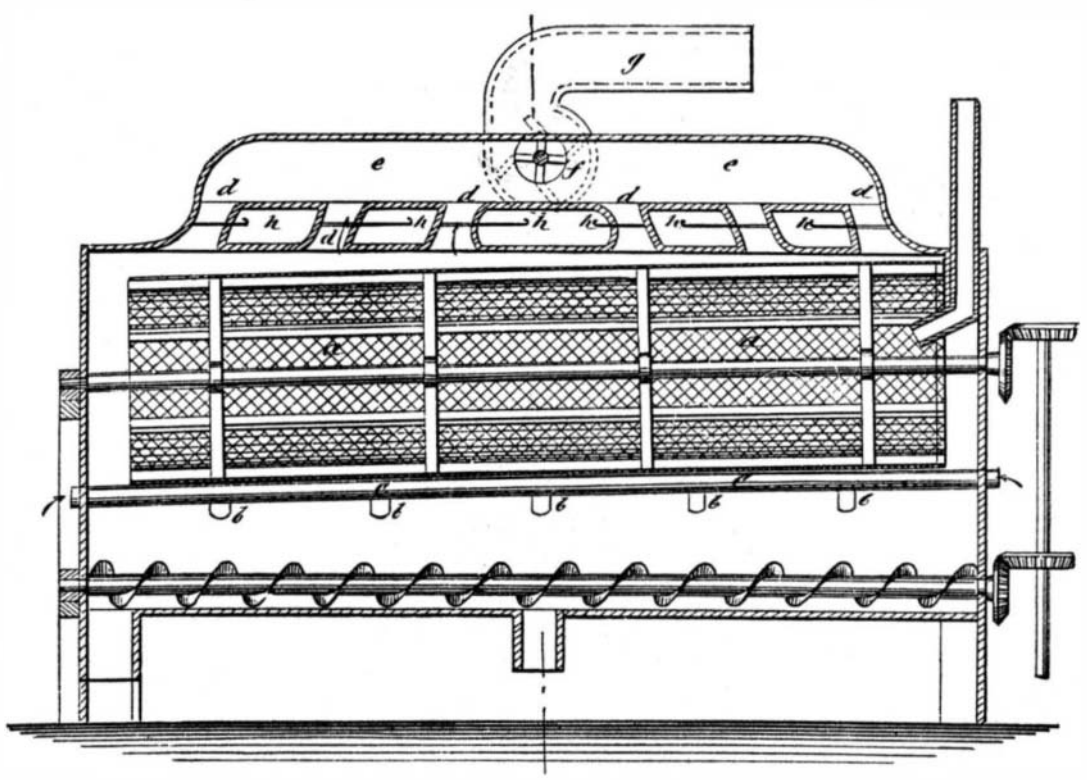


THERMOSTATIC APPARATUS FOR CONTROLLING VALVES.

A NEW FLOUR BOLT.

We illustrate herewith a novel apparatus in which an air blast removes the fuzz and fine clammy dust from flour while the material is undergoing separation from bran and middlings in a bolt or reel. The short inlet pipes, *b*, connect with long perforated distributing tubes, which admit air below the bolt, *a*. The air is drawn by the fans through the chamber, *e*, and exhausts at *d*. *g* is the spout to the dust room, and at *h* are slides for regulating the draft.

This device was patented through the Scientific American Patent Agency, September 12, 1876, by Mr. John P. Agler, of Avoca, Iowa.



ALGER'S FLOUR BOLT.

Purifying Calcareous Water.

A company has recently been formed in England to furnish potable water to the large district situated to the northwest of London. Water in that locality, although abundant, is so extremely hard, owing to its filtration through the lime formation, that it is scarcely utilizable. The object of the company is to remove the calcareous matter, and to this end extensive buildings and reservoirs have been constructed. The water is pumped up from wells directly under the works, and is purified in the following manner: Quicklime is slaked in a circular basin and mixed with water in other receptacles, so as to form a milk. This, by its weight, travels into the main reservoirs, which contains 2,000,000 gallons of water, and is allowed to act on the water for about five hours. At the end of this time the bicarbonate of lime held in solution is precipitated, and the water is pumped off into a distributing reservoir. The lime is frequently removed and sold for agricultural use.

The Machinery Exhibit.

A mechanician, alluding in the London *Times* to our mechanical exhibit, acknowledges that the display of machinery at the Philadelphia Exhibition has never been equaled, either for quantity, or for quality, or for fitness. The grand effect which it produces, adds the writer, is no mere result of repetition according to well known forms of construction, but is due to abounding novelty, originality, and progress. This department of the Exhibition has a strongly marked American character, and can hardly be regarded as an international competition. Other civilized countries, it is true, take part therein, and Great Britain especially, but the aggregate does not equal one fourth of the articles exhibited from the United States. There is also marked evidence of patriotic spirit in the prodigious efforts made by individual citizens and firms to sustain worthily the mechanical reputation of the country. The extent, the money value, the excellence and originality of the objects displayed by them impress a stranger immensely; and however much he may have seen of former international exhibitions on the grand scale, these impressions survive.

The Sonorous Qualities of Metals.

M. Decharme has recently concluded a series of experiments to determine the sonorous capabilities of different metals. Cylindrical rods, 7·8 inches in length and 0·39 inch in diameter, were suspended by threads or rested on cork prisms. Each was struck by a piece of wood covered with rubber. As regards number of vibrations, lead was found to yield the lowest, or in the ratio of 690 to the maximum of 2,762 for aluminum. The intermediate results are: For gold 976, silver 1,034, tin 1,161, brass 1,303, bronze 1,381, zinc 1,422, copper 1,462, cast iron 1,843, wrought iron 2,192, and steel, 2,322. As regards duration of sound, the following results were obtained in seconds of time and fractions: lead 0·3, tin a little less than 1, zinc 1, cast iron a little less than 2, copper about 5, wrought iron 12, brass 14, bronze 24, steel 45. The author notes the fact that a steel rod, when supported on the sides of cork prisms, gives a sound which lasts but 25 seconds, or but little over half the period as when the steel is suspended. Brass, on the contrary, sounds from 20 to 25 seconds when on the corks, instead of 24, as when suspended by the thread.

Painless Extinction of Animal Life.

"The latest experimental researches which I have conducted on lower living animals," says Dr. B. W. Richardson, "have had for their object the discovery of a ready, cheap, and innocuous method for killing without pain those animals which are destined, as yet, for the food of man. If the labor of the physiologist be allowed to progress, the day will soon arrive when the slaughter of animals for food will become unnecessary, since he will be able to so transmute the vegetable world as to produce the most perfect and delicious foods for all the purposes of life without calling upon the lower animal world to perform the intermediate chemical changes. But until this time arrives, animals will have to be slaughtered, and my research has been directed to make a process, which at present is barbarous and painful, painless in the most perfect degree. For this purpose the various modes of rapid destruction of life—by powerful electrical discharges, by rapid division of the *medulla oblongata*, and by the inhalation of various narcotic vapors—have been carried out. The experiments, which have been exceedingly numerous, have led me to the conclusion that the most perfect of the painless methods of killing is by the inhalation of carbonic oxide gas. So rapid and complete is the action of this gas that I may say physiological science has done her part, as far as it need be done, for making the painless killing of every animal a certain and ready accomplishment, an accomplishment also so simple that the animal going to its fate has merely to be passed through the lethal chamber, in order to be brought, in senseless sleep, into the hands of the slaughterer. The application of teaching and the putting into practice this humane process lies now with the world outside Science: but to insure its acceptance, all the force of selfishness, of prejudice, and of practical apathy for the sufferings of the animal creation, has to be overcome. There is a great deal of talk and a great deal of sentiment abroad on the question of the sufferings of the lower animal kingdom; but when an attempt is made to relieve those sufferings by the invention of methods for operating surgically, without the infliction of pain, or for painless killing, the true and vital sympathy, which one would expect in support of such practical and humane efforts until they are made perfect and universal, can scarcely be said to be found at all. With the exception of a few, not a dozen altogether, of really humane ladies and gentlemen, I have found no one, out of the ranks of Science, in the least interested in the saving of sufferings to which I am now directing attention. The man of science stands and wonders at the strangeness of the psychological problem before him; and, in spite of himself, is forced to the conclusion that, practically, the noise that is made at him in the name of humanity is, after all, sounding brass and tinkling cymbal."—*Nature.*

The Cost of Big Guns.

The trials of the 81-tun gun which have recently taken place in England are reported as being conveniently satisfactory to the artillerists; but it may be doubted whether those who are footing the bills, the tax payers, will share in the officially expressed gratification. At every discharge of this monster weapon, over 300 lbs. of powder are exploded at a cost of from $125 to $150. To this must be added the expense of shell and fuses. Then the gun itself, originally estimated to cost $40,000, has actually necessitated an expenditure of some $125,000, besides the construction of a railway at Woolwich, a barge for its transportation, and several huge cranes. Moreover the firing of the gun at Shoeburyness has had the effect of blowing down or at least seriously shattering the huts and cottages of that military settlement, so that it will nearly all have to be rebuilt at government expense. Meanwhile, on this side of the Atlantic, we complacently view these rather costly proceedings, profit by the results of the experiments, and congratulate ourselves that we are not paying for them.

THE secret of making the hammered bronze Chinese gongs and Turkish cymbals consists in forging the bronze into shape while hot.