

PROFESSOR S. N. CARVALHO'S NEW SYSTEM OF SUPERHEATING STEAM.

The fact that we are this day discharging into the atmosphere through the chimneys of steam boilers, either from imperfect combustion or defective methods of absorption, and transfer to the water, from 20 to 50 per cent of the calorific value of the fuel (and in exceptional cases, where a forced blast is resorted to for the purpose of gaining large capacity from a comparatively small boiler, as high as 70 per cent of the actual heat value of the fuel), is almost a reproach upon the engineering intelligence of the age.

The inventor of this new superheating system claims that it, if applied to these boilers (which he says can be done at a small cost), will remedy this great waste by recovering fully 25 per cent of the actual product of the coal and converting it into useful heat in the boiler and increased energy and power in the cylinder of the engine.

This heat is employed to superheat the steam and subsequently to raise the temperature of the feed water. In the majority of boilers the inventor finds the temperature of the escaping gases high enough for his purpose, but in some cases he places absorbing pipes in a hotter portion of the gas passages, with, he claims, economic effect, even if heat is appropriated which would otherwise be transferred in evaporating steam directly in the boiler. The inventor depends upon the principle that, if steam entering the cylinder can be supplied with heat additional to that required for its existence as true dry saturated steam, just sufficient to furnish the heat units transmitted into work, and to compensate for the heat which would be abstracted by contact with the cylinder from saturated steam, and if this addition of heat can be rendered capable of control, so as to leave the steam exhausted at the end of the stroke at saturation for the temperature and pressure obtaining at the opening of the exhaust, the best and most economical conditions of its use in the cylinder would be accomplished. The two greatest obstacles to the attainment of these conditions have been the perishability of superheating apparatus and the difficulty of controlling the exact amount of superheat given the steam.

The use of the apparatus is not confined, we are informed, to the drying and superheating of steam on its way from boiler to engine, but the main circuit of pipes connected with the feed water tank and absorbing surfaces in the hot region communicates with a hot water jacket around the cylinder, and the circulation of water in this, the inventor asserts, evaporates any entrained water and superheats the steam directly in the cylinder, the action being regulated by suitable devices. The invention is also claimed to be adapted to many other industrial purposes, as the boiling of soap and sugar, baking of bread, biscuit, etc.

Referring to our engraving, A is a reservoir with safety valve and funnel, and at B are the absorption pipes in the back connection; C is a superheating coil in an annular drum, and there is another coil in the feed water tank, D. A valve, E, is provided on the coil from the superheater, C, and valves, F, are arranged on the exit pipe from the feed water tank. When valve E is open valves F are closed, and the feed water tank is thus shut off from the system. G is a valve connecting with the feed pump for filling under pressure. A funnel is provided, as shown, for filling by hand. I is the feed pipe entering tank, D, and J the pipe from tank to boiler. Fig. 2 shows the hot water jacket around the cylinder of the engine in connection with the absorption pipes and feed water tank. Steam is thus superheated in the cylinder instead of in C. Fig. 3 shows a coil of pipe inclosed in a metallic oven to take the place of feed water tank, D. The surplus heat in pipes of superheater, C, is regulated by its radiation to contents of the oven. Fig. 4 represents a plain wrought iron cylinder or pipe with coil of tubing, to take the place of the double cylinder, C. The latter is intended to be placed around the smoke stack of a marine or locomotive boiler.

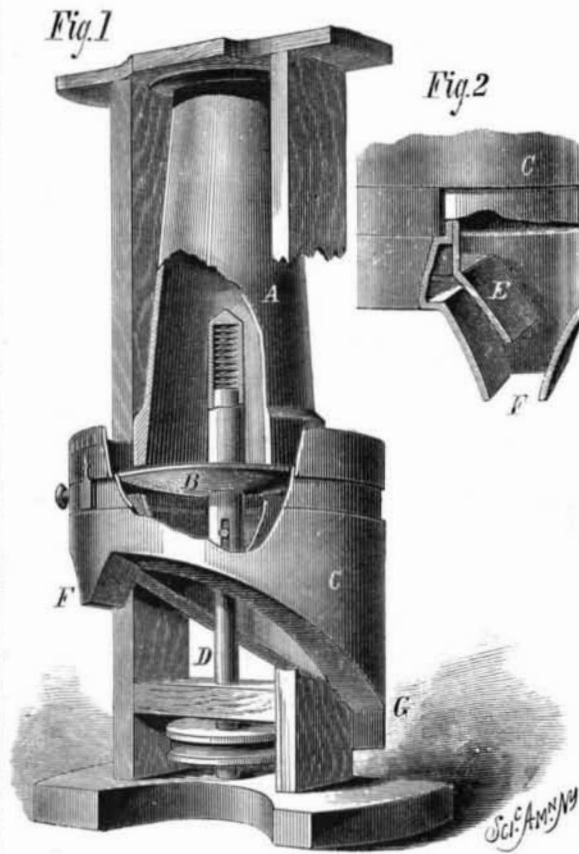
Among the other advantages claimed are that at no point of the entire apparatus is there a square inch of surface exposed to the heated gases which does not have water on the other side. This the inventor considers brings the superheating surfaces under precisely the same conditions as the ordinary water heating surfaces of a boiler, and renders them in nowise less durable. The apparatus was used at the last fair of the American Institute in connection with the boilers that supplied steam to the machinery exhibited, and received commendatory testimonials and a medal. The inventor also submits

a report of calorimeter tests, which credits a pound of steam superheated by his apparatus with an average mean of 65 units of heat more than is stated to exist in a pound of ordinary steam.

For further particulars address Professor S. N. Carvalho, 65 East 127th St., or 119 Liberty St., New York city.

VITT'S IMPROVED GRAIN TOLLER.

We illustrate herewith an improved mechanical grain



VITT'S GRAIN TOLLER.

toller, designed for use in custom mills for the purpose of taking the toll accurately and without trouble to the miller. It may be readily adjusted to any proportion of toll as may be agreed upon.

A is a conducting tube, through which the grain passes down upon the slightly concaved revolving disk, B. The latter is lowered by the pressure, and the grain gradually escapes between the lower end of the tube and said disk, and enters the annular casing or receptacle, C. The tube, A, Fig. 1, is slightly increased in diameter toward the lower

lates the opening and outlet, according to the quantity of grain coming in at the top of the machine. The spring, by yielding, allows the disk to work as well with an irregular as with a regular flow.

The casing, C, is arranged with two vertical partitions, one of which, E, Fig. 2, is movable, and is adjusted by a set screw, face plate, and index along the graduated scale on the exterior of the casing. The partitions, when adjusted to the proper distance, take up a certain fixed proportion of the circumference of the disk, and receive, by the uniform dropping of the grain over the edge of the disk, a corresponding proportion of the grain passing down the tube, A. This forms the toll agreed upon between the miller and customer, and it is conducted through an exit spout, F, to a suitable receptacle. The main portion of the grain passes along the spirally inclined bottom to a second exit spout, G.

Patented through the Scientific American Patent Agency December 11, 1877. For further information relative to sale of entire patent, address the inventor, Mr. Adolphus H. Vitt, Union, Franklin Co., Mo.

Armor-Plated Fish.

The new number of the *Popular Science Review* (London) contains an illustrated article on "Armor-plated Fish," by Mr. Henry Woodward. This is an interesting article, and should be read in conjunction with two papers by Professor Burt Wilder on the *Lepidosteus* or gar pike, in the *Popular Science Monthly* of last year.

The extraordinary structure of the Ganoidea offers an attractive field for study, and additional interest is added by the fact that few species of this order at present exist. They remind us of a past age, for their fossil remains occur in abundance in almost all the fossiliferous strata of the earth, and in some of the older formations constitute almost the only indications of the existence of vertebrated animals upon our planet at the period of the deposition of these strata.

The most interesting specimen of this order, the *Lepidosteus*, is found only in the waters of the United States, and can be seen alive at the Aquarium in our city; these appear to possess an adamantine vitality, and have outlived all other fish in the establishment.

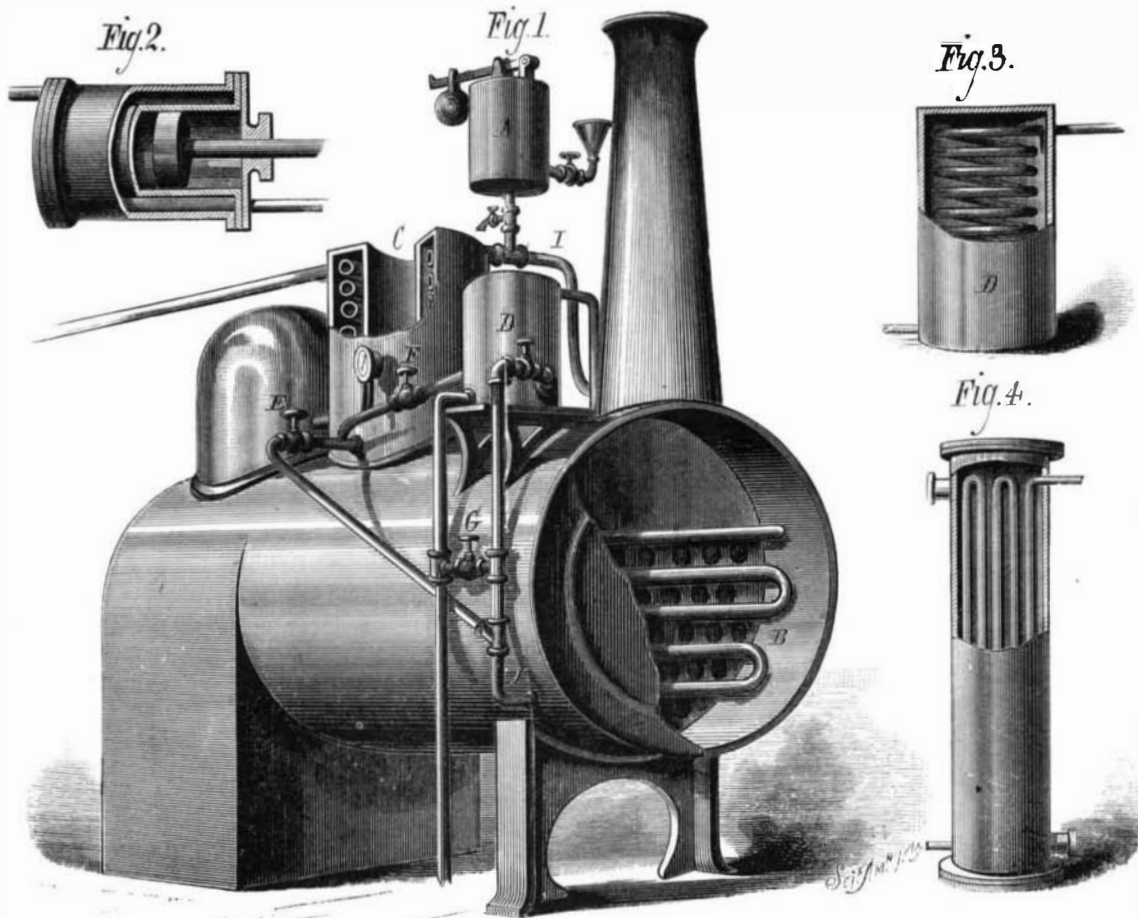
Are Natives of India Color Blind?

A correspondent of the *Times of India* calls attention to the remarkable confirmation to be found in the perceptive powers of the lower caste natives of the theory started by Mr. Gladstone in his recent article on the "Color Sense of Homer." "Our natives," he writes, "cannot distinguish between blue and green. They apply the word *lal* to a variety of objects we should describe as yellow and brown, and apply the generic epithet 'tambada,' corresponding to Homer's *Chalkos*, to all the bright red tints. Like Homer they speak of the blue sea as black (*Kala pani*). They apply the word *nila*, dark blue, to a gray horse, and their notion of the color of the sky, or *Asman's rung*, is a light gray. The subject can be readily tested by anyone by telling his 'boy' or some less civilized native to choose a blue, red or green book from a pile on the table. I have just tried a puttawallah with different colored books. Between green and blue he cannot properly distinguish; *tambada* he applies to vermilion, and the rainbow he protests is simply red or green. This is just what Mr. Gladstone says about the color sense in Homer's Greeks."

The subject (says our contemporary) is one of great interest, but we think our correspondent has been a little rapid in his conclusions. We have tried several puttawallahs in the way he suggests, and with colors on a palette. But they distinguished readily between colors and even shades of color. The glowing and many colored fabrics for which India is famous certainly suggest that a portion of the population at all events have been educated through generations of inherited experience to a very keen sense of color indeed. With whole sections of low caste people it may of course be different. The theory is

novel, and perhaps worth the attention of scientific men in India.—*Madras Times*.

THE forging and tempering of iron or steel can be greatly enhanced, according to Herr Edward Blass, by dipping the metal in fused salt. This dipping in salt is also well adapted for annealing steel without the oxidation of the surface.



CARVALHO'S FEED WATER HEATER AND SUPERHEATER.

end, so as to let the grain pass down with less friction on the sides of the tube, and consequently to enable it to exert more pressure on the disk. The latter has a central tubular portion, which is connected by a coupling pin to the shaft, D, which is rotated. The upper part of the tube is closed and a spiral spring is provided therein, so that the disk may freely play up and down while revolving. The disk adjusts itself to the pressure of the grain and automatically regu-