

**Automatic Feed for Water-tube Boilers.**

BY ROBERT P. WATSON.

The small water content of water-tube boilers as compared with fire-tube boilers demands a regular and constant feed at all times and under all circumstances when the boiler is in action; otherwise the boiler is in danger of being burned. Even if it is not burned, the tubes are liable to pull out of the tube-sheet from being softened by overheating, and serious accidents have occurred from this cause, one but a very short time ago. Men who have had no training with water-tube boilers should not be put in charge of them. But a few weeks ago the writer had a young man in his service who was of more than average intelligence, and had had, as well, several weeks' training under him in the management of a water-tube boiler of high efficiency. This young man was left in charge of a boiler carrying 225 pounds of steam under forced draught, with positive injunctions not to leave the front of it or take his eyes off the water-gage for a moment. The writer was absent just ten minutes, and, on his return, heard the pop-valve going when he got within 200 feet of the boiler. Quickening his steps, he reached the boiler just in time to prevent its destruction by burning. The water had disappeared from the glass, but issued in fitful spits from the lowest gage cock, showing that it was still above the danger line. No one was about the boiler, but in a minute or two the young man before mentioned returned, and, upon being soundly rated for his recklessness, declared that he had only been absent a few minutes from necessity. The fire had burned up white hot in the few minutes he was away, and the water had gone out most rapidly, or more rapidly than the engine could use it. Had there been an automatic feed on the boiler, everything would have run quite smoothly.

The feed on the boiler alluded to was kept up by an injector, but it is usually maintained in this class of boilers by pumps, in default of anything better. It is, in any case, however, a constant source of danger, or rather anxiety, especially with marine boilers under severe duty. Upon torpedo boats and high speed yachts the boilers are worked far above their normal rating, and as there is but a small body of water in the boiler, even when at rest, the water level, when the boiler is driven by an air blast of five or six pounds pressure, is liable to sudden fluctuations, and has to be carefully watched. The feed must not cease for one moment while the boiler is in full work, and engineers are fully alive to the necessity of an automatic feed. To devise one that will fill all requirements is not so simple as might seem upon the face of it, and any one who undertakes the task with the idea that it is, and that

some sort of a self-regulating valve, or other common device, will do the work, will be undeceived when his plans are put to the crucial test of actual running. An automatic feed for a marine water-tube boiler must have brains of its own, so to speak, and know when to put water in and when not to. Just how to accomplish this has puzzled the best engineers of the world, so far. There are some devices of the sort named in use to-day, but there are not many, and they have objections which render them anything but reliable under all circumstances. Too frequently, owing to their principle of action, they speedily work their own ruin. Some of them require as much supervision as a common pump, and therefore do not fulfill their mission. When all the water is going out and none coming in, or not enough to keep up with the evaporation, only two courses are possible: One is to get more water instantly from somewhere; the other, to stop the vessel and haul the fires. What this last operation involves is known only to those who have been compelled to do it. To suddenly deposit nearly half a ton of white-hot coal on the floor of a fire-room only a few feet square—the mere hauling of it, even—is a serious matter, only to be undertaken when it is a case of ruining a boiler or a matter of life and death to all in the vicinity.

An automatic feed device for marine work must be of the simplest construction and based upon well known laws. Small valve stems delicately balanced are highly objectionable, for the reason that, although they work well when new and smooth, the deposits and accretions from the water (especially if it is at all saline) soon render the apparatus unreliable. To cover all the conditions successfully is exceedingly difficult, and it is not to be wondered at that up to this present writing engineers have failed to devise a reasonably reliable device of the kind. It must be borne in mind that marine water-tube boilers take the water in at one end and discharge it at the other end in the form of steam. It is rapidly circulated over intensely heated surfaces in comparatively thin streams, and, there being no crown-sheet, as in a fire-tube boiler, there is no reserve water at all. The evaporation is so rapid that the entire contents of a water-tube boiler may be turned into steam in a very few minutes, if the feed is stopped. In a sixty-horse power water-tube boiler, for example, there is a total content of about 600 pounds of water. The heating surface would be about 500 square feet. Now, if the boiler evaporates only five pounds of water per square foot of heating surface per hour, it would only require a quarter of an hour to boil out every drop in it, and but a very few minutes to lower the water level to the danger point.

From these plain facts it is easy to see that an automatic feed is essential to the success of boilers of the type discussed, and equally apparent that the proposition is not a simple one. Danger signals, such as blowing whistles and displaying devices of one kind or another to show engineers that the water is low, would not be tolerated. There is a man constantly on watch for this very function, and he is apt to find it out long before a whistle would. What is required is a simple mechanism that will keep up the water supply as fast as it evaporates, and will stop acting when the boiler stops; for less than two minutes would flood the boiler if the feed kept working. The man who can devise such a machine will have work supplying the demand for a long time to come.

CHARLES A. SCHOTT, Chief of the Computation Division of the Coast and Geodetic Survey, has been awarded the Wilde Prize by the French Academy. The Wilde Prize is a coveted honor open to the world, to be conferred on the one judged the most worthy from among those who make discoveries or write works on astronomy, chemistry, geology, physics, or mechanics. The award to Mr. Schott is based on a work on terrestrial magnetism. The committee which made the award consisted of some of the best-known scientists in France, including MM. Savvan, Bertrand, Levy, and Berthelot.

**The Current Supplement.**

The current SUPPLEMENT, No. 1196, contains many interesting articles, notably one on "The Kaiser's Pilgrimage to the Holy Land," accompanied by views of vessels which accompanied the Emperor's yacht, views in Jerusalem, etc. "Torpedo Boat Destroyers" is an important paper read before the Society of Naval Architects by G. W. Dickie, and "Designs for New Vessels for the United States Navy" is by Philip Hichborn, chief constructor United States Navy. Both these papers are of great value. "Foods" is a lecture delivered before the Drexel Institute by Dr. A. P. Brubaker and has been revised for the SCIENTIFIC AMERICAN SUPPLEMENT.

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**RECENTLY PATENTED INVENTIONS.****Electrical Appliances.**

**ELECTRIC ACCUMULATOR.**—FEDERICO PESCIOTTO, Turin, Italy. The present invention seeks to provide improved means for manufacturing electric accumulator-plates. The plates are cast in the usual manner, and with the minimum and with the litharge which serve to form the active material of the plates, ulmin "ulmate" is mixed. The inventor claims that a plate thus prepared is lighter in weight than most accumulator-plates, that the reacting surface is increased, and that the active material is readily held in contact with the plate.

**Engineering Improvements.**

**ROTARY VALVE.**—BRANERD W. SMITH, Delphos, Ohio. The valve-mechanism of this inventor has a segmental valve-seat on which is mounted to turn a valve formed with a cavity for connecting the cylindrical ports with the valve-chest and the exhaust, to admit and exhaust the steam to and from the cylinder-ports. The valve is formed with an auxiliary port opening into the cavity, and is arranged to open into the steam-chest at the time the cavity opens into the chest, and to be cut off or closed during the time the cavity opens to the exhaust.

**Mechanical Devices.**

**MACHINE FOR SCREWING UP OR UNSCREWING PIPES.**—CHARLES H. MCCREADY, Neodesha, Kan. This machine, for turning pipes, screw-rods, and similar articles, comprises jaws adapted to grip the pipe; a ring on which the jaws are fulcrumed; a driven revolvable ring connected with the jaws, to close the latter on the pipe, and to carry around the jaws, together with the ring on which the jaws are fulcrumed, the connection between the driven ring and the jaws consisting of a pin mounted to turn on the ring; a clevis fulcrumed on the pin; and a link connecting the clevis with a clip on the jaw.

**ADDING-MACHINE.**—WILLIAM R. GILBERT, Birmmville, Miss. The machine devised by this inventor is inclosed in a casing in one end of which two independent reels are mounted to turn. On the periphery of a third reel, mounted in the opposite end of the casing, an annulus turns. Two numbered tapes are attached to the two first-named reels and wound respectively around the third reel and around the annulus. The third reel and the annulus have portions projecting without the casing to permit the third reel and the annulus to be turned. A stop-arm is rigidly held by the casing to indicate the limit of movement to which the third reel and annulus are to be turned. The numbered tapes having been thus set in motion, the total sum appears on the tapes at observation openings in the casing. After noting the sum observed, the operator returns the parts to their normal position by releasing the springs attached to the reels.

**ORE REDUCING AND SEPARATING MECHANISM.**—PHILIP J. LONERGAN, Colorado Springs, Col.

This invention seeks to provide an improvement in pan-process amalgamators, in the nature of a "pan-arastre" adapted to take the ore directly from the rock-breaker. The machine provided for this purpose is designed to work at its maximum energy, to keep the pulp thoroughly under control and in contact with the shoes until it is reduced to the proper fineness, and to separate and discharge automatically this pulp into a slime-receiver or gutter. The invention comprehends the construction of a machine of this kind, having its center or dead area eliminated, whereby the diameter of the pan is increased, and an enlarged annular way having a superficial area is produced. Thus are created a working channel for the pulp and shoes of a large capacity, adapted to give mechanical motion to the pulp over the whole area by a direct action thereon. A long detention of the pulp is in this manner obtained, enabling it to settle and to be carried to a final point of discharge.

**Miscellaneous Inventions.**

**PIGEON-TRAP.**—GEORGE S. MOTT, Babylon, N. Y. The trap forming the subject of this invention is a sporting trap having a setting-lever connected with a bird-cage to close the cage. Mechanism is connected with the lever, whereby the trap is opened when the lever is released. A triggers locks and releases the lever. A gearing driven from the lever actuates a disturbing device operating in conjunction with the cage, to frighten the bird on opening the cage.

**BRUSH.**—LYDA D. NEWMAN, New York city. To provide a hair-brush, so arranged as to be readily cleaned, this inventor forms recesses in the front face of the brush-back, the bristle-holder being set in the recess and partly filling it so as to leave an air-chamber in the rear of the holder. The holder, moreover, has slots extending through it from front to rear between the rows of bristles, the slots thus communicating with the air-chamber. Impurities from the scalp or hair can readily pass through the slots to the recess in the back, and can be easily removed.

**DARK LANTERN.**—ROSS M. G. PHILLIPS, Los Angeles, Cal. In this dark lantern are provided two pivoted slides for the lens and a locking device to connect the slides, whereby one slide may be opened independently of the other, or both may be opened together. One slide may be actuated to throw the light down, the other slide permitting the rays to be directed straight ahead.

**FILTER.**—JOHN H. SIEBER, Henderson, Ky. The filter forming the subject of the present invention comprises a casing in which a porous filtering stone and a cleaning stone, spring-pressed into engagement with the filtering stone, are inclosed. The water is first passed through the filtering stone and then into a service-pipe. The outer surface of the filtering stone may be cleaned when necessary by rotating it against the cleaning stone. The inlet for unfiltered water, lying directly over the filtering stone, causes water to be showered over the entire surface of the stone, thus preventing the large ac-

cumulation of filtrates necessarily deposited on the stones of filters in which the water enters at the side.

**FIRE-ALARM.**—JOSEPH CASAVELLO, Cumberland, Canada. The purpose of this invention is to provide an alarm of a detonating or explosive character, that can be heard a considerable distance and that will be comparatively cheap to manufacture. The fire alarm comprises a casing having a screen wall, a series of canisters containing explosive material, and a fuse leading into each canister. The fuses are extended around the building. As the combustible material of the fuses becomes ignited, the canisters will, as a result, be exploded, not, however, with sufficient force to injure the building.

**BINDER AND SHEET.**—JOSEPH S. HAM, Portland, Me. One of the features of this invention lies in the provision of means whereby McGill fasteners may be firmly held between the two sides of the cover at the back, and may be readily replaced should they be damaged. A binding strip is provided for the leaves, a portion of which is arranged to hold the fasteners in place, another portion being adapted to be held in binding engagement with the leaves of the book by means of the fasteners. The individual leaves have recesses so shaped that, when the fasteners are in position in the recesses of the leaves, these leaves will be held as firmly between the covers as if they were regularly bound therein. It is possible to remove any of the leaves from the covers or to introduce additional leaves.

**CONCENTRATE-RECEIVER.**—JOHN C. and RICHARD C. WATERS, Romley, Col. In concentrating machinery as hitherto employed, the concentrates are passed with the water from the machine into an ordinary box set on the floor, and are removed from the box by means of a hoe or shovel—a most laborious process. The box of the present receiver is mounted to turn and is formed with a flexible bottom separating the box into two compartments. The upper compartment is the receiving compartment. The box is mounted to move downwardly under the weight of the accumulating concentrates in the uppermost compartment. A device is provided by means of which the box is made to turn when moved downwardly.

**THIMBLE THREAD-KNIFE.**—ANNAH M. HUNTER, Paris, Ill., and LOUIS ILLMER, Jr., Washington, D. C. This invention is an improvement in thread-cutters designed to be used on an ordinary thimble. The thread-cutter has a cutting portion or knife, and a clasp to embrace the thimble, which clasp is composed of a helical coil, the length of which exceeds a circle, whereby the clasp is made to overlap in the direction of the axis of the helix. The clasp is formed of spring wire and may be easily forced over a thimble of any size.

**BEDSTEAD.**—JOSEPH W. EVANS, Haskell, Tex. The bedstead of this inventor has a rigid frame, suspended by four cords running over pairs of vertical and horizontal pulleys journaled in brackets attached to the ceiling and over fixed pulleys, and are also connected with a slide carrying movable pulleys. A pull-cord runs on the movable pulleys and certain fixed pulleys, where-

by it actuates the slide and hence applies traction to the several suspending cords to raise the bed to the ceiling.

**VENTILATOR.**—GUSTAV F. CHAMBER, Portland, Ore. The ventilator of this inventor is adapted to operate on the vacuum principle—that is to say, it may be so acted upon by the force of the wind as to tend to create a partial vacuum in the shaft or other inclosed space below, whereby an ascending draft is created. The ventilator comprises a frame or open-sided hood, slats pivoted horizontally and eccentrically thereon, devices having a curved rim and secured to the slats, and wires or equivalents attached to and connecting the devices. The wind's blowing upon the slats on side of the hood will close or tend to close them, because the greater surface area of the slats lies below the pivots. Such movement will cause the opposite slats to open correspondingly, so that an upward draft in the chimney is induced by the partial vacuum produced on the open side of the hood. The inventor has added a small contrivance by which the hood can be entirely closed at will.

**MUSIC-LEAF TURNER.**—WILLIAM G. DE RAMUS, Prattville, Ala. This improved leaf-turner is adapted to be used in turning the leaves of music, or as a copy-holder for use by typewriters. The apparatus has a frame supporting the leaves. A longitudinally reciprocal carriage is mounted on the frame and has a shaft rotatable at right angles to the direction of reciprocation of the carriage. Fingers are carried by the shaft and are arranged to hold and release the leaves. A spring is coiled around the shaft, by which spring the fingers are pressed against the leaves. A device is attached to the carriage in order to regulate the tension of the spring.

**Designs.**

**BASE FOR CALENDARS.**—MAX RUBIN, New York city. The calendar designed by this inventor is made in the form of a flag, and is so constructed that the field of the flag containing, for example, the stars of the American ensign, will represent the dates, each date being inscribed in a star. The fields representing the various months may be torn off; or, they may be rotated by means of a roller to bring a new month into view, thus giving the appearance of a moving field.

**WALL-PAPER.**—HARRY WEARNE, Rixheim, Germany. The wall-paper forming the subject of this design has pictured upon it a continuous chain or string of roses, full and partially blown, and in the bud, together with foliage.

**WALL-PAPER.**—ARTHUR MARTIN, Paris, France. This design consists of a bouquet of roses encircled by festoons of ribbon intertwined with jasmine. The ribbon is connected with the stems of the bouquet. At intervals, the ribbon is formed with bows holding rose-buds.

**NOTE.**—Copies of any of these patents will be furnished by Munn & Co. for 10 cents each. Please send the name of the patentee, title of the invention, and date of this paper.