

satisfactorily by mail by way of a clearly written, illustrated pamphlet—adopting the method of teaching in vogue with the correspondence schools—and the practical knowledge of how to do automobile repairs properly could soon be gained by intelligent application. But until some such method is brought to bear on the available and favorable elements in present conditions our automobile repair and storage facilities will continue to remain the weak spot in the industry.

A MOTOR SLED.

There is no reason why an enthusiastic cyclist should not enjoy his favorite pastime in the winter as well



A MOTOR SLED.

as in summer. Our illustration shows a motor-bicycle which has been converted into a motor-sled by simply substituting a pair of runners for the front wheel. Mr. I. H. Whipple, the designer and owner of this peculiar vehicle, delights to race his machine against the fast horses on Chicago's speedway, which he can easily outdistance. The machine is a converted Mitchell motor-bicycle driven by a 2 horse power motor and said to develop a maximum speed of thirty-five miles an hour. As a motor-sled, however, the inventor claims a speed of forty miles an hour. By having two parallel runners in front an upright position is assured to the machine and the steering of the machine easily controlled. The runners are attached to a cross-bar secured to the front forks, and are adapted to be removed in summer time. The cross-bar, however, may be retained and serve as an axle on which a pair of wheels may be mounted, thus converting the machine into a tricycle. An additional seat may be added at the front of the machine if desired, the motor having ample power to propel the additional weight.

A NEW WATER-LEVEL REGULATOR FOR STEAM BOILERS.

The accompanying illustrations give a general view and cross section of a very simple automatic apparatus for regulating the water level in a steam boiler. The device has just been patented by Mr. Nelson Curtis, of Boston, Mass., who invented it for use on automobiles, although it is readily applicable to any steam boiler.

This regulator is constructed to operate by the well-known principle in hydrostatics that a column of liquid of a given height, however small in diameter, will counterbalance or lift a great weight, provided it acts against a sufficient area at its base.

An inspection of the diagram will show the reader that the upper half of the vertical stem, above the connection with the boiler, consists of three tubes numbered 1, 2 and 3 from the outside, inward. The second of these tubes terminates below in the upper part of the diaphragm chamber, *D*, while the third one passes through the flexible phosphor bronze diaphragm and ends in the lower half of said chamber. Attached to the diaphragm on its under side is a needle valve, *N*, which is opened or closed by the fluctuations of the former. This valve, upon opening, admits boiling water and steam, through the pipe, *P*, to the supply pipe of the pump, thus checking the suction of the latter and making it non-operative; or the water and steam liberated through valve, *N*, since it has the boiler pressure behind

it, may be made to operate a by-pass valve, thus checking the feed-water from entering the boiler.

When the boiler is filled with water the first time, and steam is raised, the pressure forces water up through the outer tube, *I*, the water level, of course, being then above inlet pipe, *J*, into filter chamber, *F*. It is then forced through the filter and enters tube 2 through small holes in the wall of the latter, connecting it with the narrow chamber below the filter. This water descends through tube 2, filling it, and the chamber, *D*, above the diaphragm. The weight of this column of water on the diaphragm (4 pounds) causes it to close the needle valve, *N*, which has been held open by spring, *S*, on top of tube 3.

As soon as tube 2 has filled, water is forced up into chamber, *C*, and begins to fill tube 3. The cap on top of chamber is unscrewed a little the first time apparatus is filled, in order to keep the air in tube 3 from becoming trapped at *C* when the water enters the tube.

The water thus forced into tube 3 fills the chamber below the diaphragm and, as it rises in 3, tends to counterbalance the water in tube 2. When it reaches about the middle point of 3 it has balanced half of the water column in 2, and the spring then has sufficient stiffness to lift the valve against the weight (2 pounds) of the upper half column in 2. As the steam pressure acts on both sides of the diaphragm it balances itself and can be neglected.

As soon as the valve opens the boiling water has access to the feed pump, and the latter ceases to work.

When the level in the boiler falls below the top of horizontal pipe, *I*, steam blows through into tube 3 and tends to drive out the water in it through the open needle valve. As soon as the level in 3 is in this manner lowered some six inches the weight of the water column in 2 becomes too great for the spring, *C*, to withstand, and the valve, *N*, is closed till the water level in the boiler rises above the entrance to pipe, *I*, when the same operation is repeated.

The regulator, as at present constructed, is from 15 to 24 inches in height over all, and when this height can be obtained below the water line of the boiler, pipe 1 is not needed.

It can be readily seen that the stopping and starting of the feed pump is thus dependent upon a variation of level in the boiler of about 1/4 inch, or just enough difference to cover and uncover the mouth of pipe, *I*. As the apparatus has no moving parts except the needle valve, and as this is protected by a filter, it cannot ordinarily get out of order, but is continuously automatic in its action. The inventor informs us it has been in successful use for some time and has given entire satisfaction.

The Chicago Automobile Show seems to be doing what such an exhibition should do. The Jefferys have received seventeen orders since the

Show began; the makers of the Elmore carriage have received fifty orders. Many of the manufacturers have not exhibited simply because they cannot take orders. The Show was certainly a great success. There were many buyers, and hundreds of agents who were willing to give orders and to pay cash for automobiles if they could but get the agency.

AUTOMOBILE NOVELTIES.

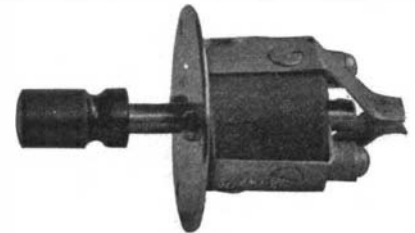
THE ELDREDGE VOLTMETER AND BATTERY SWITCH.—These are shown in the annexed illustrations and they will be found very useful by almost all automobilists. The voltmeter, besides being conveniently constructed in the shape and size of a watch, is an accurate instru-



BATTERY-TESTING VOLTMETER.

ment, and can be used in testing both primary and storage batteries.

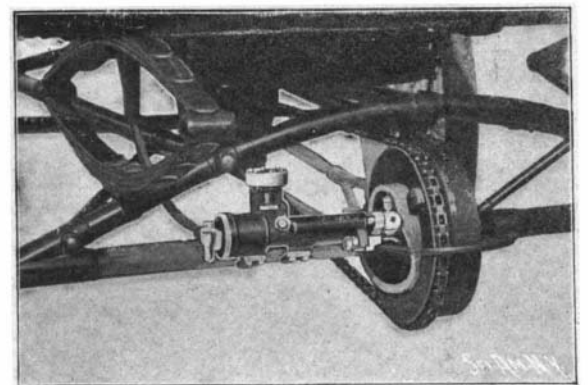
The plug switch is intended for gasoline vehicles, where it is inserted in the ignition circuit. The two wires of the circuit are fastened to binding screws on



PLUG SWITCH FOR IGNITION CIRCUIT.

the two flanges at the back, and the pin makes a connection between the two when it is pressed all the way in. When partially withdrawn, as shown in the cut, the pin is held in place by a concealed spring. The pin can be entirely withdrawn and placed by the operator in his pocket, when he leaves the vehicle, thus preventing it from being tampered with during his absence.

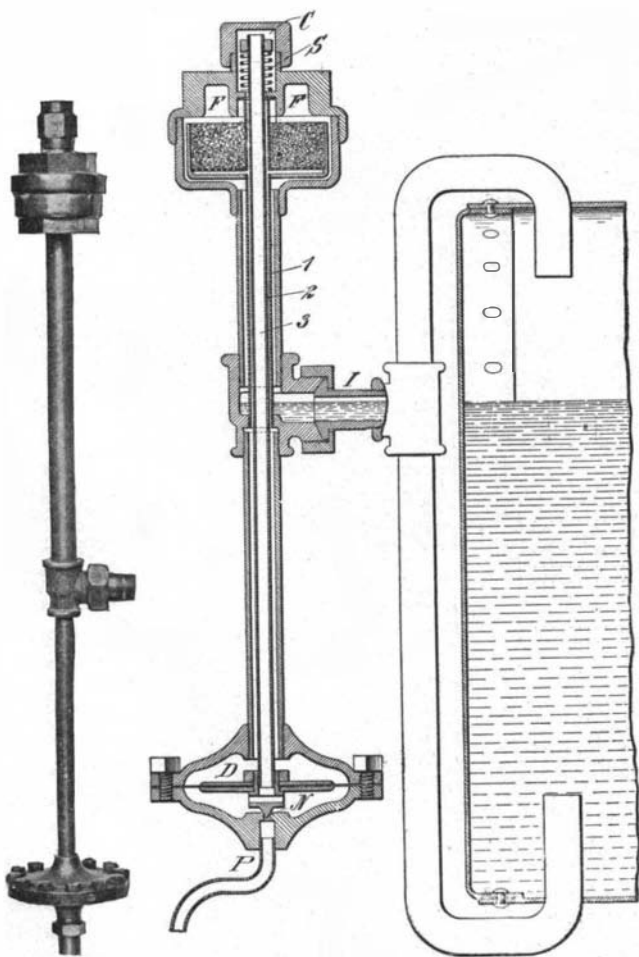
THE REASON AUTOMATIC AIR PUMP.—This is a slow running pump intended to be attached to the back axle of a steam carriage for the purpose of always keeping up the pressure in the air tank. It is entirely auto-



THE REASON AUTOMATIC AIR PUMP FOR STEAM CARRIAGES.

matic and can be set to start and stop at any desired pressure from 5 to 80 pounds. It can also be connected so as to be started and stopped from the seat when the operator so desires. The pump is driven by a cam attached to the side of the differential gear, as shown in the illustration.

In a recent lecture in Glasgow, J. D. Dunlop had something to say of the part taken by Americans in developing the automobile. "Strange to say," Mr. Dunlop remarked, "the Americans, who are such a go-ahead people, made little headway in the manufacture of petrol cars. They have, I think, been too original, and left the beaten track too far. They devoted a great deal of time and energy to the development of the electric car, which has not proved a commercial success; it is admitted, however, that they brought the steam car to a high degree of perfection. They have now returned to the beaten track, and are making considerable progress with the more commercial petrol car."



THE CURTIS WATER-LEVEL REGULATOR—GENERAL VIEW AND CROSS SECTION.