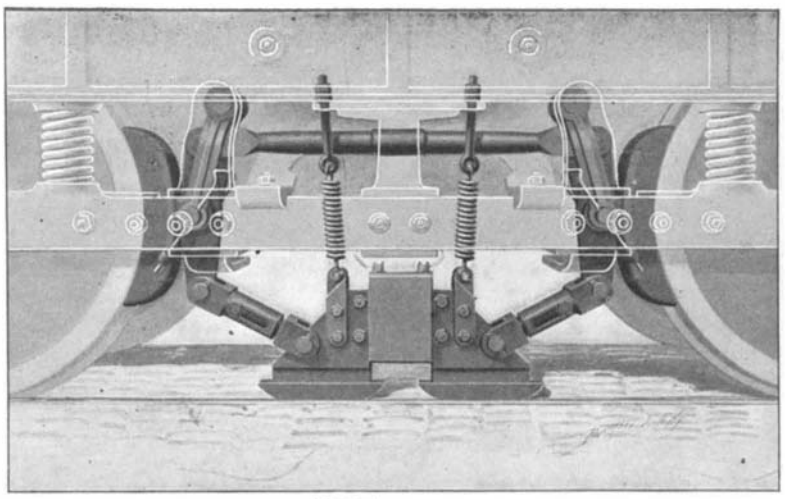
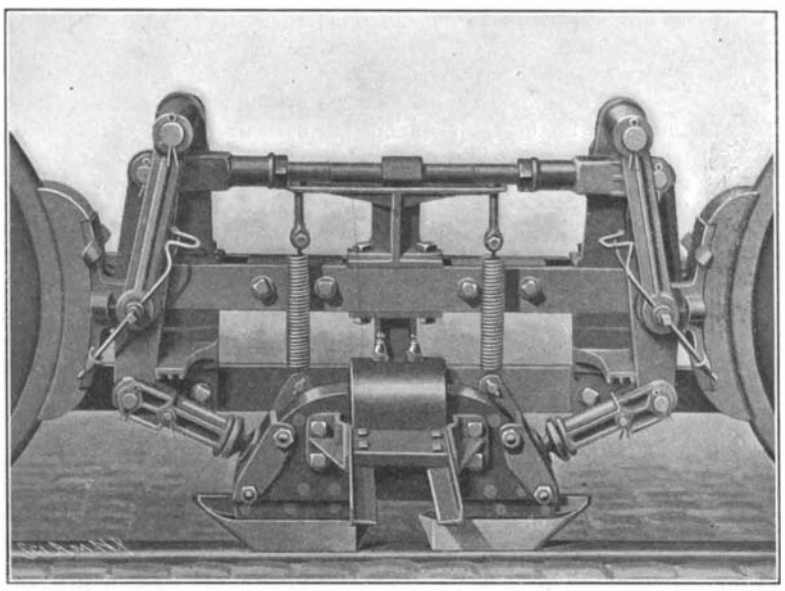
THE WESTINGHOUSE ELECTRIC BRAKE AND HEATER.

The subject of power brakes for street cars is attracting considerable attention, and it is probable that in the course of time city and town ordinances will require their use. The Newell electric brake, which we illustrate, is made by the Westinghouse Company, of Pittsburg. The apparatus consists of two elements, one a brake and the other a heater. The brake may be installed upon the cars independently, but the heater is dependent upon the use of the brake. The brake proper, which is shown in our transparent view, consists of a double track shoe, combined with a powerful electro-magnet, which when energized by the power motors, acting as generators, is strongly attracted to the rail by magnetic force. Brake heads and brake shoes of the ordinary type act directly on the wheel and constitute a wheel brake of maximum power and efficiency. There are also sundry castings and forgings for simultaneously transmitting a downward pull and resultant drag of the magnetic track brake into lateral pressure upon the wheels. The brake can, of course, be applied to a single or a double truck car. In addition to the truck equipment, whether single or double, a complete brake includes brake-controller attachments to use when the motor controllers are not provided with braking points, and a diverter or improved form of rheostat for dissipating the heat generated by any excess of current over and above that required to operate the brake when the heaters are not in service. Our transparent engraving shows the method of attaching the brake-rigging to the truck, and of suspending the brake shoes and magnetic frames directly over the track. When the brake is not in operation the suspension springs carry the track magnets and shoes entirely clear of the rails, and by reason of their flexibility they permit the shoes to ride over or clear any obstruction which is not sufficient in itself to cause the car to stop. When the brake is operated through the saturation of the magnets by current supplied by the car motors, acting as generators, the track shoes are so strongly attracted to the rails that three distinct results are produced. First, a noticeable increase in the pressure of the wheels on the track takes place, because of the downward pull of the magnets; second, there is a pronounced retardation by reason of the friction generated between the track shoes and the rails; and third, there is a maximum braking effect on the wheels obtained through the transmission of the resultant drag of the track shoes to the brake shoes by means of the mechanism provided for that purpose. It is obvious that the net result of these three effects combined represents a much higher braking power than can be obtained by the use of any other brake without skidding wheels; moreover, the feature of the powerful track brake which, instead of decreasing the weight upon the rails at the wheels, increases it, is as unique as it is valuable.

Our second engraving shows the brake from a point midway between the trucks, illustrating clearly the arrangement of the hangers, rods, etc., inside the truck-frames. The thrust against the wheel brake shoes, caused by the drag or frictional resistance between the track shoes and the rail, is similar in its effects to the thrust obtained from the expansive force of compressed air acting upon the brake cylinder piston in the well-known air brake, but the magnetic brake has the advantage that the brake shoe pressure is automatically regulated by the condition of the rail surface. This is a fortunate feature which results in securing the highest possible braking power at all times without danger of the wheel sliding. The track magnets are energized by current obtained from the car motors themselves acting as generators. This not only obviates any expense in that connection, but also effectually prevents the possibility of accident through sudden failure of the line current. The current necessary for the required magnetization is uniformly kept within safe limits by a proper adjustment of resistance always in circuit with the brakes, thus avoiding any injurious effect on the motors.



MAGNETIC BRAKE SHOWING METHOD OF ATTACHING BRAKE TO CAR FRAME.



VIEW OF BRAKE FROM UNDER CAR.

An additional advantage gained by the use of the magnetic brake is found by employing the improved form of rheostat, or diverter, previously mentioned, which has a constant resistance regardless of the heating produced by a continuous flow of current, in the automatic control of speed down long and steep grades. This result, owing to the fact that a certain resistance in the rheostat, insures a fixed current flow at a given speed; and this resistance can be readily adjusted so as to permit just enough current to pass through the track-shoe magnets to hold the car at the required speed, against the action of gravity, on any grade; any increase in speed increases the current and causes the brakes to act with greater force, while a decrease in speed instantly decreases the current and the brake action at the same time, so that the speed of a car may be automatically regulated within narrow limits regardless of changes in the gradient.

The brake can be readily applied to trailers by attaching the track magnets and accessories to them and connecting the magnetic coils to the wiring system of the motor cars.

The heating of the electric cars in the winter requires the expenditure of considerable power and it is quite evident that an electric car heater, occupying no valuable space, easily controlled and costing nothing to operate, will prove equally satisfactory both to street railway companies and their patrons. In the system which we are describing, the heaters are installed underneath and along the front of the seats. They are connected with the general system of wiring by means of a suitably arranged switch so constructed that the braking and starting currents, both of which are used for heating the car in cold weather, may be divided as desired and the whole or any portion thereof sent through the heaters, the remainder going through the proper portion of the diverter beneath the car. The ordinary car heaters with which the heat is generated by the line current have so much storage capacity that they are cooled to atmospheric temperature very quickly, when for any reason the current is interrupted. With the electric heater there is a great capacity to store and retain heat within its mass. In the event of blockades, or the failure of the line current from any cause, this heat-storage capacity is so great that the car is kept comfortable for an hour or more, even in severe weather. The operation of the heater is dependent upon the use of the brake and the heat produced is derived from energy which would otherwise be wasted. This brake and heater have been in practical use in Pittsburg and the results have been highly satisfactory.

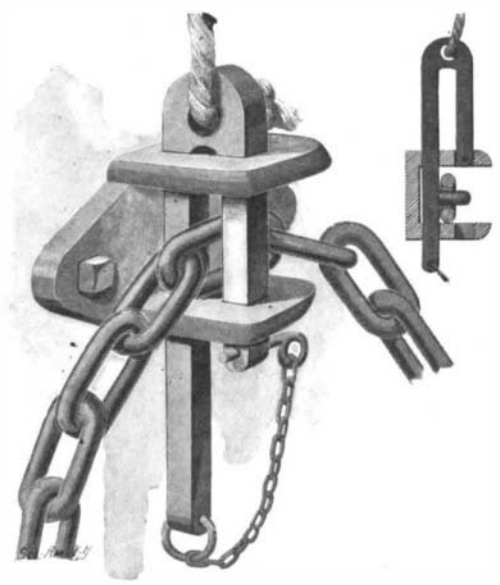
FOG STUDY FROM MOUNT TAMALPAIS, CALIFORNIA, FROM THE OBSERVATORY.

FOG STUDY FROM MOUNT TAMALPAIS, CALIFORNIA.

FOG STUDIES ON MOUNT TAMALPAIS, CALIFORNIA.

Some very interesting studies on fogs have been conducted on Mount Tamalpais by A. G. McAdie, forecast official of the United States Weather Bureau. On the coast of California there is a city, San Francisco, justly famed for the abnormalities of its climate. Overcoats and heavy wraps are worn in midsummer and lilies bloom in December. From May to September almost no rain falls, but during this period, with clock-like regularity, great banks of fog float in every afternoon and cover the bare brown hills. Day after day the inhabitants walk about under a sediment of water vapor, knowing that 1,500 feet above the air is clear and 20 to 30 degrees warmer. The Monthly Weather Review justly says that it is an ideal locality in which to study the formation of the cloud, the birth of the cloud, and to note the shifting strata at the bottom of the atmospheric

sea. Like an immense blanket the fog is drawn through the Golden Gate. Below the blanket all is gray and dreary; above, all is sunshine and delightful weather. The topography of the district is remarkable because of the close juxtaposition of the ocean, bay, mountain and foothills. The valley, level as a table, is 450 miles long and 50 miles wide, having afternoon temperatures of a hundred degrees or over and is connected by a narrow water passage with the



A SIMPLE CHAIN-STOPPER.

Pacific Ocean; the mean temperature of the water in this locality is 55 degrees. Thus within a distance of 50 miles in a horizontal direction there is frequently a difference of 50 degrees in temperature, where in a vertical direction there is often a difference of 30 degrees in an elevation of half a mile. Wherever the fog impinges on a condensing surface water trickles down, one side of the street is wet, the other dry. Under the trees, in the redwood canyons of the slopes of Tamalpais, the drifting fog after touching the leaves falls gently to the ground. A few hours earlier this water was in the Pacific; as vapor it traveled perhaps 1,000 feet upward. Then settling and chilled by the cold water surface it was carried inland as fog, and meeting in the leaf a modest but efficient rainmaker, turns to water and flows in part into the sea.

An attempt has been made at the Mount Tamalpais station to correlate the surface pressure conditions with fog. There are, however, many different types of fog. The conditions prevailing in winter, when tule fog formed in the great valleys drifts slowly seaward, are quite different from those prevailing in summer, when a sea fog is carried inland. A typical pressure distribution accompanying the sea fog has been recognized. In general a movement southward along the coast of an area of high pressure in summer means fresh northerly winds and high temperatures in the interior of the State, with brisk westerly winds laden with fog on the coast. The mountain, as might be supposed, is the driest station, the mean relative humidity being 59 per cent, while it is 83 per cent at San Francisco. Especially during the summer months is the difference noticeable, and doubtless it is this dryness which causes such an agreeable change of climate to visitors at this season. The average hourly wind velocity seems to increase with elevation, the values for the mountain station far exceeding those of the lower station. The maximum velocities recorded are respectively 9 and 47. We are indebted to Mr. McAdie for the remarkable pictures of fog which we illustrate.

Judging from published reports, the use of second-hand boilers by small manufacturers abroad is practically unrestricted, while the penalties in case of explosion are not severe. A boiler of the class mentioned recently burst in England; its age was unknown, as its history could not be traced, it having passed through several hands and used without any test as to its strength. Owing to defective construction and design it was said to have been safe when new for only 20 pounds per square inch, but was being used at 70 pounds when it blew up. The inspectors found that this latter event was due to carelessness, but fined the parties to blame for it only $10, possibly upon the ground that they didn't intend to do it.

A NOVEL CHAIN-STOPPER.

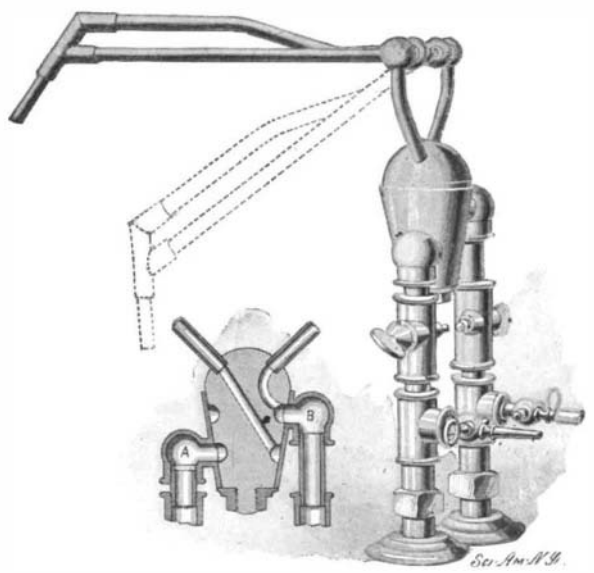
We present herewith an illustration of a simple chain-stopper invented by Mr. Michael A. Drees, of Peshtigo, Wis., by which a chain can be easily and effectively stopped, and which can be readily released, notwithstanding the strain to which the chain may be subjected.

The device comprises a body having oppositely arranged openings. The corresponding openings of the top and bottom lugs are in alignment with each other. These lugs are designed to receive the unequal legs of a stopper-bar. The two legs are connected by an eyepiece through which a rope is passed, whereby the stopper-bar can be withdrawn. The one leg of the stopper-bar is about twice as long as the other, so that when the stopper-bar is withdrawn to open position (see illustration) the shorter leg will be moved out of the space between the lugs. When the stopper-bar is moved to the locked position shown in the general perspective view, both of the legs will lie across the space between the lugs. One end of the chain is attached to the longer leg of this stopper-bar, the other end of the chain being provided with a key which can be inserted in an opening in the end of the shorter leg, so as to lock the stopper-bar in position. Thus locked, the two legs straddle the chain. When the stopper-bar is moved to open position, the chain is released.

AN IMPROVED BLOWPIPE.

The illustration herewith presented pictures a blowpipe invented by John McLoughlin, of 253 Tremont Street, Boston, Mass., and arranged so that it can be quickly and conveniently adjusted to bring the flame to the desired point.

The blowpipe is mounted on a base on which two vertical pipes, *A* and *B*, are secured, the one supplying air and the other gas. Valves in the pipes regulate the flow. The upper ends of the pipes, *A* and *B*, support a valve-casing in which a valve-plug is mounted to turn. The valve-plug, as shown in the smaller figure, is formed with two annular ports, one of which is constantly in register with the air-pipe and the other with the gas pipe. From these ports channels lead to feed-pipes secured to the outer end of the rotatable valve-plug. These pipes are swiveled to pipes



AN IMPROVED BLOWPIPE.

opening into a blow-pipe nozzle. By reason of this construction the swivel connection and rotatable valve-plug form a universal joint, so that the blow-pipe nozzle can be brought into any desired position. The nozzle can be swung up and down, and can be turned with the valve-plug. The universal joint dispenses with the usual rubber-hose.

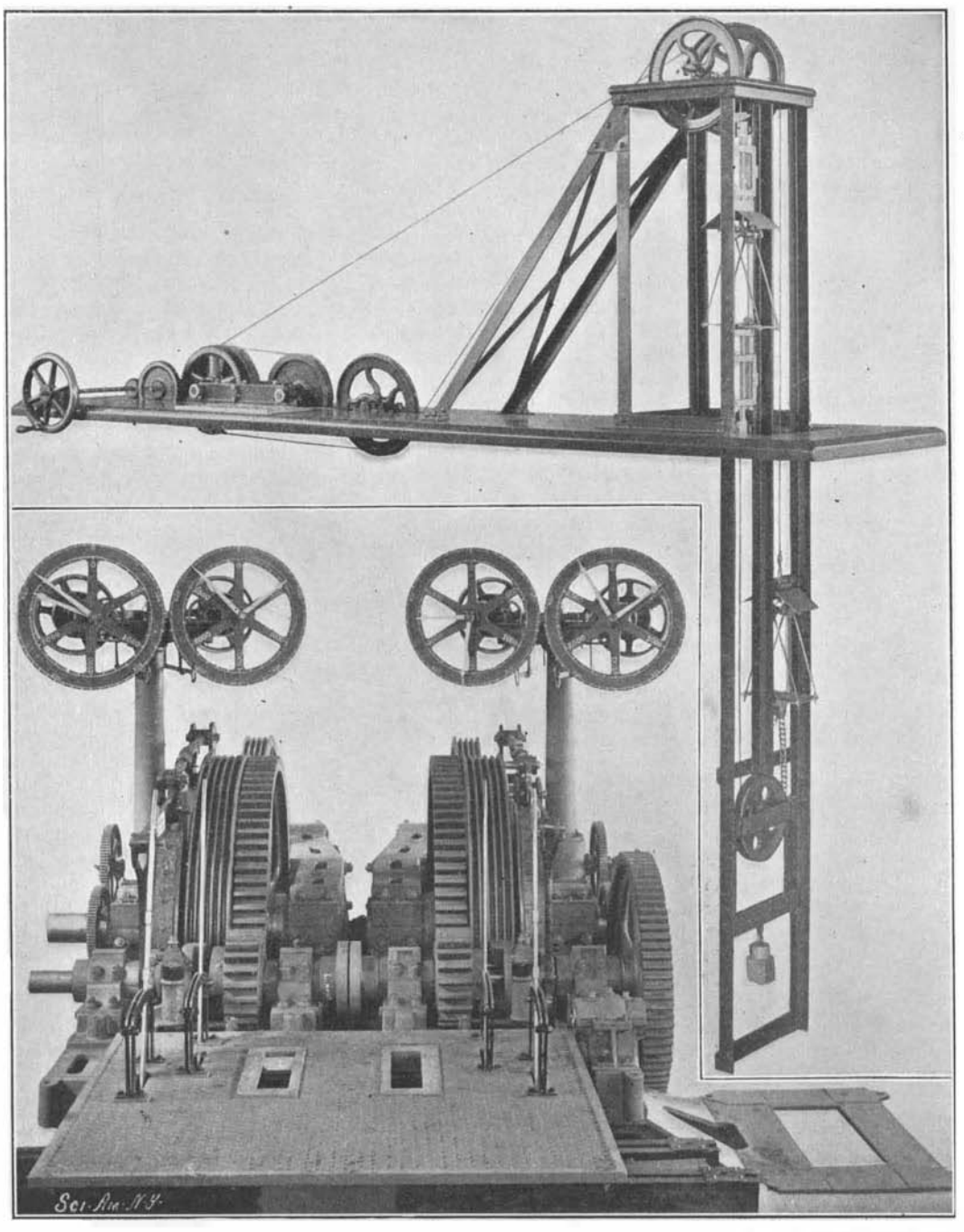
ELECTRIC HOISTS ON THE COMSTOCK.

BY LEON M. HALL.

With the advent of electricity on the Comstock it became necessary to take up the problem of hoisting from considerable depths by means of electrical energy, and after much research and a thorough investigation of the then existing electrical hoisting machinery, it was evident that in order to meet our conditions of service and power, we must procure something radically different from the usual run of such machinery. The writer then, after discussing the matter with the Risdon Iron Works, of San Francisco, decided on the system as described in this article, the ultimate result being the development, installation and successful operation of a continuous rope electric hoist, driven by means of a variable speed, three-phase induction motor.

The power for the Comstock is developed on the Truckee River, at a point near Floriston, thirty-three miles from the mines in Storey County, Nevada. The generating station is equipped with two 750 K. W., three-phase, 60-cycle, Westinghouse generators, and six 300 K. W. oil-cooled transformers. McCormic turbines are used to drive the generators and a close regulation is secured by means of Lombard governors. At the station the potential is raised from 400 volts to 24,000 volts, at which pressure it is transmitted over a double circuit of No. 4 hard-drawn copper wire. At the sub-station, in Virginia City, the potential is reduced to 2,300 volts, and in this form is distributed to the various mining companies. In the case of each hoist but one, namely, that at the C. & C. shaft, it is again reduced to about 450 volts.

The power is purchased of the Truckee River General Electric Company upon a continuous rate basis, the amount being fixed by a peak load of two minutes' duration. Under these conditions it has therefore been the endeavor of the mining companies to secure a hoist that will operate at the highest possible efficiency



Model Showing Method of Operation.

ELECTRIC HOIST INSTALLED ON THE COMSTOCK.