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.

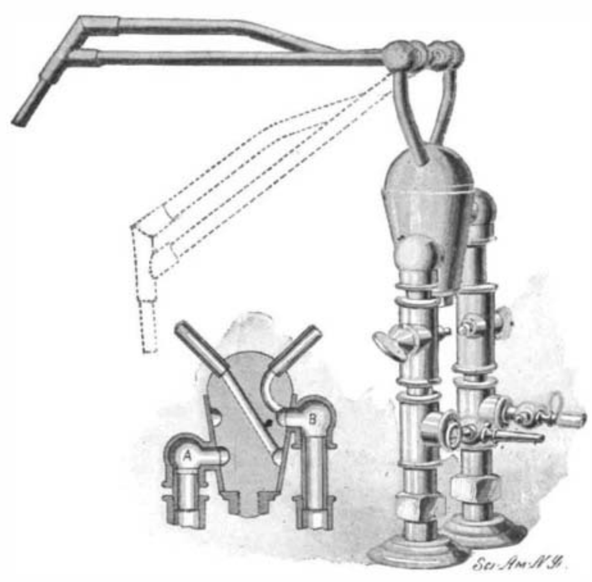
We present herewith an illustration of a simple chain-stopper invented by Mr. Michael A. Drees, of Peshtigo, Wis., by which a chain can be easily and effectively stopped, and which can be readily released, notwithstanding the strain to which the chain may be subjected.

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.

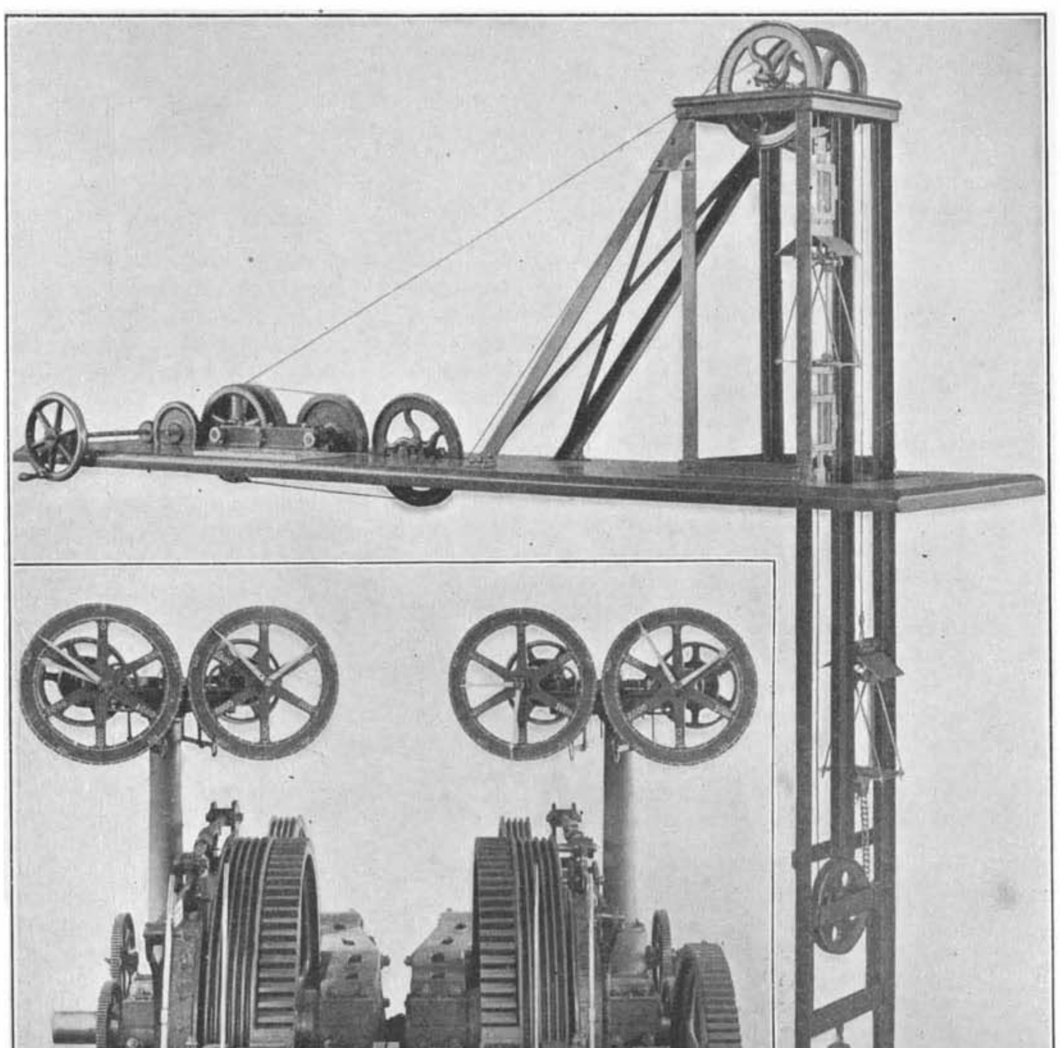
The illustration herewith presented pictures a blowpipe invented by John McLoughlin, of 253 Tremont Street, Boston, Mass., and arranged so that it can be quickly and conveniently adjusted to bring the flame to the desired point.

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.



Model Showing Method of Operation.

ELECTRIC HOIST INSTALLED ON THE COMSTOCK.

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 and at the same time affect the regulation of the general system to as slight a degree as is consistent with good service. To meet the condition of high efficiency, it is evident that the motor should operate continuously at or near its full load capacity and be designed especially for the work it has to perform. For a continuous full load condition, the work must of necessity be constant at all points in the lift, and the nearest possible approach to this was secured by the adoption of the continuous rope or balanced system, where the load is reduced to the weight of the rock alone. Then to secure the necessary variations in speed an induction motor with a non-induction resistance in both primary and secondary was developed. The resistance being varied by the introduction of a modified form of the ordinary street car controller. With an equipment of this kind the cages are started slowly and the dip in line voltage is comparatively slight, being about 7 per cent at starting. By running on the second notch of controller one-third of the maximum speed may be maintained for the full length of the shaft.

The hoist itself, as will be observed in the accompanying photographs, consists essentially of a main driving drum and an idler around which the rope is wrapped four times in order to secure the necessary friction for lifting. From the main driving drum, the rope is carried over the head sheave, down one compartment, under a movable tail sheave, back the second compartment over a second head sheave and on to the driving drum. One cage is inserted between the ends of the cable and the other fastened by means of heavy iron clamps, one above and one below the cage in the adjacent compartment. This simple arrangement allows of varying the relative position of the cages at pleasure and also permits us to use one cage in a single compartment without reference to the other.

The hoist is necessarily a geared machine, the motor speed being reduced by the introduction of cut gearing. To the main drum is attached a brake ring upon which is operated a heavy post brake. This brake is set automatically by means of a heavy weight and is released by hydraulic pressure. In the case of the Yellow Jacket and Belcher, there are two hoists side by side, both being operated by one motor. One of these is intended for the vertical shaft and the other for the incline, which leaves the vertical at the point where the vein intersects it. Double deck cages used in each compartment of the vertical shafts and a two-ton self-dumping giraffe in each compartment of the inclines.

The hoists have been erected in the most substantial manner upon concrete foundations and there is practically no vibration and very little noise.

The Yellow Jacket hoist was a success from the start and was operated for more than a month with a single cage in one compartment. This is the severest test to which the hoist can be subjected, and under these conditions the performance is as near perfection as any hoist I have ever seen. Tests were made during this time and the following are the results:

Weight of cage	1,200	pounds.
" " car	850	"
" " rock	1,600	"
Total weight lifted	3,650	"

Maximum rope speed, 600 feet per minute. Length of vertical lift, 1,175 feet. Time of hoisting, 2 minutes 10 seconds from the moment the load was started until cage was landed on chairs, at the surface. Time to accelerate load, 8 seconds. Power required as per watt meter readings was 88.40 horse power. Theoretical power required, 66.40 horse power. Efficiency of system is therefore about 75 per cent, and this includes motor deficiency and all friction losses from secondary of transformers. Secondary voltage was 525 volts before starting and the running voltage slightly over 500. The maximum current per phase at starting was 180 amperes, and 85 amperes when operating at full load. A reading was also taken while lifting the empty cage at 600 feet per minute and the wattmeter showed 48 horse power. It will therefore be seen that the results obtained are remarkably good, and no trouble should be experienced with a hoist of this character upon any well regulated plant. At a future date I will take pleasure in submitting data when these hoists are operated under balanced conditions. In conclusion, therefore, I will add that the successful operation of this hoist is a decided advance in mine hoisting; not alone in the high efficiency secured, but also in the large capacity as compared with the size of the motor in use. Of course, there are cases to which this system is not adapted, but wherever it is applicable, it is certainly worthy of serious consideration where economical operation is a feature of the development.

All four of the above hoists were built by the Risdon Iron Works, of San Francisco, and that firm publish a pamphlet with controller and torque diagram which will interest anyone interested in mine hoisting. The cut attached is from the experimental model submitted to the writer. All four hoists are built so that the speed can be doubled, using two motors instead of one.

THE MANUFACTURE OF BLOWN GLASS—LAMP CHIMNEYS.

In an article published in the SCIENTIFIC AMERICAN of May 18, 1901, we described the manufacture of plate glass as carried out at the Charleroi Works of the Pittsburg Plate Glass Company. The present article is devoted to the description of another great branch of the glass industry, known generically as blown glass. We saw that in the manufacture of plate glass, the mixture is first melted, then rolled into plate form on a table and finally ground down to the required thickness and polished. In the blown glass industry, the molten mass is formed into the required shape by an entirely different process, known as "blowing," a process which is nothing more or less than that by which a child forms its soap bubbles by blowing through a pipe upon the bowl of which is a film of soapsuds, the blown bubble in the case of the glass being molded, while hot, to the particular shapes required. Although the forms into which blown glass is worked up are endless, the general methods of manufacture are the same, and a description of any first-class works, such as that of the lamp chimney works of Macbeth-Evans Glass Company at Charleroi, which forms the subject of the present article, is illustrative of the blown glass industry in general.

Perhaps the most important feature in the manufacture of lamp chimneys or, indeed, of any form of glassware, is the mixing of the ingredients. As in the case of plate glass, the body of the mixture consists of a sand which is as nearly pure silica as can be obtained. The sand is quarried from silica rock, then thoroughly ground and sifted through a 40-mesh screen, the material being received at the works in the prepared condition. The second most important ingredient is litharge; while potash and soda are used as fluxes. When the above mixture is used for the best quality of lamp chimneys, about 50 per cent of the total is silica. The sand is melted in what is known as the "furnace," a large conical structure which is fired by gas from beneath and contains some 14 to 16 large melting pots, which are molded from a specially prepared and very carefully kneaded pot-clay. The melting pots are generally 44 inches in their largest diameter, and 50 inches in height. They are arranged in a circle within the furnace, each one opposite a door of the kind shown in our illustration. It takes twenty-four hours to melt the contents of a pot of the size just described. Ordinarily the contents are made up of part of the prepared mixture and part "cullett," i. e., glass left over from previous days of operations.

The blowing is done with a long iron tube, known as the blow-pipe, which has a mouth-piece at one end, and is swelled out and thickened into a bell-mouth form at the lower end. In the process of blowing, the operator dips the thickened end into the melting pot and twists it around until it has gathered up a ball of molten glass of the desired size. The blow-pipe is then withdrawn from the furnace and the ball of glass is rolled out to a conical shape on a plate and slightly inflated by blowing through the tube. The blow-pipe is then handed to the second operator, who completes the operation of blowing. The bubble, if we may so call it, of glass, is thicker and heavier at its lower end, and to secure the elongated form necessary in lamp chimneys the operator swings the blow-pipe to and fro, thus causing the bubble to stretch by its own weight. By thus alternately swinging and blowing he brings the bubble to the required length, and approximately to the required diameter, and then places it within a hinged mold, which is opened to receive it, either by himself or one of his assistants. He then twists the pipe and blows at the same time, thus pressing the glass against the inner walls of the mold. The tube with the molded chimney attached is then withdrawn from the mold, and handed to another operator, who, with a pair of spring tongs, forms the flaring top of the lamp chimney and marks a sharp depression just outside its base where it is to be broken away from the blow-pipe. Although a large amount of blowing is done by hand and mouth, increasing use is being made of what is known as the Owens Blowing Machine, which substitutes mechanical for hand power. This consists of a vertical stand, at the base of which is a circular table, carrying half a dozen of the hinged molds already referred to. After the first operator has blown and elongated the ball of glass to the desired shape, the blow-pipes are placed in the mold, with the upper end of the tubes secured in a clamp near the top of the stand. To each of the tubes is connected a rubber hose, which is supplied with air from a small air-pump located on and forming a part of the machine. The table with its blow-pipes is rotated and air pressure is applied through the hose, half a dozen chimneys being thus blown and molded at the same time.

The chimneys are next carried to the annealing furnace. This is constructed with a metallic belt conveyer, that passes through the furnace from end to end. The chimneys are piled up thickly upon this belt and carried through the furnace. The conveyer moves sufficiently slowly to subject each chimney to the heat of the furnace for from 12 to 24 hours. After annealing the chimney is cut down to length. This cutting is done by rotating the chimney horizontally above two fine transverse slits, through which a thin stream of hot air impinges on the glass at the point where it is to be cut through. The strain set up by this local heating is sufficient to enable the girl who attends the machine to break off the ends with a slight bending pressure. The chimney ends, after cutting, are sharp and rough, and it is necessary to give them the proper finish. The mouth of the chimney is smoothed by "glazing," which is done by exposing it to the blast of a small gas-fired furnace until fusion of the edge takes place, the result being the smooth, rounded edge which characterizes the lamp chimney. In the case of chimneys with crimped edges, the crimping is done in a special machine which slightly flares and crimps the edges at one operation. The base is squared and smoothed down by grinding it upon a circular, rotating, cast-iron table, whose surface is covered with sand and water. The lamp chimneys are stood on end in small pockets formed in smaller disks, answering to the "runners" of a plate-glass grinding machine, and are loaded with weights to give the proper pressure. After they have been ground they are taken to a stamping machine, where the maker's name is stamped on with a hydrofluoric acid preparation known as "white acid."

The chimneys are next taken to the labeling and packing room, where they are labeled, wrapped in paper, placed in separate cardboard boxes, and finally delivered to the packers. Such chimneys as are not shipped in boxes are packed loose with straw carefully worked around them. This packing is so successful that shipments of chimneys to such distant points as Africa and Australia reach their destination with practically no breakage.

Electrical Notes.

A line of electrically-operated canal boats running between Toledo and Cincinnati will probably be started in a short time.

A Berlin tramway company offers prizes of $750 and $375 respectively for the best speed indicators suitable for use on their cars. An additional royalty will be paid to the owner of the successful instrument. Those of our readers who desire further particulars are recommended to address Die Direktion der Grossen Berliner Strassenbahn, 218 Friedrichstrasse, Berlin, S. W., Germany.

The Cunard ocean liner "Lucania" has been fitted with the Marconi instruments, and messages have been successfully transmitted from the vessel to Holyhead, and communication was kept up until the vessel was 20 miles from shore. The New York Herald is installing a station at Nantucket lightship. It will then be possible to receive messages from an incoming vessel twelve hours before she is sighted off Sandy Hook.

The London County Council has at last decided upon the scope and approximate cost of its scheme for converting the existing horse tramways of the British metropolis to electric traction. It proposes to construct several new lines, and to carry out great extensions in addition to converting the tramways already in use. The cost of the enterprise is estimated at over $10,000,000. The scheme applies to the tramways throughout the whole county of London, and is to be partly shared by the local authorities of the various suburbs. Several street widenings and other improvements are embraced in this proposal, but the estimate does not include the cost of erecting the generating stations for the supply of the electricity. The conversion will be carried out simultaneously throughout the entire city, immediately Parliamentary sanction is obtained, so that before long London will be in possession of an up-to-date electric tramway system with all the latest improvements.

The conversion of the Underground Railway to electricity is to be proceeded with apace. Mr. Yerkes and his syndicate are to undertake the work. They propose to carry through the scheme without interrupting the traffic. When it is understood that there are twenty trains running in each direction every hour it will be recognized that Mr. Yerkes' task is by no means a light one. The syndicate proposes to erect a generating station to carry out the necessary alterations, and to supply new rolling stock at cost price. The contract is to be fulfilled within two years of Parliamentary sanction. The syndicate will get $2,500,000 worth of ordinary stock at the nominal price of 25 per cent and $830,000 worth of debenture stock, which carries 4 per cent at par, and 5 per cent on the outlay. The contract will not be placed in the hands of one electrical firm, but the various details will be purchased in the cheapest markets. Mr. Yerkes has also announced that everything will be purchased from English firms, and he will not come to this country for any material unless it is not obtainable in the home market.