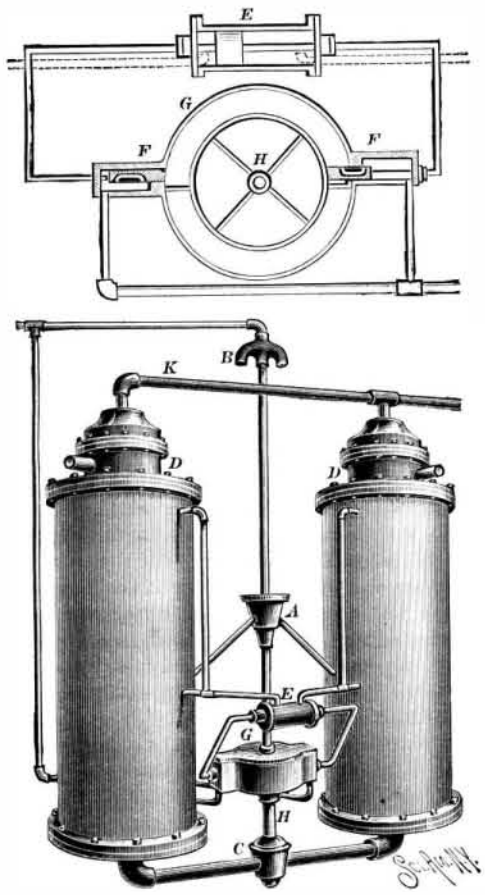
AN HYDRAULIC AIR COMPRESSOR.

The illustration represents an air compressor which is automatic in operation, and designed to utilize the force of the water with the greatest advantage directly on the air to be compressed. It has been patented by Messrs. John H. Henderson and Emile Schutz, of Sierra City, Cal. It has two vertically arranged cylinders connected with pipes leading to a valve, A, the valve plug of which alternately connects with the ends of each pipe. The upper end of the valve plug also connects at all times with a pipe leading upward into a nozzle, B, arranged to draw in air and water for charging the cylinders. Into the top of the nozzle discharges a conical spout from a water supply pipe connected with a suitable source of supply, the arrangement being such that the force of the water sucks in air through valves in the side arms of the nozzle, and both water and air pass down into the valve, A, and thence into one or the other of the main cylinders. The lower ends of these cylinders have water discharge pipes leading to a valve, C, the valve plug of which has an L shaped opening adapted to alternately connect with the pipe from either cylinder, and this valve plug is on a hollow stem, H, a solid upper extension of which carries the valve, A, so that both valves are operated simultaneously, and when one cylinder is filling with water and air, the other is discharging its water.

At the upper end of the main cylinders are auxiliary cylinders, D, containing pistons, and having in their walls ports to alternately connect or disconnect with downwardly extending pipes opening into opposite



HENDERSON AND SCHUTZ'S AIR COMPRESSOR.

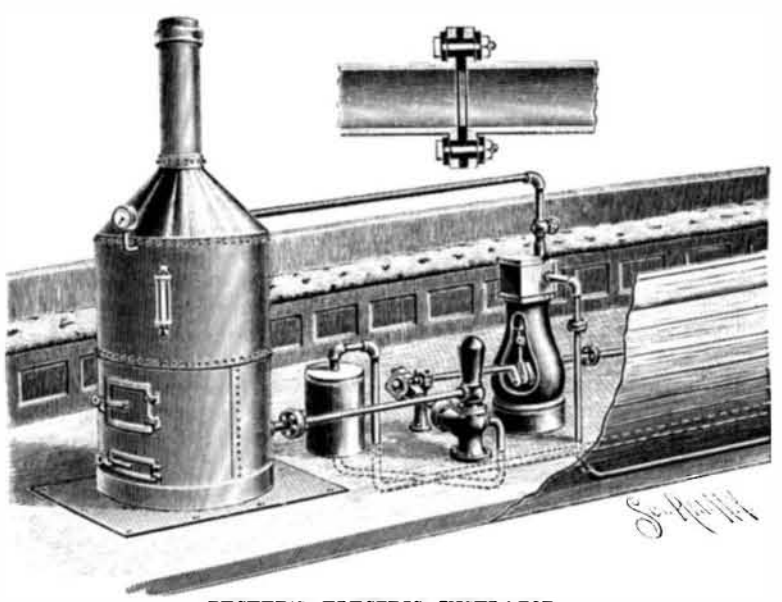
ends of the horizontal cylinder, E, located between the two main cylinders, and shown also in the sectional plan view. In this cylinder is a piston held on oppositely extending U shaped piston rods carrying valves in water chests, F, connected by branch pipes with the water supply pipe, and also with the cylinder, G, on the central valve stem, H. In the cylinder, G, is a water wheel mounted to revolve, and having on its rim a port leading to an opening in the hollow valve stem, H, whereby water is discharged from the cylinder, water from the cylinder, E, being discharged by valved branch pipes to the main cylinders near their lower ends. In the pistons in the auxiliary cylinders, D, are floating ball valves, allowing the escape of compressed air into the cap connected by the pipe, K, with a compressed air reservoir, the valves closing to prevent the escape of air and water as the cylinder is nearly filled. In operation, the air and water flow into one cylinder until it is almost filled, the lifting of the piston in the auxiliary cylinder, when the float valve closes, allowing the water to flow from the main cylinder to the cylinder, E, to act on its piston and move the valve in the water chest, F, establishing communication with the cylinder, G, whereby the central valve stem is turned and the position of the upper and lower valves changed. The water in the cylinder which had been filled then discharges, while water and air accumulate in the other cylinder. A modified form of the improvement is provided for use in case the water has not sufficient fall and pressure to counterbalance the required pressure of air per square inch.

Large Electric Mining Plant.

One of the largest electric mining plants yet installed in the United States has been put in the Virginia group of mines near Ouray, Colo. The water power plant is located nearly four miles from the mines, and consists of a small duct from which an iron pipe is extended a distance of about 4,000 feet along the side of the cañon, producing an effective head of 485 feet. Two Pelton water wheels, one 5 feet and the other 6 feet in diameter, are used, capable of developing 500 horse power and 720 horse power respectively, or a total of 1,220 horse power. The wheels are connected independently, so that the entire station may be run with either one. The electric generating plant consists of one 100 kilowatts and two 60 kilowatts Edison dynamos, giving a total output of 295 electrical horse power. The machinery, which is operated by this current at the mines, consists of one pump of 60 horse power capacity and another of 25 horse power, one 25 horse power hoisting machine, two 60 horse power Edison motors running stamp and concentrators, and one 15 horse power blower. The hoisting engine is an Edison motor of standard type, the winding and controlling switch being the same as used on street cars. This motor is geared to the drum through a friction clutch. Coal at the mines, it is stated, costs $18 per ton, and before this plant was put in the power cost the mining company nearly $40,000 per annum, and they are expecting by the use of this system to practically do away with this expense.

AN ELECTRIC INSULATOR FOR BOILERS AND CONDENSERS.

An extremely simple and inexpensive insulating appliance, for use in connection with all kinds of boilers and condensers, is shown in the illustration. The improvement forms the subject of two patents issued to Mr. Peter Decker, of 53 West Avenue, Norwalk, Conn. As applied to land and marine boilers, the appliance prevents the excessive oxidation of the interior parts of the boiler by electrolytic action resulting from currents of electricity pervading the water and generated by friction of working parts of the engine, an electric circuit being established between the boiler and engine through the steam pipe and feed water pipe. This difficulty is obviated by the introduction in one of the pipes of the electrical insulator, shown in detail in the sectional view. The pipe is divided into two parts, and at the opposing ends is provided with a radial flange on each terminal, the flanges being perforated for the reception of securing bolts. A washer is introduced between the flanges, made of any good non-conductor that will constitute a water-tight joint, and around each of the bolts is a sleeve, there being washers between the flanges and bolt heads and nuts, and the sleeves and washers being formed of non-conducting material. In the application of the improvement in connection with condensers, the condensing apparatus shown is a tubular conduit extending from the steam chest of the engine around the keel and terminating in a connection with the hot well, from which the condensed water is pumped back into the boiler. The rapid oxidation of exposed iron portions of the shaft, propeller wheel and fittings is frequently caused by galvanic action from the exposure to salt water of the copper condensing tube, which is in direct electrical circuit with these parts and to obviate this difficulty the insulator is inserted between adjacent portions of the exhaust steam pipe and the copper condensing tube. The manner of connecting the pipes is not limited to the exact form shown, and the place where the insulating joint should be inserted will vary with different engines and according to the disposition of the connected parts.



DECKER'S ELECTRIC INSULATOR.

The New Star in Auriga.

Dr. William Huggins in a recent lecture on the above subject said that an object glass as wide in diameter as that theater would do less in revealing the nature of the suns around us than has been done by the prism. The latter has revealed much about their motions in space, but picks out alone that part of their motion which is in the direction of the line of sight; notwithstanding this, what with improvements in instruments and the sensitiveness of the gelatine plate, it is now possible to give the motion of the stars referred to our sun.

The new star in Auriga was of about the fifth magnitude, and it remained undiscovered for about five weeks, when it was first observed by Mr. Anderson with a small pocket telescope and a star chart. Photographic records prove that for six years there has, until recently, been no star in that position, but it was found later on in some photographs taken shortly before Mr. Anderson first discovered its existence in December last. In February and March the light of the new star died out with rapidity, and at first with great irregularity. On the 26th of April last it had fallen to about the sixteenth magnitude. It was not a nebulous star to any appreciable extent. In throwing out any suggestion as to the possible cause of the phenomenon, he felt like a blind man treading on red hot plowshares. Possibly two bodies were now moving away from each other in space after a casual meeting, so that there had been a partial grazing rather than direct collision. One of these bodies seemed to consist largely of a cool absorbing gas. The spectroscope revealed the presence of hot and cold hydrogen.

AN IMPROVED SHINGLING GAUGE.

The illustration represents a simple and inexpensive tool, designed to greatly expedite the work of shingling a roof, no other tool but a hatchet being required after the eaves course is laid. The improvement has been patented by Mr. Chancy Avery, Pleasant Lake, Ind. The main portion of the device consists of a single piece of steel, bent to form a bow spring, from which extend two lateral members, the lower one of which is wedge-shaped at its outer end and has an angled portion tapped to receive a screw shank. The upper member is attached to a straight edge made equal in breadth to the weather exposure to be given to the shingles, and of a length convenient to handle, which may be five or six feet, one of the metal pieces being secured to the straight edge near each end. The inner one of the two screws by which the attachment is made to the straight edge has its point projecting slightly below the straight edge, and when the gauge is inserted in position for service, as shown in the illustration, this point is driven into a shingle whereon the straight edge is imposed. The upper and lower members of the metal piece are connected by a screw having on its upper end a crank handle, by rotating which the bow springs are compressed, thus clamping the straight edge upon the row of shingle butts after the wedge portion of the lower member has been fully inserted, the roofer then applying a row of shingles upon the parts of the shingles exposed above the straight edge, the gauge supporting them until they are nailed in place, and the gauges being removed and replaced for laying and securing the successive rows. When a

AVERY'S SHINGLING GAUGE.

long roof is to be shingled an intermediate gauge strip is provided, one of the gauges being then fixed on each outer end of two straight edges whose inner ends are held in alignment with the intermediate gauge strip, the arrangement giving greater length to the device and affording more room for roofers to work in a line. The tool is designed to enable roofers to lay more shingles per day than can be done in the usual way, or one workman may place the shingles in position while another nails them, the gauge supporting the shingles in proper position until they are nailed.