

the lower end of this rod is sleeved into the upper portion of the ratchet rod. This causes the ratchet rod to have a longitudinal motion, moving the ratchet teeth continuously toward the right. The ratchet rod is provided outside of the cylinder, and is provided with a series of ratchet teeth, which are moved longitudinally. Two wheels, which extend with a feather and groove connection in contact with the ratchet teeth and levers, having pins in their ends. Each lever has a vibratory motion, and is oscillated by the alternate energizing and de-energizing of the electro-magnet, thereby imparting motion to its adjacent ratchet teeth, and consequently the circuit closing needle. Each pressure of the push button at the exchange made at the will of the operator, causes, through the channels thus described, the circuit closing needle to move from row to row and from wire to wire, it being understood that both ends of the wire are grounded or connected with a return tap, and also that a battery is used to generate the current. This battery is located at the sub-station between the keys and the ground.

Each perforation of the cylinder is numbered with respect to an initial or starting point on the cylinder. When any conversation is ended the person hangs up his ear phone and presses the release key. This causes the magnets to be energized, attracting the armatures, thereby withdrawing the several pawls from their engagement with the ratchet teeth and allowing the circuit closer to fall and return to its initial point.

The subscriber is never isolated from the exchange. Suppose that two persons are in communication with each other and a third wishes to speak with the first. He can tap the number and make sufficient connection to ring his bell and call his attention to the fact that some one wishes to speak to him, so that the first subscriber can then at will release his instrument from the one with which he is in connection and connect with the third man, or he can continue his own conversation until finished, when upon pressing the release key, he will find himself in communication with the third person. The outside party, however, cannot either speak with the other party or listen to any of the conversation, he can only obtain sufficient connection to ring his bell.

Mr. Linnell claims that there can be no errors in the call, for an arrangement is provided on the instrument of every subscriber so that the number which he calls up is automatically registered on the front of his telephone. If a subscriber calls up No. 100 he sees 100 in plain figures on the face of his instrument, and there can be no question as to whether he is in connection with the right person.

A FEW POINTS ON UNPACKING AND ERECTING.

In unpacking machines and lamps, be very careful, says the *Scientific Machinist*, that packages are never dropped or jarred in any way.

Use special care to avoid dropping anything on to the lamp rods or arc lamps.

Never lay an arc lamp on its side, but set it up in some secure place.

After taking lamps out of boxes, remove the packing blocks, and see that all parts are in proper position and working freely.

In unboxing the dynamo, do not attempt to remove it from the box after simply taking off the cover; but, instead, knock the entire box apart, leaving the machine standing on the bottom piece only. If the armature is shipped in a separate box from the balance of the machine, it will, in most cases, be necessary to use a hoist for the purpose of placing it in position, and great care should be used to avoid scraping or cutting of the shaft wires, or armature bobbins, in dropping the armature into place. Look the machine over thoroughly, and see that everything is in place and all screws tight. Secure the pulley firmly on the shaft.

It is a good plan to run a dynamo idle for a day, or even longer, if possible, following this with several hours' run with only a light load. This load should only be sufficiently heavy to warm up the fields and armature, so as to dry them out thoroughly in case they have become damp during transportation. A little care of this kind before putting the machine into regular service, will avoid trouble at a later stage of the proceedings.

It is very important to locate the machine in a dry place, and

in the case of lighting machines, it may not be necessary to run all of the dynamos for exactly the same length of time. Under such circumstances, a clutch pulley must be provided on the main shaft, which will permit throwing on or off the dynamo which it drives, as such dynamo may be needed or dispensed with.

A light double belt is the most desirable for lighting work. It should never be less than 30 feet long, and should be very pliable. If the belt is new and stiff, it can be softened up by applying neat's foot oil, or belt oil, on the outside.

THE MONTREAL LIGHTING CONTRACT.

Following are the terms upon which a committee of the Montreal City Council has recommended the renewal of the city lighting contract with the Royal Electric Co.: "That the contract for lighting the city of Montreal by electricity be awarded to the Royal Electric Company for a period of ten years from the first of January, 1894, at the following prices. For the first five years at 34 cents per lamp per night, equal to \$124 per year; for the following three years at 33 cents per lamp per night, equal to \$120 per year; for the remainder of the term, two years, at 32 cents per lamp per night, equal to \$116 per year; each lamp to be of 2,000 nominal candle power." The present contract is \$146 per light, and has one more year to run, but in consideration of a renewal the company agrees to reduce the price for the remaining year to \$124 or a total of about \$22,000, which would make an average of \$110.35 per light for the whole term. The company under its present charter has an absolute right to maintain its poles in the streets, but it makes the following concessions: "Should the city at any time during the continuance of the present contract construct conduits for the placing underground of all electrical wires for whatever purposes they may be used, and cause all such electrical wires to be placed in said conduits, the Royal Electric Company shall make use of such conduits for its wires on such terms as may be mutually agreed upon, provided, however, the expense to the company for supplying electric light to the city or to its inhabitants be not thereby made more onerous than if they were to continue to use poles for the purpose; and the company will then remove their poles from the streets, wherein such conduits are constructed without indemnity."

The following are the officers of the Canadian General Electric Co.:—President, W. R. Brock, first vice-president, H. P. Dwight; second vice-president and general manager, Frederic Nicholls; assistant general manager, M. D. Barr; comptroller, Walter S. Andrews; chief engineer, W. M. Rutherford; assistant engineer, H. T. Hartman; purchasing agent, Geo. W. Watts; superintendent Peterboro factory, William S. Andrews; superintendent Hamilton factory, C. S. Stilwell.

I have an idea which, though not new to some, may be of use to others. It is just a little wrinkle in lapping a journal box. When lining up a shaft, put a small piece of pine wood in the bottom of the box, in length about 1½ or 2 inches less than that of the box, and in width ¾ to 1½ inches, according to the size of the box. Equalize it in the bottom from each end, let the shaft lie on it, and pour. After you have scraped out the box, remove the piece of pine and substitute some woollen cloth saturated with oil. This prevents the oil from dripping, and not only insures a more positive lubrication of the journal, but also is clean and requires less oil than other journals. No patent is infringed.

A coating of pulverized chalk is excellent for preventing the packing sticking. A paste of graphite, plumbago, or black lead, as it is variously called, is most excellent. It is the finely pulverized product that is used, and the paste is made with water or some oil, having no gum as kerosene or lard oil or glycerine. Some old-time boilers used to have a steam dome surrounded by a cast iron safety-valve, from which steam is led to the engine. The valve is usually, in such cases, fastened to the dome with cap screws, holes for the same being drilled therein and tapped—the flange of the valve and dome being made steam tight by a rubber gasket between. If the rubber is objectionable, and the iron is wanted to join, a rough joint may be made tight and durable by putting between a cement made of boiled linseed oil with two parts litharge and one part each of fine sand and air-slacked lime mixed to a paste. It dries rapidly and should be screwed down before too stiff. This cement is equally applicable to joints below the water line.