

the molds and finished by the addition of an oak top. Fig. 3 shows the construction of the carrier foundation. Concrete foundations are made in long boxes holding 18 molds each. There are two standard sizes, 11 in. wide and 16 in. wide, the latter carrying from three to six carriers. The size of the oak top is varied according to the number of carriers. When larger than six way carriers are needed, two 11-in. foundations, an 11-in. and 16-in. or two 16-in. foundations, as the case requires, are placed side by side, and a single oak top is placed over both, each foundation being of the same height and thickness. Two $\frac{1}{2}$ -in. x 14-in. bolts are used for carrier foundations. The threaded end of the bolt projects downward through the bottom plank of the mold far enough to be of the length necessary to hold the oak top. The concrete for all foundations is made of three parts of stone, two of sand, and one of imported Portland cement. The 11-in. foundation costs 45 cents, and the 16-in. 50 cents.

Our first iron pole erected was at Jackson, in the summer of 1885. This pole, for two arms, is made of four $1\frac{1}{2}$ -in. pipes kept in position by cast-iron braces. The braces, base casting, and bearings for the semaphore arms, are held rigidly in place by babbitt metal. The opening in the collars of castings through which the pipe passes is $\frac{1}{2}$ in. larger in diameter than the pipe, and this space is filled with babbitt metal. The base casting rests on a concrete foundation and is held in position by four 1-in. bolts. The single arm pole costs \$42 and the double arm \$54.

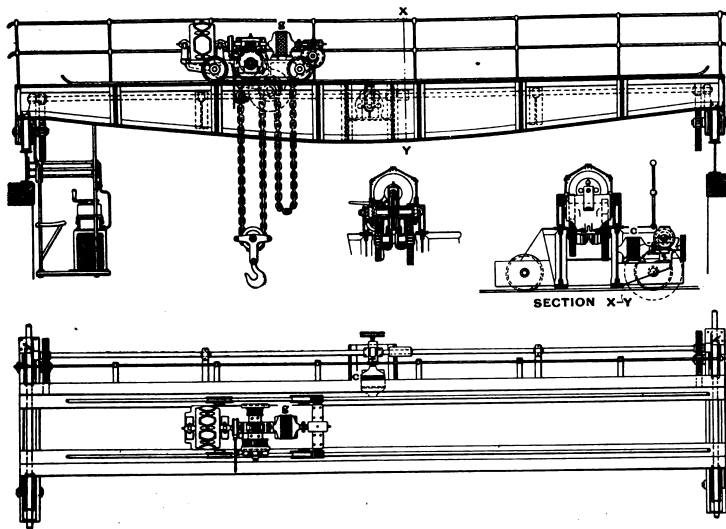
Another design of poles, Fig. 6, was erected at Marshall this summer. The pole consists of a single column of pipe made in three sections, which consist of six, five, and four-inch wrought iron pipe, respectively, the sections of pipe being held together by swedged joints. Both upper and lower castings are held in place by babbitt metal. The balance lever casting *B* being made in the form of a divided collar, is clamped to the post. A sheet iron casing, 12 in. in diameter, is placed around the base of the pole and the space between the casing and pole is filled with concrete. This concrete extends above the surface of the ground and prevents the base of the pole rusting. Both designs of poles in use are very neat in appearance, and should be very durable, but as the single pipe post can be made for \$10 less than the four-pipe post, it is naturally preferred.

I have attempted in this article to speak of that part of the practice of the Michigan Central that is not common practice. Of course, some of the methods and devices spoken of here were used on other roads before being adopted by the Michigan Central; but, as a great many roads use different methods, I felt that a statement regarding the reason for our practice was advisable, with the hope of determining from a subsequent discussion of the matter, what the best practice should be.

An Electric Traveler with Three-Phase Motors.

Three-phase current electric motors, built by the Oerlikon Works, Switzerland, are used for the operation of the famous machine shops of Escher, Wyss & Co., at Zurich. Power is transmitted to them 11 miles. 24 motors, aggregating 420 H. P. drive tools, ventilators, movable drills, etc., 38 motors aggregating 250 H. P. operate lifting apparatus of all kinds, among them five 30-ton, eight 10-ton and seven 5-ton cranes. To provide for a break down of the line a steam generator has been installed capable of driving the more important tools, etc.

A report on this installation in the *Z. d. Oesterr. Ing.*



An Electric Traveler, with Three-Phase Motors.

& Arch. V. contains some data regarding the use of three-phase motors on traveling cranes in shops. Ready subdivision is the great boon of the employment of electric power. It is, therefore, considered bad practice to install only one motor for the three directions of motion of the traveler. It would needlessly complicate the mechanism, and diminish the ease of maneuvering the traveler. The motor would be worked part of the time, during longitudinal and transverse motions at only $\frac{1}{3}$ its capacity, and consequently at a low average efficiency.

The Oerlikon Works install one separate motor for each direction of motion, equipping, for instance, a 20-ton crane with one motor 18 H. P. for lifting, one motor $4\frac{1}{2}$ H. P. for transverse motion, one motor 9 H. P. for longitudinal motion. The motors are controlled from a

suspended stand; they are started and reversed by one combination switch for each one. Resistances for speed regulation are not used. The motors have two distinct speeds which are as 1 : 2, sufficient for all practical purposes. The motors are running at about 1,000 revolutions per minute. The reduction of speed is effected by gear-wheels or worm gear. Worm gear and motor are connected by an elastic or non-rigid coupling, a friction pulley in the case of the lifting motor, which can be thrown in by the motorman and also by means of a light chain from below.

In the accompanying drawings, which are taken from the French *Revue Industrielle*, *c* indicates the motor for longitudinal motion, *g* the one for transverse motion and the one for lifting.

TECHNICAL.

Manufacturing and Business.

The Virginia Bridge & Iron Co. has incorporated at Richmond, Va., last week, with Samuel Walton, of Tazewell, President; C. Edwin Michael, of Roanoke, Secretary and Treasurer, and Charles C. Wentworth, of Roanoke, Chief Engineer. This company has purchased the plant of and succeeds the American Bridge Co., whose works have been idle since March. The plant will begin operations in two weeks. Some contracts have already been secured.

The Pennsylvania Bolt & Nut Co., Lebanon, is now employing 1,300 men and is doing the largest business in its history. It is building an important extension and adding new machinery.

The Buckeye Malleable Iron & Coupler Co. has just received orders to equip the passenger cars on the new Wellston & Jackson Belt Railroad, in Ohio, which is to be operated by electricity and steam, with the "Little Giant" Buckeye coupler.

The Lowe Bros Co., of Dayton, O., manufacturers of paint, report sales in their railroad department having doubled during the past year, and that the present sales and the outlook for future business are excellent.

The General Railway Equipment Co., incorporated, with office in the Rookery, Chicago, has been formed for the purpose of handling heavy railroad supplies. The company has taken the agency for the Shickle, Harrison & Howard Iron Co., the Pencoyd Iron Co., the Bucyrus Steam Shovel & Dredge Co., the Pioneer Rail Renewing Co., the Wellman Steel Co. and other firms. The officers are Harlow N. Higginbotham, President; James H. Long, Treasurer; Eliphaz W. Cramer, Secretary; and Harry M. Higginbotham, Assistant Secretary.

J. A. Fay & Co., builders of wood-working machinery, Cincinnati, O., report that they are doing an extremely large business in their railroad department, and at present are building machinery for the entire equipment of the Big Four shops at Wabash, Ind., also for the shops

Anderson, DuPuy & Co. have erected an addition to their plant at McKee's Rocks, Pa., for the manufacture of tools, principally for railroad shops and railroad work.

Mayor Elliott and W. H. Loomis, for thirteen years proprietors of the National Paint Works, at Williamsport, Pa., have dissolved partnership, the latter retiring in order to devote his whole time to other business interests.

New Stations and Shops.

The work of re-establishing the Grand Trunk shops at London Ont., which had been removed to Brantford and Toronto, will begin at once. All the car building west of Montreal will be done at London. The shops at Point Edward are to be abandoned.

The Southern Railway has purchased a new site for shops at Alexandria, Va. This fact caused the renewal of the old rumor that the company's shops were to be removed from Manchester, Va., but its officers deny that the shops are to be removed from Manchester, which is just across the river from Richmond. The company will, however, build entirely new shops at Alexandria, and the old shops there will be abandoned.

The Chester & Lenoir road, operating between Lenoir, N. C., and Chester, S. C., will soon establish shops at Lenoir, N. C. The town offered a site for the shops some time ago and the officers have decided to accept the offer, it is stated, and will soon do so formally.

Iron and Steel.

The Tennessee Coal, Iron & Railroad Company's Osmore Furnace No. 1, with a capacity of 300 tons of iron daily, was blown in last week after an idleness of two years. Two more furnaces at Ensley and Bessemer are also preparing to renew work soon. In an interview President Baxter says that the company sold during August and September 150,000 tons of iron. Inquiries and orders that are now coming in indicate that the demand will soon be greater than ever before.

The Canadian Government is about inviting tenders for 4,000 tons of steel rails; 1,000 tons for the Prince Edward Island division, to be delivered at Summerside; and 3,000 tons for the Inter-Colonial, to be landed at Point Levis, opposite Quebec. Tenders are to be in by December 17. The rails are required for renewals and ordinary repairs.

Tests of Car Wheels.

A series of comparative tests of car wheels was made by the P. H. Griffin Machine Works and the New York Car Wheel Works beginning Nov. 8. These tests consisted in subjecting chilled charcoal iron wheels made from special mixtures to the tests required by the European roads for steel wheels, as follows:

Austrian State Railroad Test.—Wheel placed upright on heavy iron and stone foundation. Weight of 475 lbs. dropped from varying heights, commencing at one meter and increasing by half meters to six meters. Wheel must stand eight blows in all. Tests will be continued until wheel fails.

German State Railroad Test.—Wheel placed horizontally on heavy iron and stone foundation, tapering steel wedge placed in center. Weight of 440 pounds dropped from varying heights, commencing at one and a half meters, and increasing by half meters to four meters. Wheel must stand six blows in succession without breaking.

French State Railroad Test.—Wheel placed upright on heavy iron and stone foundation. Weight of 2,200 lbs. dropped from a height of four and a half meters. Wheel must stand three blows without breaking. Test to be continued until wheel fails.

Master Car Builders' Test.—Wheel placed horizontally on heavy iron and stone foundation. Weight of 140 lb. dropped from a height of twelve feet. Required to stand five blows. Test to be continued until wheel fails.

These tests were made on wheels of the following grades:

Standard quality for American service 33 in., 600 lbs. M. C. B. specifications.

Special quality 30 in. engine truckspoke wheels, Lake Shore & Michigan Southern Railway standard, weighing 500 lbs.

Sp. clal quality 33-in. tender wheels, Lake Shore & Michigan Southern Railway standard, weighing 650 lbs.

Special quality 33 in. truck wheels, Michigan Central Railroad standard for 100-ton locomotive service, weighing 600 lbs.

Special quality 33 in. double plate passenger wheels weighing 750 lbs. M. C. B. specifications.

Special quality 365 millimeter (35-in.) double plate wheel, weighing 800 lbs. Austrian State Railroad specifications.

Special quality 365 millimeter (35-in.) wheel, weighing 820 lbs. Hunzarian State Railroad specifications.

Special quality 1,050 millimeter (42-in.) wheel, weighing 1,075 lbs. French State Railroad specifications.

Special quality 975 millimeter (39-in.) wheel, weighing 810 lbs. German State Railroad specifications.

Spoke wheels for electric service: Special quality 30-in. 33 lbs.; special quality 33-in. 390 lbs.; special quality 33-in. 400 lbs., all New York Car Wheel Works specifications.

Empire State Express Engines.

New York Central locomotive No. 870, which has drawn the Empire State Express from New York to Albany for four years, has now been running 17 months since it was last in the shop. It has run every week day since May 26, 1894, making 148,314 miles up to Oct. 18. During this time the engine has not been taken off the train or detained by any fault that could be attributed to the engine.

Engine No. 903, which came out of the shop April 3, 1894, has hauled the Empire State Express on one of the other divisions every week day from then until now, making 143,543 miles. During this time No. 903 has been detained twice by hot journals.

The Deep Waterways Commission.

Last Monday the appointment by the President was announced of the commission on deep waterways. The commission is to examine and report on the general subject of deep waterways from the great lakes to the sea. The Commissioners are Dr. James B. Angell, President University of Michigan; L. E. Cooley, of Chicago, and John E. Russell, of Massachusetts. Dr. Angell is an astute man, experienced in large affairs, not only the President of one of the greatest universities of the land, but distinguished as a diplomat. Whether or not