A NEW INSPECTION LOCOMOTIVE.

BY W. FRANK M'CLURE.

Two inspection locomotives, differing in some important features from any yet built in this country, have been turned out within the past few months by the locomotive shops of the Lake Shore Railroad at Collinwood, Ohio. The first one to be completed is shown in the photograph. It is already in active service on the Lake Shore road and attracts a great deal of attention among railroad men wherever it goes.

The chief point of construction which distinguishes these engines from others of similar type, is in the fact that they are each four-cylinder balanced simple locomotives. The combining of the balanced feature with a simple engine has been used in Europe, but these new engines are the only ones of this type in America, and are the only inspection locomotives thus equipped in the world. Below the forward end of the new locomotives are located four equal cylinders, those on the outside being connected with drivers, and the inside cylinders driving through practically duplicate connections to the crank axle. Between the cylinders is a single piston valve with inside admission. The valve chamber has only two steam ports. An opening in the port allows the steam to enter the rear of one cylinder and the forward end of the other simultaneously and in equal amounts. This maintains the balance. The valve gear, as will be seen, is of the Walschaert type.

As indicated in the photograph, the observation room and the engineer's and fireman's quarters are under the same roof. There are four chairs on each side of the boiler in the observation room. The interior finish of this room is elaborate. An arrangement for signaling the engineer is located near the right-hand front chair. The front doors, it will be noted, open outward to winding steps. To prevent coal dust from being blown into the observation coach, the tender is equipped with a sheet-iron covering.

The weight of the new locomotives in working order is 126,600 pounds. The weight on the drivers is 85,100 pounds. The diameter of the drive wheels over tires is 63 inches. The wheel base of the engine and tender is about 48½ feet. The boiler is wagon top in shape, and has a working pressure of 180 pounds. The total heating surface is 1,466 square feet. The water capacity of the tender is 4,300 gallons, and the coal capacity 10 tons. The diameter and stroke of the cylinders is 12½ x 20 inches.

SHIPPING SUBMARINES INTACT TO THE PHILIPPINES.

The recent shipment of two submarines, upon the deck of a U. S. naval collier, to a destination over half way round the world, is a new departure that deserves more than a passing notice. It is true that the French navy did once transport bodily a very small submarine for a short distance; but the matter was not of sufficient importance to form a precedent for the present attempt.

The "Shark" and "Porpoise" are sister submarines, whose construction was authorized in 1900, and which went into commission in the autumn of 1903. Each boat is 63½ feet in length by 11¾ feet maximum diameter, and its weight is 120 tons, or 240 tons for the two. The common method of transporting submarines is to ship them in sections; a method which allows of their easy stowage in the hold of a ship, and furthermore, makes it a very simple matter to load them in sections on flat cars for transportation by rail. Of course, in this case, the engines, motors, tanks, etc., are knocked down and crated for separate shipment. This was the method followed in transporting the submarines which were shipped to Japan during the late

Russo-Japanese war. The novelty in the case of the "Shark" and "Porpoise" consists, of course, in the fact that the boats were shipped intact, and the difficulty was to find some method of carrying them upon the deck of a ship (since they were too large to be placed

bers were carried down from the deck frames to the upper floor of the ship's double bottom, and securely wedged in place. A transverse bulkhead of the ship, which extends athwartship at about the center of the cradles, also offered considerable support. Each submarine was carried upon two cradles, one being a regular launching cradle for side launching, as practised at the shipbuilding yards on the Great Lakes, the other, or auxiliary cradle, having its bearing blocks intermediate of those of the launching cradle. When the "Cæsar" reaches the Philippines, the intermediate supports will be wedged up, the end supporting cradles removed, and the launching ways, which will then be built out until they extend 6 feet beyond the sides of the vessels, will be well greased. The boats will then be let down upon the launching ways, and launched over the ship's sides, dropping 7 feet

from the ends of the ways into the water.

During the voyage, the weight of the submarines resting in their cradles would be sufficient to hold them in place as long as the water was smooth; but since the ship will probably have to pass through more or less heavy weather, precautions had to be taken to lash the submarines so securely to the hull of the ship, that, for all purposes of movement, they would be practically one with it. To effect this, a system of combined tension and compression was used. Heavy timber shores were set up between the deck and the bilge or rolling keels, as shown in our engraving, and the boats were drawn down tightly upon these by means of ¾-inch wire cables attached at the upper end to ring bolts riveted to their outer shells, and at the lower end to similar bolts riveted to the steelwork of the ship's deck. These wire ropes are placed diagonally to the length of the submarines, and each of them is provided with a turnbuckle.

Similar shores and ropes, not shown in the photograph, were placed at the bow and stern of the boats. The slack of the ropes was then taken up by the turnbuckles, which served to pull the submarines down to a snug bearing upon the shores, the adjustment being also assisted by wedges driven in beneath the shores. Heavy horizontal shores were also placed between the submarines and drawn together in the longitudinal direction by means of 1½-inch bolts, thus wedging the two boats apart against the tension of heavy wire cables which were passed entirely around the boats at two or more points in their length. The advantage of this method of securing the submarines is that, should any of the cables become slack during the voyage, it will be possible, by means of the turnbuckle and the wedges, to bring everything up to a very snug and secure bearing.

Great care was exercised in working out the plans for the launching cradles and the lashing devices. The work was done at the Brooklyn navy yard under the supervision of Naval Constructor Baxter, who, to prevent any possibility of error in the launching, caused a model to be built and launched before any actual work was done in building the ways.

To Stain Bone Brown.—The object must be freed from grease with the acid of petroleum ether, and for five to fifteen minutes must be left, at ordinary room temperature, in a mixture of 40 parts of hydrochloric acid with 1,000 parts of water, washed off with water, and placed in a solution of 5 parts of permanganate of potash in 1,000 parts of water. After coloring has taken place, the object must be removed, washed off with water, and when dry polished. If a more reddish color is desired, the object, before polishing, should be placed in a solution of 10 parts of fuchsine or grenadine in 1,000 parts of water.

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in the hold) which would be perfectly safe both for the submarines and for the ship itself. As far as the ship was concerned, it was necessary to provide special supports to distribute the effect of the concentrated load, and prevent the vessel from being strained in a seaway. As for the submarines, the problem was to provide some form of cradle in which they could rest without strain, and at the same time to lash them so firmly down to the structure of the ship, that not the slightest movement would be possible in heavy weather.

The submarines were placed upon specially-built cradles, laid upon the main deck of the collier "Cæsar." To relieve the strain on this deck, heavy shoring tim-

Floating Derrick Hoisting the "Porpoise" Aboard the "Cæsar." **The Submarines "Porpoise" and "Shark" Lashed in Cradles on the Deck of the "Cæsar" for Shipment to the Philippines.****SHIPPING SUBMARINES INTACT TO THE PHILIPPINES.**