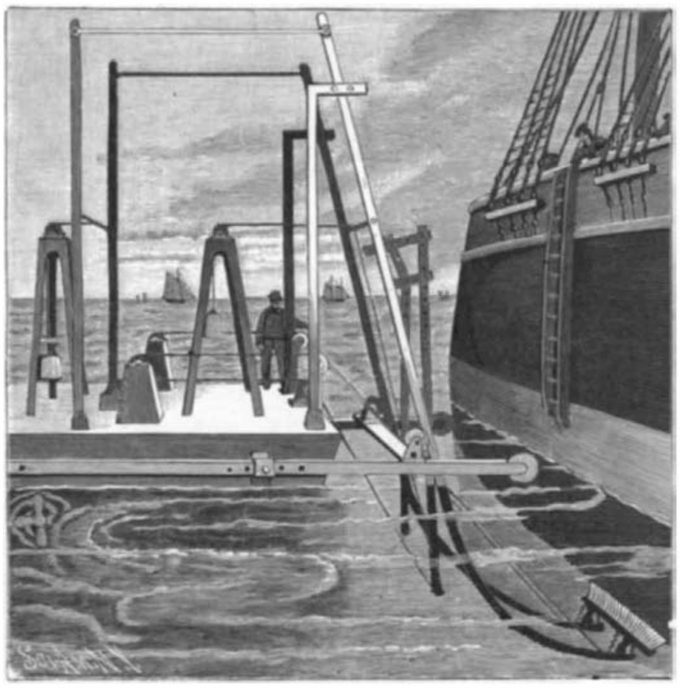
A NEW WAY OF CLEANING SHIPS' BOTTOMS.

The great expense and delay of docking a vessel for the purpose of cleaning its foul bottom has prompted inventors to devise other means whereby the removal of barnacles is effected more inexpensively and quickly. The most recent method of this kind forms the subject of a patent granted to Mason S. Moreno, Key West, Fla., and Hayden W. Branch, 404 Washington Street, Tampa, Fla.

In the system in question a scow is used, which carries the cleaning apparatus and which is moved along



A NEW WAY OF CLEANING SHIPS' BOTTOMS.

the vessel by means of side propellers. Adjustable side bars extend from the scow and carry buffers to prevent possible injury to the vessel. Rollers on the bars engage the side bars of a frame, on the lower end of which a brush or steel cleaner rocks. Swinging standards on the float each carry two rollers, between which the side bars of the brush frame move. The brush frame is yieldingly carried toward the hull of the vessel to be cleaned by means of weights attached to ropes running over pulleys and connected with the frame. The brush or steel cleaner is brought into engagement with the hull by means of lifting cables secured to the brush frame and to winding drums on the scow or dock. A drawing-down cable is fastened to the brush frame near its upper portion, passes down around the pulley on the lower end of a shifting bar, and up around second pulley to another winding drum.

The shifting bar referred to can be moved toward or from the vessel, as may be required; and can be adjusted vertically. The shifting bar is furthermore adjustably connected with the rocking bar, so that a swinging of the one will cause a like movement in the other.

When the brush is in its lowermost position, the drums are set in motion by the engine to wind up the lifting cables, thus drawing the brush up into contact with the hull. When the brush or cleaner reaches the surface of the water, the drawing-down cable is operated to pull the brush downward, the lifting cables being released from their drums. During this operation, the scow can be moved toward the side of the vessel by means of a stern propeller.

This apparatus can be carried (knocked down) on board a man-of-war, taking up less room than 60 cubic feet of space, and in a few moments set up on a dock in any part of the world, ready for cleaning the ship.

Death of Mrs. Roswell Smith.

Mrs. Roswell Smith, the widow of the publisher of The Century Magazine, died recently in New York at the age of seventy-two. When she was seventeen years old, as Annie G. Ellsworth, she sent the first telegraphic message—"What hath God wrought?" Her father was the first Commissioner of Patents, and has been called the "Father of the Patent Office." He was a close friend of Morse's, and together they induced Congress to appropriate $30,000 for the expense of a line between Washington and Baltimore. When the bill was finally passed, Annie Ellsworth carried the news to Prof. Morse, and he said she should have the honor of sending the first message, which she did.

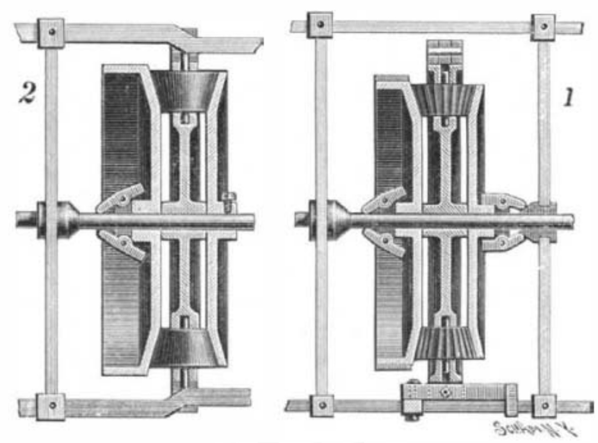
A NOVEL REVERSING GEAR.

The reversing gear which is illustrated herewith is designed to permit the quick reversal of a shaft from a pulley continuously driven in one direction. The inventor of the device is Andrew Brott, of South Denver, Colorado. Fig. 1 is a sectional side elevation of one form of the invention. Fig. 2 is a sectional side elevation of a modified form of the gear.

In the form shown in Fig. 1 the shaft to be driven carries a loosely mounted support, provided with two bevel pinions engaging on either side two bevel gear-wheels likewise loosely mounted on the shaft. One of these gear-wheels is driven by a belt. Two clutches lock the respective gear-wheels to the shaft by means of cones connected by shifting arms, so that the operator can throw one clutch into engagement with its wheel and the other out of engagement with its wheel. A band-brake is controlled by the shifting-arms to brake the support of the bevel-pinions. The driven gear-wheel when locked to the shaft directly rotates the shaft in a forward direction by means of its clutch. The other gear-wheel being disconnected from the shaft, the pinions and the wheel in question evidently rotate loosely without transmitting motion to the shaft. To drive the shaft in the opposite direction, the operator moves the shifting-arms to apply the brake and hold the pinion support against rotation, to release the driven gear-wheel, and to clutch the other gear-wheel to the shaft. The motion of the driven gear-wheel is then transmitted by the pinions to the other gear-wheel, clutched to the shaft, but in a reverse direction from that previously given.

In the modified arrangement shown in Fig. 2, friction pinions and wheels are substituted for the bevel pinions and gears illustrated in Fig. 1; the loose driven wheel is provided with a clutch, but the other wheel is secured to the shaft by a set-screw. The brake is dispensed with, the support for the pinions being locked and released directly by the shifting-arms, which are given a special form for this purpose. The operation is essentially that of the form shown in Fig. 1.

The simplicity of the device and its efficiency constitute its chief advantages.

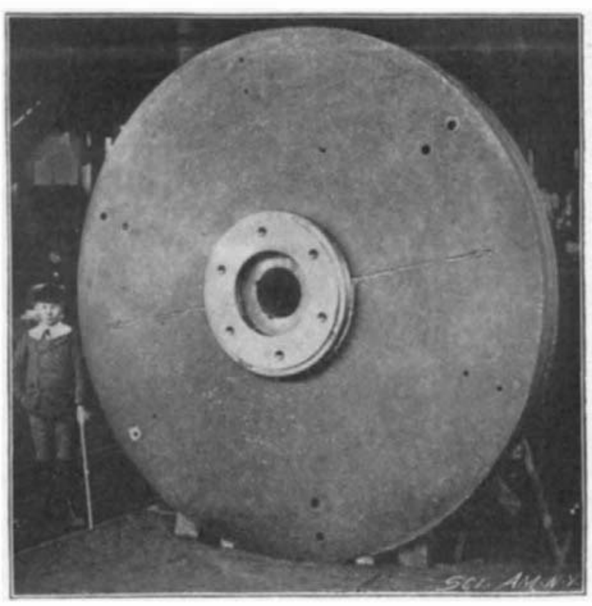


BROTT'S REVERSING GEAR.

MAGNETIC CLUTCHES.

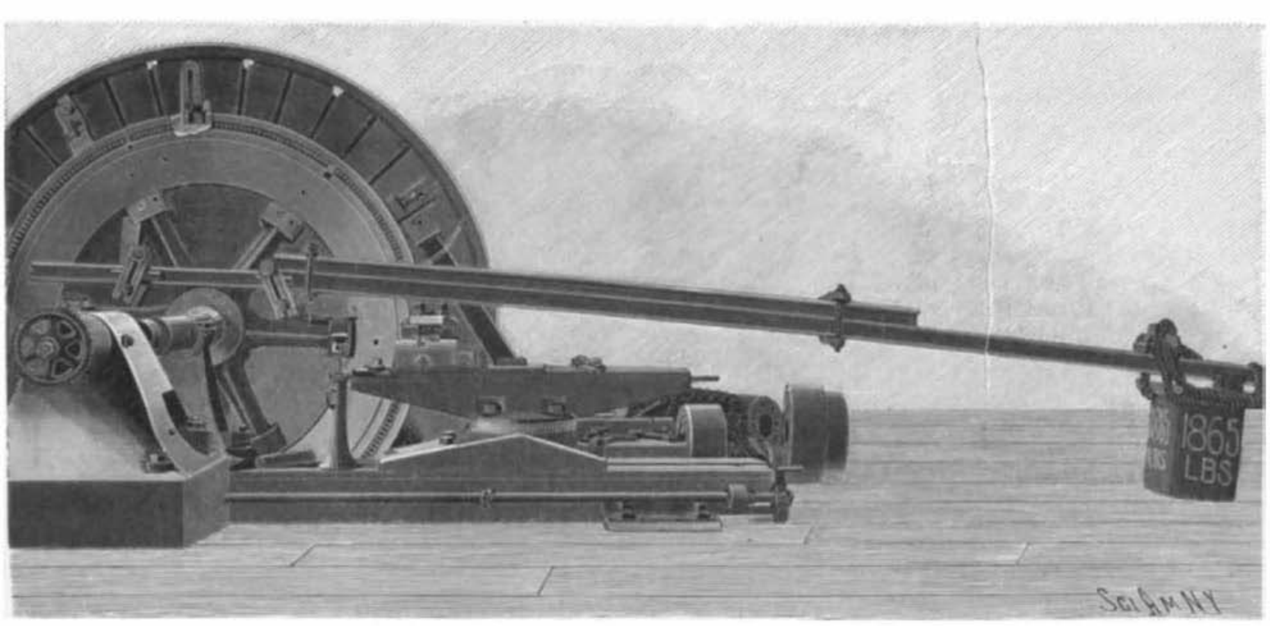
BY GEORGE A. DAMON.

The magnetic clutch shown in the illustration is one hundred inches in diameter, and is capable of transmitting 3,000 horse power. It is the largest ever built, and is one of three recently completed to connect the engines and generators in a central electric power station. In designing power plants engineers have been limited to the use of the ordinary friction clutch, and its adoption for transmitting power has been so universal that its action is well understood and its limitations recognized. The modern tendency toward large units, arranged compactly so as to occupy a minimum amount of floor space, has militated against the use of belts, shaft, pulleys and friction clutches, and it has become common practice either to connect the electric generators directly to their prime movers by means of a rigid coupling, or to key the generator armature upon the extended shaft of the engine or turbine. This practice is objectionable from lack of flexibility, and was developed because no coupling was found by which to connect or disconnect the generator readily that had the advantage of neat appearance and compact design. The magnetic clutch, therefore, possesses a peculiar interest as offering a solution to this problem.



MAGNETIC CLUTCH CAPABLE OF TRANSMITTING 3,000 HORSE POWER.

Advantage is taken of the tractive force existing between two highly magnetized bodies of metal, and this action secures one of its chief points of advantage. The tractive power of any magnet depends upon the number of "lines of force" passing from the magnet proper to the armature which it is attracting, across the small air gap existing between the surfaces of the two parts. Owing to the superior permeability of iron it takes considerably less energy to maintain in it lines of force than is required to force them through the surrounding air, and, therefore, that magnet is most efficient which provides for its "lines of force" a closed ferric circuit of dimension sufficient to prevent oversaturation, and at the same time is designed to get the full benefit of concentration of magnetization at the contact surfaces. As such a magnet is self-contained, the adhesion is secured without any resulting external reaction, and a clutch built upon this principle will operate without the slightest end thrust upon its journals, and without requiring any applied mechanical force to put it into service. The power-transmitting capacity depends upon the coefficient of friction between the two surfaces held together by magnetic adhesion. An interesting test of this "torque" or turning power is shown in the illustration, in which a weight of nearly a ton is suspended on the end of a twenty-foot lever arm, the result being only to bend the rails of which the lever is composed without causing the clutch to slip. It might be added that only one of the two coils with which this clutch was provided was used in this test, and that the voltage applied to this one coil was reduced one-half before slipping occurred. The small amount of electrical energy required by an efficient magnet is quite as surprising as the large amount of tractive pow-



TEST OF TURNING POWER OF MAGNETIC CLUTCH.

Length of lever, 20 feet; deadweight at end of lever, 1,865 pounds; energy necessary in exciting coils of clutch, 200 watts.

er developed, the large magnetic clutch shown requiring but 200 watts for its exciting coils, an amount of energy less than would be consumed by four 16-candle-power incandescent lamps. The efficiency of this clutch as a power-transmitting device is, therefore, 99·99 per cent, that is, the loss is one-hundredth of one per cent, which may properly be considered a negligible quantity.

In the application of the magnetic clutch in the central electric plant of the Imperial Company, of St. Louis, Mo., the clutches are used to connect the generator to the engines in such a way that each dynamo can be reached from more than one engine. The current is carried to the coils by means of collector rings attached to the sides of the clutches, and the electrical connections are simple and easily inspected. The collector rings take their current from insulated brush-holders, which are connected electrically to the source of current through a switch provided with a device for taking care of the inductive discharge when the oil circuit is broken. These switches are placed upon the switchboard, so that in starting or stopping a generator, all of the controlling devices are within the reach of one station attendant. The fact that magnetic clutches can be controlled by one or more push buttons or electric switches, placed at different parts of a room or plant, is one of their marked advantages.

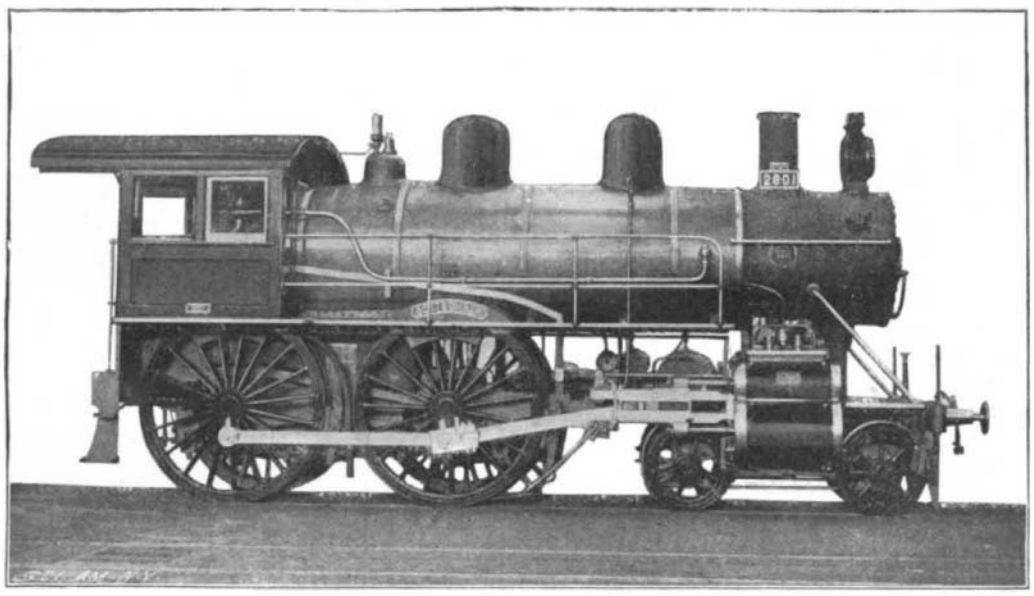
Mr. Bion J. Arnold, a consulting electrical engineer of Chicago, is the designer of this clutch, and he is now making extensive use of specially designed magnetic clutches for various purposes. A number are now being installed in a plant using large synchronous motors for driving heavy machine rolls, the main function of the clutch being to furnish a quick means of releasing the driving motor in case of emergency, thus allowing the rolls to be shut down without overcoming the inertia of the revolving motor armature.

The applications where the use of these clutches is desirable would seem to be limited only by the number of places where it is required to transmit power from one shaft to another. For motor applications to individual machine driving, for shafting transmission, for connecting generators to gas engines, steam engines, or turbines, and for any other purposes, the small amount of space required, the small amount of power needed, and the neat appearance of the magnetic clutch, will readily commend its use to engineers.

FENCES are easily grown in Cuba from pinon twigs, which are planted in rows a few inches apart.

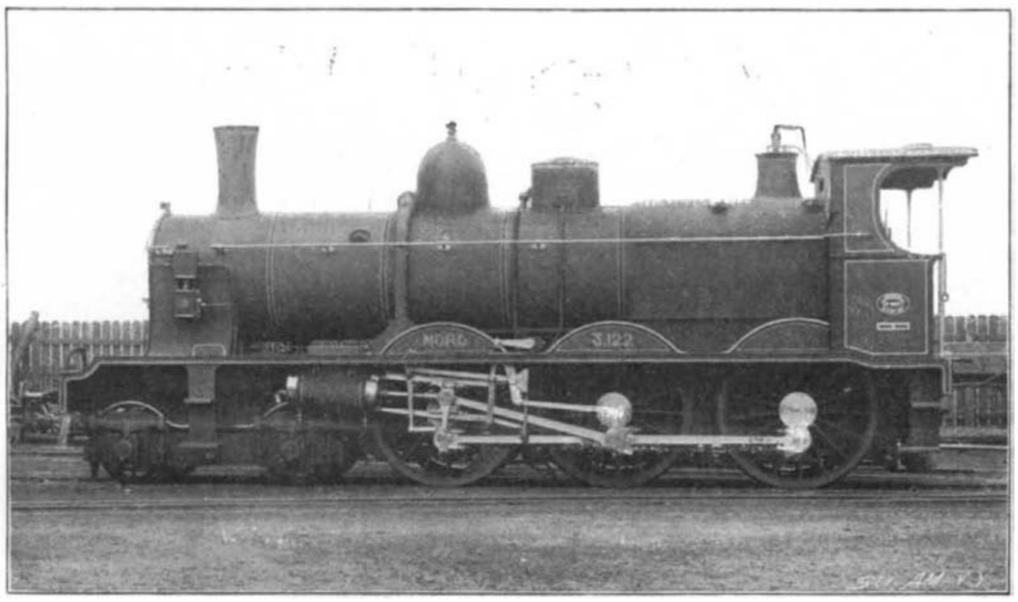
THE FOUR-CYLINDER COMPOUND LOCOMOTIVES OF THE NORTHERN RAILWAY OF FRANCE.

In a recent issue of the SCIENTIFIC AMERICAN, reference was made to the remarkable daily service of express trains run by the Northern Railway of France, which includes no less than forty-five trains, with an average timed running speed, including stops, of from 50 to 60 miles an hour. Of these forty-five trains, ten are timed to run at speeds of over 54 miles an hour. The present article will be devoted to a description of the four-cylinder, compound engines, which have been designed especially for this remarkable service. It is certainly difficult to find in the annals of railroading a parallel instance wherein a railroad company has made such a surprising advance in the number and speed of its express trains as has taken place on this French road in less than a decade; for it is a fact that ten years ago, the Northern Railway of France had no express trains on its schedule that were timed to run at a higher speed than 43 miles an hour, including stops.



1.—EIGHT-WHEEL, COMPOUND, AMERICAN EXPRESS LOCOMOTIVE, FOR THE FRENCH STATE RAILWAYS.

Cylinders, two H. P., 13 × 26 inches; two L. P., 22 × 26 inches. Drivers, 84¼ inches. Heating surface, 1,893 square feet. Steam pressure, 215 pounds. Weight of engine alone, 59 tons.



2.—TEN-WHEEL, COMPOUND, LOCOMOTIVE FOR HEAVY EXPRESS AND FREIGHT SERVICE.

Cylinders, two H. P., 13·8 × 25·2 inches; two L. P., 21·6 × 25·2 inches. Drivers, 68¾ inches. Heating surface, 1,950 square feet. Steam pressure, 215 pounds. Weight, engine, 65·6 tons; tender, 45 tons.

3.—EIGHT-WHEEL, COMPOUND, FRENCH LOCOMOTIVE, FOR FAST EXPRESS SERVICE.

Cylinders, two H. P., 13·4 × 25·2 inches; two L. P., 21·6 × 25·2 inches. Drivers, 83¼ inches. Heating surface, 1,900 square feet. Steam pressure, 215 pounds. Weight, engine, 56·5 tons; tender, 45 tons.

It was in the year 1885 that La Société Alsacienne de Constructions Mecaniques, under the superintendence of M. de Glehn, designed and built in its workshops at Belfort a four-cylinder compound locomotive for the express service of the Compagnie du Nord. That was, of course, before the era of the present fast express service, and the engine, which was, no more powerful than the ordinary locomotives used by the company at that time, was built chiefly to prove that, owing to its economical steaming, the compound locomotive was sensibly more powerful than the ordinary type. When in 1890 it became necessary, on account of the increased weight and high speed of the new express service, to build a special type of locomotive, the excellent results obtained with the compound locomotive of 1885 induced the company to adopt the four-cylinder, compound system for its high-speed trains. An engine considerably more powerful than the compound of 1885 was designed, and with some minor modifications forms the standard express locomotive of to-day on this line. These engines, of which one of the latest type is shown in Fig. 3, conform in many respects to the standard eight-wheeled American engines, the likeness consisting in the fact that it has the truck and four-coupled drivers, and that the tender (a new departure in European practice) is carried upon two four-wheeled trucks. Apart from these broad resemblances, however, these fine engines possess marked characteristics of their own. They are of the four-cylinder, compound type, with the two high-pressure cylinders, 13·4 inches in diameter by 25·2 inches stroke, placed on the outside of the plate frames between the truck and the leading drivers and connected to the rear drivers, and the two low-pressure cylinders, which are 21·6 inches in diameter by 25·2 inches stroke, placed between the frames beneath the smokebox and coupled to the forward pair of drivers. The two pairs of drivers, which are 83¼ inches in diameter, are connected by the usual coupling rods, the arrangement being similar to that of the ordinary high-pressure locomotive of the Atlantic type in this country. The boiler carries a steam pressure of 215 pounds to the square inch. It is provided with Serve tubes, the heating surface of which amounts to 1,768 square feet, which with about