Electric Drive on U. S. S. "New Mexico"

By CHARLES M. RIPLEY

THE battleship *New Mexico* is the pride of the United States Navy, and her electric drive is the pride of the *New Mexico*. How the electrical machinery looks, how it works, why the electric drive is preferable to other forms of propulsion, how she looks inside and outside, is here related by one of the men who recently was a passenger on Uncle Sam's latest superdreadnaught, riding between the Brooklyn Navy Yard and Rockland, Maine.

This latest leviathan weighs 32,000 tons and requires 32,000 horsepower or *one horsepower per ton*. Her weight is equivalent to a bar of iron weighing one pound to the foot and forming a band of iron from the North to the South Pole with enough in addition to reach from Maine almost to the borders of Florida. She is so huge that it requires ten tugs to push her from her pier in Brooklyn Navy Yard out into the East River. From the platform called the "crow's nest" at the top of the mast down to the level of the water is 120 feet, or equal in height to a ten-story building.

The battleship can generate enough electricity to run the giant General Electric Works and the Schenectady Railway Company.

Motors Drive Propellers.

Like everything else that is electrical, the *New Mexico* is the cleanest institution of her kind. There are no engines or turbines connected with the propeller shafts—only electric motors. There are no grates under the boilers—merely oil burners. There is not a coal or ash shovel on the ship; nor are there any cinders, smoke, dust, or soot.

The *New Mexico* "coals" thru a 6-in. hose, that is because she burns only oil for her power. The total oil capacity of the dozen or more compartments is 3,400 tons or 6,800,000 lbs., or nearly a million gallons. If the *New Mexico* were an automobile with a mileage of 20 miles per gallon, this amount of oil would drive her close to 20 million miles or a distance equal to 80 times to the moon. But a 32,000-ton battleship does not equal the mileage of a flivver, for it weighs as much as 60,000 of those vehicles, and must plow thru the water displacing her own weight of water each time she runs her own length, 624 feet. The cost of fuel is more important on ship board than on land, and this is emphasized by the fact that on the 2,000-mile trial trip alone she will displace over 620,000,000 tons of water.

From Oil to Electricity.

Following the energy of the oil fuel thru the different processes until this energy drives the propellers electrically is an entertaining and instructive trip. Escorted by courteous officers, you start for one of the three boiler rooms. You must open and close several steel bulkheads in the watertight compartment and descend steel ladders and steel steps apparently equivalent to those in a five-story building. On the way down you must pass thru an "air lock" similar to those which give the excavators access to the caissons used in building the foundations of the skyscrapers 90 feet under Broadway, or in constructing the piers under big bridges in the middle of the river. The officer who escorts you is very careful to close the steel door behind you before he opens the one in front of you.

High Air Pressure.

No sooner are the bolts loosened than you feel the increased air pressure swish into your ears. This is because the air in the fire-room is maintained at a higher pressure than the outside air. All the air which the firemen breathe is pumped air. There is more oxygen in a cubic foot of this air than there is in ordinary air. This increased pressure and increased oxygen are both useful in providing the proper combustion in the boiler.

How Smoke Screens Are Made.

If the *New Mexico* wishes to throw a smoke screen, the men in the fireroom merely turn a few tiny hand valves in a ¼-in. pipe and, presto! inky blackness will vomit from the single smoke stack and blacken vast sea areas. This is a very nice study of how different mechanical mixtures of oil and air will bring about different chemical combinations between oil and oxygen. One of these combinations eliminates smoke by effecting almost perfect combustion; while the other creates a heavy black smoke which will practically blindfold the enemy. And three little ¼-in. pipes in each boiler are all that is needed to do this.

THE day of the all-electric superdreadnaught, not to mention electrically driven war vessels and merchant ships of smaller size, has arrived. In the present article Mr. Ripley gives us an interesting authoritative description of his trip on Uncle Sam's latest superdreadnaught, the "New Mexico", with her 32,000 horse-power electric propelling plant. Like everything else that is electric, the "New Mexico" is the cleanest institution of her kind. There are no engines or turbines directly connected with the propelling shafts—only powerful electric motors. There are no grates under the boilers—merely oil burners. Electrical propulsion not only does away with reversing turbines, but also does away with reduction gears, with their accompanying mechanical loss. The battleship "New Mexico" can travel a distance of 7,500 knots at 12 knat speed before it will be necessary to take on more fuel. The electric equipment totals nearly 100,000 horsepower, including over 100 loud speaking telephones, nearly 200 electric fans, electric gyroscopic compasses, and in fact "Electricity" rules the day everywhere about this modern naval wonder.

Size of Boilers.

It is said that no other 32,000-ton battleship has as few as nine boilers. There are three boiler rooms, each in a separate compartment, and each room contains three large boilers. Each of these nine boilers can deliver over 4,000 horsepower and contains three miles of 2-in. seamless pipes. Put end to end the pipes in all nine boilers would make a seamless tube 27 miles long. The Pennsylvania has 12 boilers and the Oklahoma has 12, altho its tonnage is only 27,500.

The history of the steam engine shows that its inventor, James Watt, thruout his entire life opposed any steam pressure higher than 5 to 10 lbs. per square inch. The *New Mexico's* boilers supply *steam at 250 lbs. per square inch!*

Superheated Steam.

After the steam is generated, and has past thru the big pipe away from the water in the boiler, it is again brought in contact with the flames of the furnace and is superheated to a still higher temperature. In fact, as the steam leaves the boiler it is about 450° F., or hot enough to melt solder and tin.

Superheated steam gives super-results. This is because the steam turbine is class among engineers as a "heat engine" and the more heat that is supplied in this steam the more energy is available for power.

Two Power Plants.

For propulsion there are two electric power plants in separate compartments. They are way down low in the *New Mexico* close to the boilers. Each of these power plants alone is able to drive the battleship at a speed of 18 knots. (A nautical mile, or knot, is 6,080 feet, as against 5,280 feet in a land mile.)

Turbine Electric Plant.

In two separate steel compartments 15 by 45 ft. are located the two turbine generator sets, each not over 27 ft. long. The turbine itself is little larger than a hogshead of molasses laid over on its side. It seems almost incredible that this small machine can generate 16,000 horsepower from steam.

The engine rooms of most ships of the past have been a tangle of bending and curving pipes, and in order to move about the men had to stoop down to go under them or climb over them or squeeze between them. When one of these pipes burst it practically meant the death of every man in the engine room. One of the advantages of these power plant rooms in the *New Mexico* is the fact that there is only one steam pipe in the room, and that is only 16 ft. long.

Steam Turbine.

In each of these two power plants the steam turbines make electricity for driving the battleship. From the outside the most interesting thing about these wonderful rotary steam engines, called turbines, is their small size, their light weight, and the fact that they are so perfectly enclosed that you cannot see anything move. A turbine of 16,000 horsepower when compared in size and weight with the great triple and quadruple expansion steam engine that had been used up until recent years, is practically a watch charm—a little toy. There is only rotary motion in the steam turbine.

Inside the casing are ten wheels arranged side by side like the coins are kept in a bank. In the rims of all of these wheels are hundreds of buckets against which the steam strikes. The steam enters at one end of the turbine and dashes against the buckets of each of these wheels, one after the other; and as it strikes against these buckets the wheels and the shaft to which they are fixt all turn around. This shaft drives the electric generator immediately adjacent, and in it the mechanical power is turned into electricity. Then eight copper wires only slightly larger than a garden hose convey the 16,000 horsepower thru the steel walls to the next compartment where the switchboard is located. Electric fans in the power plant ventilate the room and also *cool the generator*, and the heated air is pumped outside.

The Switchboards.

When the eight electric wires leave the power plant room, they go to the electric switches back of the switchboard. Here the ship is controlled upon receipt of in-

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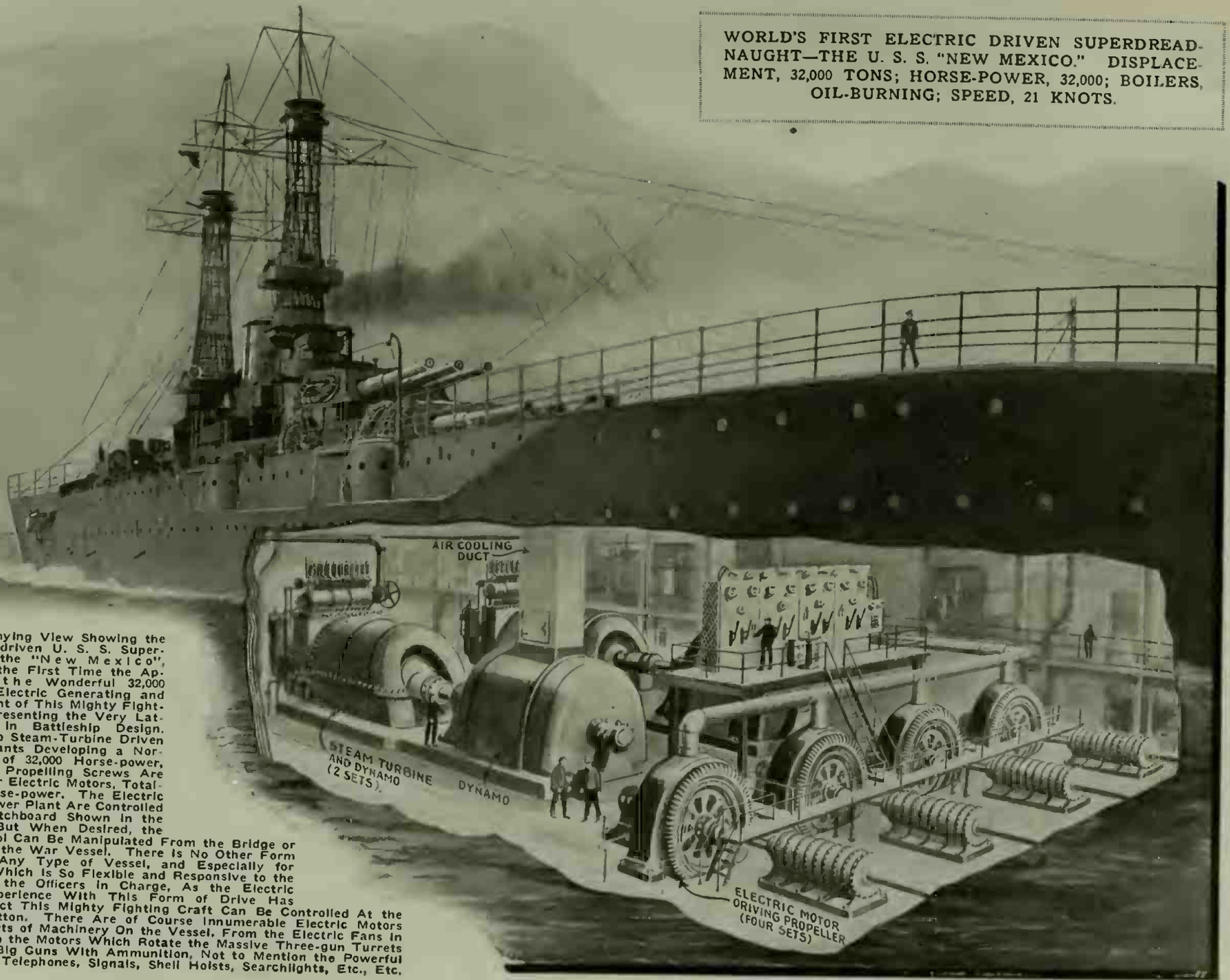
WORLD'S FIRST ELECTRIC DRIVEN SUPERDREADNAUGHT—THE U. S. S. "NEW MEXICO." DISPLACEMENT, 32,000 TONS; HORSE-POWER, 32,000; BOILERS, OIL-BURNING; SPEED, 21 KNOTS.



The Accompanying View Showing the New Electric-driven U. S. S. Superdreadnaught, the "New Mexico", Discloses for the First Time the Appearance of the Wonderful 32,000 Horse-power Electric Generating and Propelling Plant of This Mighty Fighting Ship—Representing the Very Latest Advance in Battleship Design. There Are Two Steam-Turbine Driven Generating Plants Developing a Normal Capacity of 32,000 Horse-power, and the Four Propelling Screws Are Driven by Four Electric Motors, Totaling 32,000 Horse-power. The Electric Motors and Power Plant Are Controlled From the Switchboard Shown in the Power-room, But When Desired, the Electric Control Can Be Manipulated From the Bridge or Pilot-house of the War Vessel. There Is No Other Form of Drive for Any Type of Vessel, and Especially for Battle-ships, Which Is So Flexible and Responsive to the Commands of the Officers in Charge, As the Electric Drive, As Experience With This Form of Drive Has Proven. In Fact This Mighty Fighting Craft Can Be Controlled At the Push of a Button. There Are of Course Innumerable Electric Motors Driving All Sorts of Machinery On the Vessel, From the Electric Fans in the Kitchens to the Motors Which Rotate the Massive Three-gun Turrets and Feed the Big Guns With Ammunition, Not to Mention the Powerful Radio Station, Telephones, Signals, Shell Hoists, Searchlights, Etc., Etc.

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