

THE MOST POWERFUL LOCOMOTIVES IN THE WORLD.

The accompanying illustrations give a correct impression of the great size of a set of mountain locomotives which have recently been built for the Northern Pacific Railroad by the well-known Schenectady Locomotive Works. In respect of boiler and cylinder power they are undoubtedly the most powerful locomotives ever constructed in this or any other country. It is true there is a freight engine on the New York, Lake Erie and Western Railroad which weighs 192,000 pounds and has 170,000 pounds on the drivers, but it has only 2,443 square feet of heating surface, against nearly 3,000 square feet in the Northern Pacific compounds.

Four engines of this type are already at work and twelve have been ordered. They are to be used as "helpers" in hauling trains across the summit of the Rocky Mountains between Helena and Missoula, Montana. The grade is excessive, 116 feet to the mile, and 17 miles in length, and, as the overland freight and passenger trains on the Northern Pacific road are very heavy, there is every economy to be realized in the use of extremely powerful engines.

As we look at this giant end on, it really appears as though the limit of possible dimensions had been reached—at least with the present gage of track. The boiler is 72 inches in diameter and the low-pressure cylinder is 34 inches in diameter, the latter dimension being not far short of the boiler diameter of some locomotives of forty years ago. The compounding is carried out on the Schenectady two-cylinder system, and it is arranged with the intercepting valve which is in common use on all the later compounds turned out from this works.

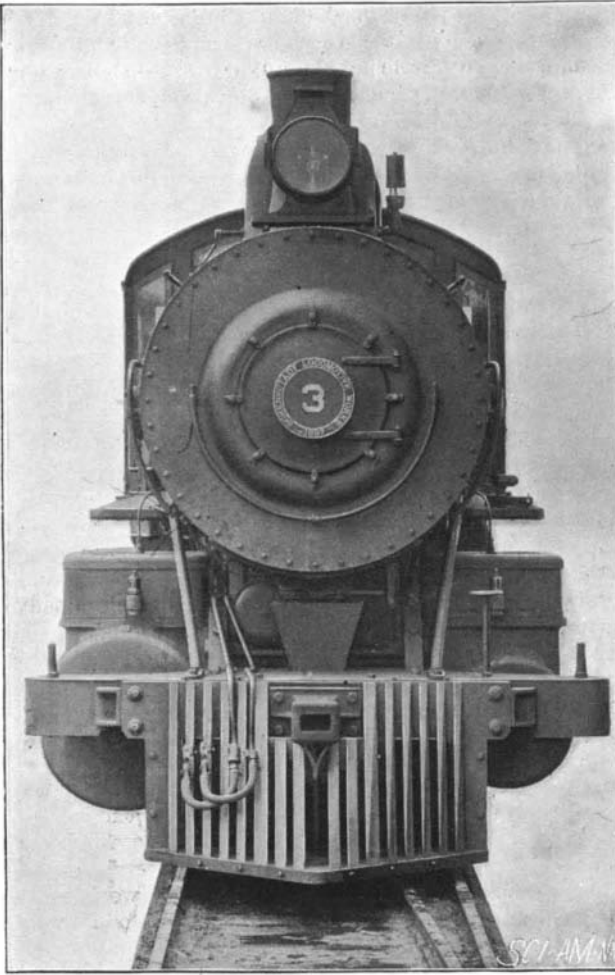
The boiler is of the extended wagon top type. There are 332 tubes, $2\frac{1}{4}$ inches in diameter and 14 feet long, their total heating surface being 2,721 square feet. The firebox is 10 feet long, 42 inches wide and 77 inches deep at the front and $73\frac{1}{2}$ inches at the back. It is built of carbon steel, with $\frac{1}{2}$ inch tube sheet, $\frac{3}{8}$ inch crown and $\frac{1}{8}$ inch back and sides. The plate for the first ring of the boiler is $\frac{1}{4}$ inch thick and measures $71\frac{1}{4}$ inches by 224 inches. The heating surface in the firebox is 206.5 square feet, and the grate surface is 35 square feet, the rocking grate being used.

The high-pressure cylinder is 23 inches in diameter and the low-pressure, as stated, 34 inches, the latter being by far the largest cylinder ever used on a locomotive. The stroke is thirty inches. The high-pressure cylinder is bushed to 22 inches, so that it may be possible to investigate the question of the best relative proportions for high and low pressure pistons. Both pistons have their rods carried through the cylinder heads. The steam ports of the high-pressure cylinder measure $20 \times 2\frac{1}{2}$ inches, and of the low-pressure cylinder, $23 \times 2\frac{1}{2}$ inches. The exhaust ports are respectively 20×3 inches and 23×3 inches. Allen-Richardson slide valves are used; the greatest travel is $6\frac{1}{2}$ inches, and the outside lap $1\frac{1}{2}$ inches. The boiler pressure is 200 pounds to the square inch.

There are eight coupled driving wheels, 55 inches diameter, and the main driving wheel journals are 9

4,000 gallons of water and $7\frac{1}{2}$ tons of coal. The total length of the engine and tender over all is 62 feet.

It can readily be believed that these giant machines have enormous hauling power. They are credited with a drawbar pull of from 35,000 to 40,000 pounds. We are informed that a builders' trial of their hauling power was made on the New York Central and Hudson River Railroad, at Schenectady, where one of these engines hauled 58 loaded cars up a grade of 60 feet to the



TWELVE-WHEELED COMPOUND LOCOMOTIVE, NORTHERN PACIFIC RAILROAD.

Front view showing great size of boiler and cylinders.

mile for a distance of three miles. The united efforts of a switch engine and a mogul freight engine had previously failed to pull the same load.

Our thanks are due to Mr. A. J. Pitkin, superintendent of the Schenectady Works, for the photographs and particulars of these remarkable engines.

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The World's Costliest Book.

The most expensive book ever published in the world is the official history of the war of the rebellion, which is now being issued by the government of the United States at a cost up to date of \$2,334,328, says the Chicago Record. Of this amount \$1,184,291 has been paid for printing and binding. The remainder

march, plans of forts and photographs of interesting scenes, places and persons. Most of these pictures are taken from photographs made by the late M. B. Brady, of Washington. Several years ago the government purchased his stock of negatives for a large sum of money. Each volume will, therefore, cost an average of about \$26,785, which probably exceeds that of any book that was ever issued. Copies are sent free to public libraries, and 1,347,999 have been so distributed.

The atlas costs \$22 and the remainder of the edition is sold at prices ranging from 50 cents to 90 cents a volume.

There does not seem to be a large popular demand, for only 51,194 copies have been sold for a total of \$30,154. Thus it will be seen that the entire proceeds received from sales thus far but slightly exceed the average cost of each of the 112 volumes. The books can be obtained by addressing the Secretary of War.

The material used in the preparation of these histories is taken from both the Federal and Confederate archives, and is purely official. The reports of commanders of armies, corps, brigades, regiments, etc., are carefully edited and arranged so as to give a consecutive account of all engagements, with as little duplication and unnecessary material as possible, and as the writers represent both sides of the struggle, it may be regarded as impartial.

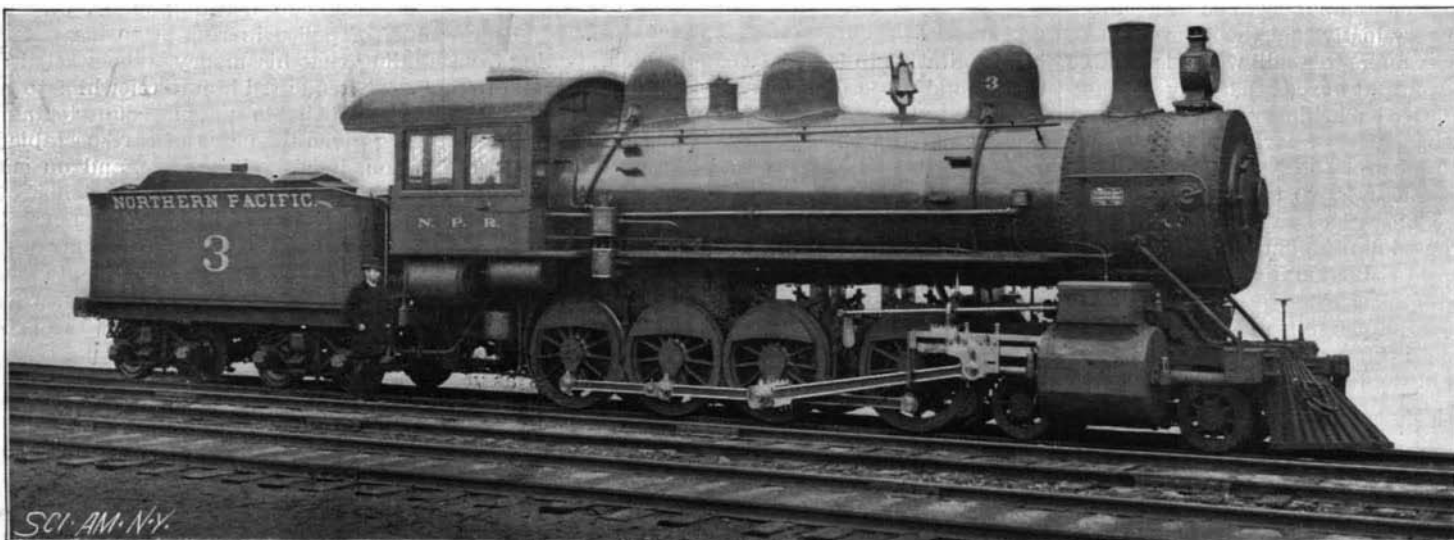
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Disturbing Nature's Balance.

The great and growing cost of the attempts in Massachusetts to exterminate the gypsy moth shows how serious may be the consequences to "the balance of nature" by the introduction of foreign insects or animals. A few of these moths were imported some years ago by an entomologist residing near Boston, says the New York Times. Several of the captives escaped from custody, and the State has spent \$450,000 in the last four years in a vain attempt to exterminate their descendants. It is now estimated that at least \$1,575,000 will be required, and that the appropriation for five years to come should be \$200,000 per annum. On the other hand, a perpetual appropriation of \$100,000 per annum would serve to confine the moths to the district in which they are now found.

The problem resembles that which has taxed the resources of the Australian colonies since the progeny of half a dozen rabbits, imported from England, became so numerous that the maintenance of agricultural industries was menaced by their depredations. Australia has expended millions in rabbitproof fences and in devices for killing off the rabbits. But, although bacteriologists have endeavored to remove them by disseminating the germs of fatal disease, the colonists have thus far been able to do no more than hold the animals in check.

In Florida several rivers have recently become choked by the rapid growth of a kind of hyacinth imported a few years ago, and considerable expenditures will be required to keep the streams open for navigation. An imported insect called the black scale menaced the fruit industry in California until the State procured from Australia and introduced in the orchards a little



TWELVE-WHEELED COMPOUND LOCOMOTIVE, NORTHERN PACIFIC RAILROAD.

Weight of engine alone, 186,000 pounds; 23 inches and 34 inches diameter by 30 inches stroke; heating surface, 2,943 square feet; steam pressure, 200 pounds.

by 10 inches, and the intermediate front and back driving journals are $8\frac{1}{2}$ by 10 inches. The main crank pin journals for side rod are 7 inches diameter by $5\frac{1}{4}$ inches long, and for main rod $6\frac{1}{2}$ inches diameter by 6 inches long.

The total weight of the engine in working order is 186,000 pounds, and the weight on the drivers 150,000 pounds. The fuel used is bituminous coal. The tender weighs 36,300 pounds, empty. It has a capacity of

was expended for salaries, rent, stationery and other contingent and miscellaneous expenses, and for the purchase of records from private individuals. It will require at least three years longer and an appropriation of perhaps \$600,000 to complete the work, so that the total cost will undoubtedly reach nearly \$3,000,000. It will consist of 112 volumes, including an index, and an atlas which contains 178 plates and maps illustrating the important battles of the war, campaigns, routes of

beetle which ate the obnoxious insects and thus brought relief. These and other instances which might be cited show that the utmost caution should be observed with respect to the introduction into any country of insects or plants for which nature has made no preparation there, and the growth of which may not be restrained by natural enemies and checks with which they must contend in the countries from which they are brought.