

bearings had been but little affected by such usage. The chain, while slightly rusted, was entirely free from mud and dirt, which undoubtedly accounts in part for the remarkable showing.

Besides the tests on general efficiency, a few special tests have been made. Among the results of greatest interest are those obtained from the sprocket tests.

All the combinations obtainable with eight, nine, and ten-tooth rear sprockets and from twenty to twenty-five teeth, inclusive, on the front sprocket were tested.

Fig. 3 shows the results obtained from a combination of a twenty-tooth front with the eight, nine and ten rear. The dotted curve represents the efficiency resulting with an eight-tooth rear. The broken line represents that obtained with the nine-tooth rear, and the full line the corresponding efficiency for the ten-tooth rear.

The average of the preceding combinations shows that while a slight irregularity seems to exist for the smaller loads, the effect for the higher pressures is very apparent, and shows for the average maximum values that the nine-tooth rear has an efficiency equal to 98.7 per cent of that of the ten-tooth, and the eight-tooth an efficiency of 98.6 per cent of that of the nine-tooth. The eight-tooth would then show an efficiency of 97.5 per cent of that of the ten-tooth.

It has been often asserted that the tire is the most important factor affecting the efficiency of a wheel, and that the amount of inflation would hide all other possible chances for variation in efficiency. While no attempt has been made in these tests to go into this question in detail, yet just at the close of the other experiments a few interesting results were obtained along this line (see Fig. 4).

It is the present intention to make tests with wheels running at different speeds, and also when the wheels are forced to run over different obstructions made to represent road conditions as nearly as possible, the power required to drive the wheel being determined by a dynamometer.

It is also probable that a pedal dynamometer will be constructed to register the actual force exerted on the pedal by the rider when the wheel is in regular road service. There are many other points of interest, among which are the duration of cone and ball bearings, the effect of vibration of the frame and the efficiency of different makes and grades of tires under increase of speed.

These different points will be investigated as time permits, and a series of results obtained which will be far more complete than those presented in this paper.

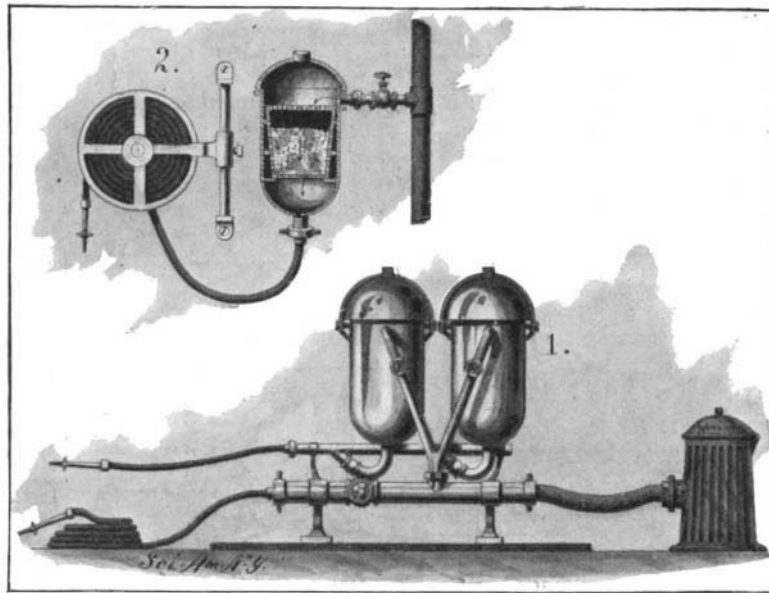
Taxation of Copyrights.

An attempt of the Comptroller of the State of New York to tax copyrights has been defeated. A tax for the year 1897 was

which the taxation of patent rights was interdicted, was referred to in the SCIENTIFIC AMERICAN of October 29, 1898.

AN IMPROVEMENT IN CHEMICAL FIRE-EXTINGUISHERS.

In the accompanying engraving, an apparatus for extinguishing fires is illustrated, which is connected



A NEW CHEMICAL FIRE-EXTINGUISHER.

with a water supply and is provided with receptacles containing chemicals which, when dissolved in water, produce a fire-extinguishing solution.

Fig. 1 is an elevation of one form of fire-extinguisher. Fig. 2 is a view showing another form.

The fire-extinguisher illustrated in Fig. 2 consists of a cylinder provided with a cover and connected, by

water-supply is opened to permit the water to saturate the chemicals contained in the cartridge. The water containing the dissolved chemicals is then discharged through the hose.

In the fire-extinguisher illustrated in Fig. 1, the chemicals contained in one cylinder are first used; and when these are exhausted, the contents of the second cylinder are used. It is for this purpose that the arrangement of valved pipes already referred to has been devised. If it be so desired, the water can be used directly from the hydrant by closing the valves in the pipes leading to the cylinders and opening the valve in the supply-pipe.

This fire extinguisher has been patented by Abram H. Van Riper and Patrick F. Guthrie, Nutley, N. J.

NOT every one is aware that the opening years of the next century will witness the completion of the first milliard of minutes since the beginning of our chronology. From approximate calculations it would seem that the one billionth minute will be reached at 10:40 A. M. on April 30, 1902.

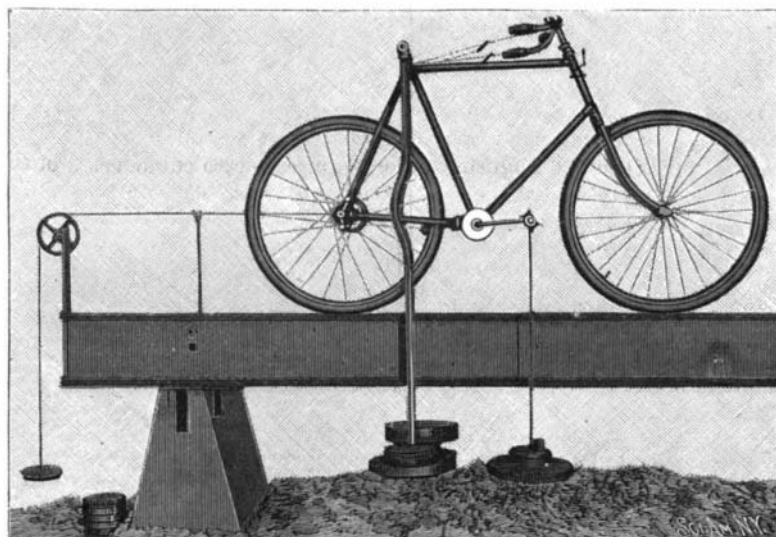
An Educational Index.

For some time past educators have felt the need of a catalogue of popular scientific papers. Mr. J. C. Packard, M.A., has prepared such a catalogue, with special reference to the instructor, librarian and pupil. This catalogue, which is now ready for distribution, is published under the auspices of the Science Committee of the Brookline, Mass., Educational Society, of which Mr. Packard is the chairman.

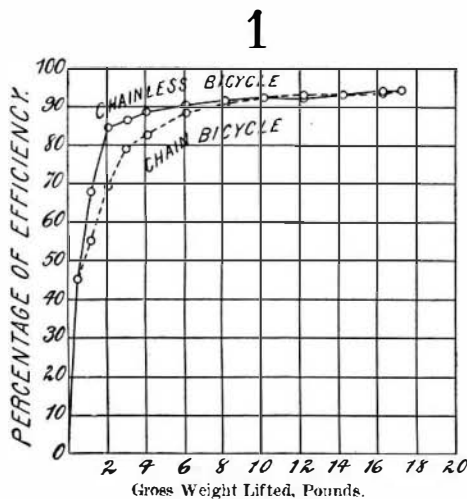
The booklet comprises forty pages and is small enough to go in the vest pocket. The subjects, which have been selected from the SCIENTIFIC AMERICAN SUPPLEMENT, are classified under such heads as "Archæology, the Science of Antiquity," "Facts About Familiar Elements and Substances," "How to Make Things," "How Things are Made," "Transportation," etc.

The Current Supplement.

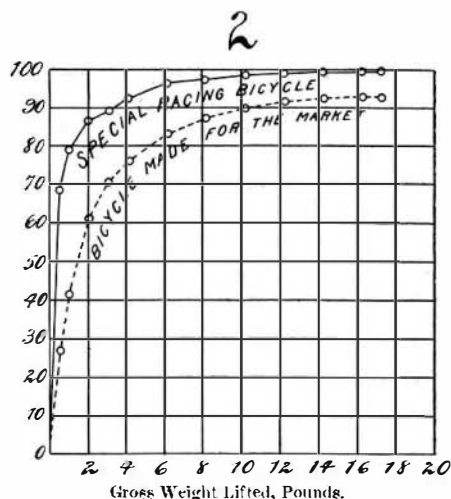
The current SUPPLEMENT, No. 1221, is of extraordinary interest; the first page article is "The New German First-class Battleship 'Kaiser Friedrich III.'" It is accompanied by a spirited picture of the vessel at sea. "The Palatine Hill of Rome" is illustrated by many excellent engravings showing the present condition of the ruins and by a clear plan. The text deals with all of the principal remains. Wilson's "Prehistoric Art" is the conclusion of a review of an important book, and is accompanied by nine most interesting engravings. "Wave Action in Guns" is an article by F. H. McGahie, M.E., and is referred to editorially elsewhere. Other articles are "British Coal Supplies," "Electric Hacks at Paris," "The



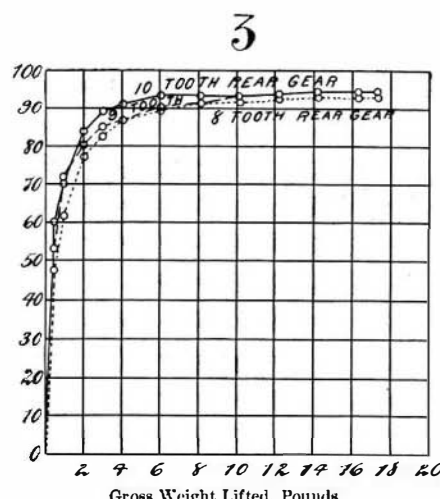
THE TESTING APPARATUS.



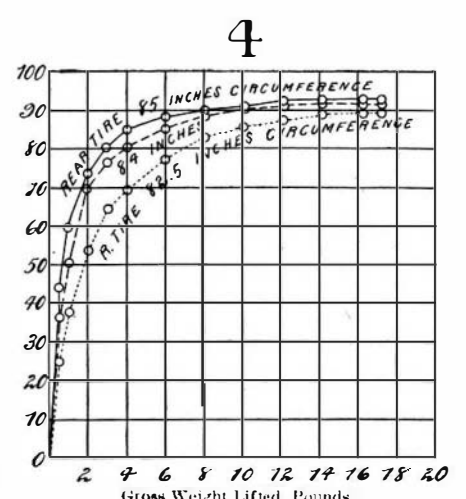
Chain and Chainless Bicycles.



Special and Common Bicycles.



20-tooth Front Gear, with 8, 9, and 10-tooth Rear Gear.



Effect of Inflation of Rear Tire.

THE EFFICIENCY OF THE BICYCLE.

imposed by the State Comptroller upon the A. J. Johnson Company, publishers of "Johnson's Universal Cyclopedia," and in proceedings to determine the validity of the assessment, the main objection to it was that the company's property was nearly all invested in copyrights, and that these were not taxable. The Court of Appeals, in opinions by Judges Vann and Gray, has unanimously reversed the decision of the Third Appellate Division, which affirmed the determination of the Comptroller. The court holds that copyrights are not taxable as property, but stand upon the same basis as patent rights, and are exempt from taxation.

The very important previous decision of the court in the case of the Edison Illuminating Company, in

means of a valved pipe, with a water-supply pipe extending upwardly through the building. At its bottom the cylinder is connected with a hose. The cylinder is designed to hold a perforated cartridge containing suitable chemicals, such as ammonium chloride and sodium chloride, mixed in proper proportions.

In the extinguisher shown in Fig. 1, two cylinders are employed, connected by valved branch-pipes with a water-supply pipe leading to a hydrant. The covers of these cylinders are connected by bails so that they may be quickly removed in recharging the cylinders. At their bottoms the cylinders are connected with a discharge pipe to which a hose is attached.

In the operation of the form shown in Fig. 2, the valve in the pipe connecting the cylinder with the

Love Gifts of Birds," "Cultivation of the Vanilla Bean in Mexico," etc.

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