ROCK-DRILL.—J. B. Marshall, Broken Hill, New South Wales, Australia. According to this invention the recess is made in two portions and its depth varied to give smaller escape for the air at the forward end of the piston, thus the front end of recess passing the front relief port permits not sufficient escape to cause sudden reversal of valve nor does reversal occur until a deeper part of the recess encounters the relief port. There is adequate escape at all parts of the stroke for reversing.

Prime Movers and Their Accessories.

TRACTION-ENGINE. — A. S. Wysong, Meade, Kan. The invention lies largely in the detail construction and arrangement of the transmission gear and in the frame and the bearing boxes for the shafts. Frame portions are secured adjustably in the main frame and the bearing boxes of the adjustment devices, all with the view to facilitate the adjustment of the tension of the sprocket chains.

Railways and Their Accessories.

VENTILATOR FOR CARS.—H. Van Ness, New York, N. Y. When the ventilator is properly set to the roof of a car and particularly when the car is in motion, a current of air will enter the ventilating chamber at one end and pass over the ventilators, creating a suction to draw all foul air upward and conduct it to an exit at the opposite end of the car, thus providing a perfect ventilation without drafts.

TRACK-SPREADING SIGNAL.—I. M. Bond, Tacoma, Va. The object of the invention is to automatically indicate the spreading of the rails of railways at any particular point at which the device is applied. It frequently happens that one of the rails of railways under constant usage, especially on sharp curves, is loosened and sprung outward, and if unnoticed and neglected causes derailment at this point. Mr. Bond's novel device secures the avoidance of this trouble.

SMOKE AND CINDER CONDUCTOR.—H. L. Larisey, Charleston, S. C. The aim of the inventor is to provide a conductor, arranged to conduct the smoke and cinders from the smoke box of the locomotive back over the locomotive tender and cars, to increase the draft and to prevent back draft in the fire box when the doors thereof are opened, to insure a free exhaust and thus relieve the locomotive engine of back pressure.

Pertaining to Recreation.

ADJUSTABLE SWING.—C. F. Bean, Port Tampa City, Fla. In this swing the character and degree of the tilting motion may be varied at will. The invention admits of general use, but is of peculiar value in reference to swings used for recreation and comfort, and in which an oscillatory motion is accompanied by a tilting motion.

GAME DEVICE.—F. W. Moseley, St. Hyacinthe, Quebec, Canada. The aim is to provide a puzzle of that type which is manipulated by the hands of the operator to bring rolling objects to predetermined positions, wherein magnets are employed at the various stations for the rolling objects, and to provide rolling objects attractable by the said magnets.

TOY.—W. F. Schoenhut, Philadelphia, Pa. The aim in this instance is to provide a toy in the form of human or animal figures having movable body parts, to allow a child to conveniently and readily change the position of the body parts relative to each other, with a view to give different appearances to the figures to suit the mood of the child.

PUZZLE.—R. W. Kemp, Jr., New York, N. Y. In the present patent the invention relates to puzzles, the more particular object being to produce a device provided with rolling bodies and so arranged as to enable the operator, by a little skill, to place the rolling bodies in various predetermined positions.

Pertaining to Vehicles.

AUTOMOBILE DRIVING-GEAR. — R. S. McIntyre, Riverside, Cal. The invention pertains particularly, though not necessarily, to a means for driving motor vehicles, in which a countershaft is employed with the engine or motor by certain means for driving the shaft and for changing the direction of revolution, and connected with the rear or other traction wheels of the vehicle by means of chains running over sprockets, connected with the traction wheels.

FRAME FOR AUTOMOBILES.—E. Sanchis, 60 Rue Pierre Charron, Paris, France. The object of the invention is a system of motor car with three or four wheels characterized by the special construction of its frame and its method of suspension. These arrangements permit of doing away with the ordinary construction of car-body while giving the driver's seat the form of seats used for large carriages, of suspending it comfortably and bringing to the driver the mechanism of the control and steering gears, which can be arranged in the same manner as in a large vehicle and without diminishing the simplicity of construction of the tri-car, while giving it definite solidity.

HARNESS.—W. H. Sneed, Pensacola, Fla. The purpose of the inventor is to provide shaft-supporting collars, or shaft holders for vehicles, adapted for attachment to the saddle straps, so constructed that in harnessing a horse to a buggy it is simply necessary to raise a shaft and snap the holder thereon, thereby greatly facilitating the work, since necessity of backing the animal to a predetermined position between the shafts is not necessary.

NUT-LOCK.—D. B. Hanlon, New Liberty, Ky. The invention relates particularly to improvements in locking devices for nuts on vehicle axle skeins, an object being to provide a nut lock that may be readily and quickly adjusted for locking the nut in position and as readily detached when it is desired to remove a wheel from an axle.

MOTOR-VEHICLE STEERING-GEAR.—W. E. Slater, San Francisco, Cal. In its preferred embodiment the steering road wheels of the vehicle are connected with the motor cylinder; the admission or exhaust of fluid pressure to and from the same being under the control of a multiple valve placed convenient to the driver, and the fluid pressure being stored in the reservoir which in turn is charged by a pump coupled with the engine of the vehicle or with some other suitable driving element.

COLLAPSIBLE BABY-CARRIAGE.—G. A. Svanberg, Fort Lee, N. J. The principal object of the inventor is to provide a carriage or cart propelled by hand, of which the parts are few and arranged to be conveniently packed and folded so as to occupy but a small compass and which will then be in condition to be conveniently, quickly, and easily readjusted in operative positions and securely held in place for use.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(10587) W. B. M. says: Will you kindly answer the following inquiry? Is the weight of water in a boiler "under steam pressure," additional pressure on bottom of boiler? Is the result the same when the water is above boiling heat, and when it is not? What makes a good belt dressing? A. The weight of water in a boiler under steam pressure *is* additional pressure on the bottom of the boiler, and the result is just the same when the water is above the boiling heat. Heating water does not change its weight. One-half neatsfoot and one-half castor oil makes a good belt dressing.

(10588) C. S. says: I have a blower making 100 revolutions per minute; discharge pipe is 24 inches in diameter; the blower is used for a pneumatic cash system of 75 stations. Now I would like to know if I can discharge the exhaust air from the blower into my smokestack without interfering with the draft of my furnaces. I have in use two boilers, 125 horse-power each; the stack is square, 3 feet x 4 feet 6 inches, and also has an offset a little above the center of the stack. The only place where I could exhaust into the stack now is about five feet *below* the boiler flue, that would be at the bottom of the stack. If I can't exhaust in this place, I would have to carry a line of pipe up on the outside of the building to a point above the boiler flue. Which would be the best? And would I need an elbow in the stack, so the air shoots up, or is it unnecessary? A. You do not give the height of your stack, nor the velocity, pressure, and volume of the air from the Root blower, so that it is impossible for us to make any exact calculation; but unless you have a draft very considerably in excess of what you actually require when forcing your boilers, it would not be wise for you to discharge the blower into the stack, because that would have the effect of materially reducing the size of your chimney. On account of the distance of the stack from the boilers, it is more doubtful if you have the draft to spare. In case you try the experiment, insert the discharge pipe from the blower at the base of the stack, with an elbow pointing upward.

(10589) C. J. S. says: How long is the scaling ladder in use in the New York Fire Department, and where was it invented, and how long is it in use in Berlin? Which is more improved—New York or Berlin? A. The scaling ladders used in the New York Fire Department were first used in 1883, and they run from 12 to 20 feet—12, 14, 16, 18, 20. At about the first time they were used, a very successful rescue was made by Chief of Battalion Binns. We have no information relative to the scaling ladders in use in Berlin, except that they are used. In general, we may say American-built fire engines are the best made, and we have never heard it questioned that the secondary part of the fire equipment was any less good. Owing to the methods of construction employed abroad they have fewer fires, therefore there is no such demand for improvements in fire apparatus as here.

(10590) O. N. writes us: Is a 16 candle power bulb frosted more luminous than one that is not frosted? That is to say, will one 16-candle-power frosted bulb give more light than one that is not frosted? A. An incandescent electric lamp with clear glass bulb will emit more light than one with a frosted bulb. The bulb cuts off light. No arrangement of the bulb can increase the light of the filament. It is the filament which gives the light, and not the bulb. Even a bulb of clear glass absorbs some light. One of partly opaque glass will, of course, absorb more light.

(10591) N. A. N. says: Will you please decide if there is a difference between a mile square and a square mile? I hold that a mile square is a mile around it, and a square mile is four miles around it. A. A "mile square" and a "square mile" have each the same area, but the phrases have very different meanings. A mile square is a figure one mile on each side, and all its corners right angles. A square field one mile on a side is a mile square. A square mile contains 640 acres, and may be in any shape whatever, circular, rectangular, etc., or of any irregular form.

(10592) F. A. F. asks: Kindly answer the following mathematical problem to set your readers right: We have an aquarium, a globe, 6¼ inches in diameter, 6½ inches high; the question is, How many pellets or buckshot ¼ inch in diameter will this globe or aquarium hold? A. The problem you send us may admit of a mathematical solution, but so far as we know it only admits of solution by experiment. Fill the globe with shot and count them. The globe is apparently an irregular solid. You give the dimensions as 6¼ x 6½ inches. This is not a spherical solid, and its shape is not determined by two dimensions only. The rate of curvature of its parts is not given by knowing two dimensions only. If it be assumed that the dimensions are the axes of an ellipse, then the solid is an ellipsoid of revolution and its form is definitely known. But it can hardly be assumed that a globe of glass blown by ordinary processes of the shop is an ellipsoid of sufficient accuracy to base a mathematical calculation upon. If its solid contents simply are known, the number of spheres which it would contain could not even then be calculated without more data. And if the problem were solvable, what would be the use of doing it? We are fond of working upon problems which lead to results of practical value, and though we sometimes work out problems for correspondents, which are simply puzzles, we always feel that the time is misspent, since we are beyond the age when we do such work simply for mental gymnastics.

(10593) W. H. asks: I would be obliged to you for a little information on following: Suppose we take a motor, and from the same motor get the power to run a dynamo, and place both pieces of machinery in a receptacle from which we could extract the air, and therefore form a vacuum. Do you think that we could get more return for the power expended, on account of relieving both machines of the atmospheric pressure, and by depriving the bearings of the oxygen, would they be less liable to heat? A. We know no reason to suppose that a dynamo will perform any better or worse electrically in a vacuum than in the open air. This idea has been advanced very many times. We usually reply that any one can easily try the experiment and find out if it be so. Nor has oxygen anything to do with the heating of bearings. Friction is the cause of hot bearings, and this is as operative in a vacuum as in the air. The friction of the air retards the motion of a machine somewhat. This retardation would be absent in a vacuum. The work of pumping the air out of the receptacle and maintaining the vacuum must be paid for. We feel sure that this would cost more than overcoming the friction of the air.

(10594) E. C. R. asks: If a sealed glass globe containing atmospheric air is weighed in air, and then a vacuum is produced in said globe, and the globe reweighed, will it weigh the same, or more, or less than when filled with air? All other conditions assumed to be equal, and also assumed that the experiment is mechanically possible. A. If a glass globe be weighed with air in it, and the air be then pumped out, the globe will weigh less than it did with the air in it. Air has weight just as really as iron or water. The experiment is not only mechanically possible, but nearly every high school student in the country who studies physics performs it. It is the usual method of determining the weight of air.

(10595) C. R. S. asks: 1. I understand that a pure red pigment should reflect only those lengths of waves which would give the sensation of red. Similarly with green and violet pigments. Do we possess such pigments? And further, in the case of intermediate colors, such as orange or violet, have we pigments which would give waves of nearly one length, or with the orange pigment a reflection of waves confined between the red and green, etc.? A. We probably have no perfectly pure colors in pigments, but the aniline dyes, vermilion, emerald, and Hoffmann's violet RB come very near it. Any pigment may be a combination of two or more pigments, and give a color corresponding very closely to a color in light which has but one wave length. A compound color may appear just like a simple color until it is analyzed. 2. Explain how red and blue pigments mixed give violet instead of black, as would seem to be the result. A. Red and blue give purple, as they should, and not black.

NEW BOOKS, ETC.

A Manual of Hydraulics. By R. Busquet. Translated by A. H. Peake. New York: Longmans, Green & Co. 12mo.; cloth; 312 pages, illustrated. Price, $2.10.

The price of coal has risen so steadily that the ratio of the efficiency of steam engines to their running cost has remained almost a constant, in spite of their wonderful improvement in construction and design. This has caused attention to center upon hydraulic power as a convenient energy source, especially since the developments in electrical science have enabled energy to be conveniently transmitted from the spot where it is produced to the region where it is needed. This book expounds the principles underlying the use of water-power, and discusses the application of these principles to almost every type of hydraulic prime mover in commercial use, showing the relative merits of each type and the circumstances favorable to it. The methods are simple arithmetical ones, and only a very elementary knowledge of arithmetic and geometry is necessary in order that the whole of the many examples may be followed. The measurements have all been changed to "British units," and the constants occurring in the various formulæ modified to suit the reduction. The book occupies the middle ground between the popular descriptive work and the abstruse treatise.

Theory and Practice of Pianoforte Building. By William B. White. New York: Edward Lyman Bell. 8vo.; cloth; 160 pages; illustrated. Price, $2.

The development of the American pianoforte is a study which is interesting to the artisan as well as to the pianist, since the skill of each re-acts upon the work of the other. There has not been wanting a number of writers who have treated of the history of the subject, but an exposition of the correct principles of design has not hitherto appeared in the English language, at least in a form that possesses permanent value to the American manufacturer. "The Theory and Practice of Pianoforte Building," the result of more than two years of conscientious study and research, is a work of technical knowledge in a concrete form. The general outline of the book can be explained with little detail. After a short historical sketch, follows a general statement of the laws that govern the propagation and transmission of sound. This leads to a concise explanation of the peculiarities of stretched strings and their behavior under varying conditions. From this it is but a step to the subject of pianoforte strings, their dimensions, and the manner in which they become the agents of a sound-production in the instrument. The next department is that of resonance and the resonating apparatus of the instrument. The framing that holds together the elements is next subjected to analysis and explanation, with the mechanisms of touch and percussion. The volume closes with the draughting of scales, and the calculations for shrinkage that are rendered necessary by the vagaries of cast iron.

The Steel Square Pocket Book. By Dwight L. Stoddard. New York: The Industrial Publishing Company. 32mo.; cloth; 159 pages. Price, 50 cents.

Many books have been written upon the steel square, but one of pocket size will be met with joy by all who use the tool. Although in this little volume it has not been attempted to describe all the various operations that can be performed with the steel square, the endeavor is made to place those that it does deal with before the eye by illustrations rather than to confuse the mind by complex printed descriptions.

The Architects' Directory and Specification Index for 1907. New York: William T. Comstock. Quarto; cloth; 192 pages. Price, $3.

This directory, known among architects, manufacturers, and dealers in building materials as the Red Book, has just come out for the year 1907, and is gotten up in a very commendable manner. The general list of architects shows an increase, and the change of addresses and of firms has been very considerable during the last year. The activity in building has evidently resulted in many rearrangements among the members of the profession. The list of architectural societies has