



The Diagram Shows the Vibration Caused in a Bridge Span by a Locomotive Running at the Critical Speed; the Picture Below the Diagram Shows Typical Counterbalanced Drive-wheels and the Instrument With Which the Vibrations Were Measured.

TAKE VIBRATION TESTS

ENGINEERS ASCERTAIN FACTS CONCERNING BRIDGES.

Stress Produced by Locomotive Running at High Speed Was Point to Be Arrived At, and the Result is Interesting.

Tests recently made by an engineering association throw an interesting light on the severe vibration to which railroad bridges are subjected by locomotives running at high speed. Every locomotive drive-wheel is counterbalanced to neutralize the weight of the driving rods, the counterbalancing metal being cast adjacent to the rim on the side opposite the driving-rod connection. With this arrangement it is possible to counterbalance perfectly the weight of the drive-wheel, so that with the locomotive running at either greater or less speed than this there is no vibration. This becomes a serious matter when the locomotive is running at a speed greatly in excess of that for which its drive-wheels are counterbalanced, the wheels lifting from the rails a small fraction of an inch at each revolution, and then falling back with a hammer blow. Every bridge span has a natural rate of vibration, depending on its length and construction. When the pounding of the locomotive corresponds to the natural rate of vibration the result is excessive vibration, the effect being exactly like that of pushing a swing at just the right intervals. The speed at which this occurs for any particular bridge is known as its critical speed. In the case illustrated, the maximum bending of the span under the critical speed is about 50 per cent greater than that caused by a steady load of the same amount. It has been found that this effect is practically absent for speeds under 15 miles an hour and for speeds greatly in excess of the critical speed.—Popular Mechanics.

Waste of Good Men.

Master mechanics, shop superintendents and general foremen, as a rule, work hard, too hard, in fact, in that they expend their energy in the performance of tasks which are beyond their capabilities, instead of conserving their time and ability for the solution of problems of greater weight and importance. The employment of a high-speed racer with enviable track records as a cab horse would be no more ridiculous, no less reasonable, than the assignment of routine and detail work, requiring only the intelligence and ability of a clerk or minor foreman. An executive of the capital city, and yet this very condition is found to exist on most, if not all, of the railroads, and it may be attributed in great measure to the inefficiency of the total results obtained. It is no uncommon thing to find an official of the mechanical department, a man of rare perception and judgment, possessed of great energy and ability, so burdened by the press of insignificant matters imposed on him by precedent that he is utterly unable to give to matters of prime importance the attention which they deserve.—Engineering Magazine.

1914 Motor Car Sales.

An argument against pessimism in the motor industry is shown by the fact that in six months of 1914 more than 2,000 motor cars have been registered in Massachusetts, more than during the entire 12 months of 1913, and the latter was a very good year. In the six months the Bay State has collected \$16,201 more from automobile owners than it had in the entire 12 months of the preceding year. The rate of increase keeps up more than 75,000 motor cars and trucks will be listed this year. And the revenue will total more than \$1,000,000. At the present rate approximately 100,000 will be operators of machine, or one in every 35 inhabitants.

Ink Stains.

To remove ink stains from cloth or other absorbent substance, dissolve four ounces of citric acid in two quarts of water that has been previously boiled and cooled. Then add six or eight ounces of a strong, strained solution of borax.

Forcing Vegetable Growth.

Experiments with forcing vegetable growth by electric lights have shown that plants are more productive when the lights are given off carbonic acid gas.

PROBLEM FOR THE ENGINEER

Increased Size of Locomotives Has Caused Complications That Have to Be Adjusted.

The constantly increasing size of locomotives involves increasing the weight of all moving parts, with the attendant heavy stresses set up not only in the locomotive itself, but in the track structure as well. To reduce these to the lowest practicable point, careful investigations have been carried on to determine the most satisfactory method of counterbalancing the reciprocating parts. It has been determined that to secure the minimum of oscillation and promote smooth riding of the large, heavy engines commonly used, it is necessary to counterbalance about 50 per cent of the reciprocating weights, and that the ratio of reciprocating weights to total weight of the engine should be approximately 1 to 1.60 or 1.70. This ratio is attained in many ways giving satisfactory service. Special, heat-treated steel is employed for pistons, piston rods, crossheads, valve gear connections, main rods and hollow crank pins, all for the purpose of reducing weight. Great endeavors are being made to educate firemen in the most effective methods of preventing smoke, especially near cities. As is well known, the city of Chicago has a large force of smoke inspectors, whose duty it is to observe, classify and report all black smoke produced. It is said that this service costs the city \$25,000 annually, and the railways entering there maintain a similar work, expending \$45,000 a year. Those railroads on which electric motive power has been wholly or partially installed report that employees trained in and accustomed to the operation and maintenance of steam locomotives easily adapt themselves to similar service with electric engines and motor cars. At the present time portions of fourteen steam railroads have been electrified, comprising 591.3 route miles, or a total of 1,761 miles of track.—Scientific American.

Eyes of Railroad Employees.

With the object of protecting its employees against permanent injury to the eye or loss of sight, the Baltimore & Ohio Railroad company in a circular just issued, urges that in all cases of injury or of the lodgment of foreign particles in the eye, the employee at once seek the services of a company physician, whenever this is possible, rather than attempt to treat the injury or allow fellow-employees to do so. Railroad experience cites many instances of permanent injury to the eye or total loss of sight sustained as the result of attempts by inexperienced persons to usurp the office of surgeon. The immediate securing of medical attention, it is held, eliminates the possibility of infection.

Fifty-seven Employees Retired.

Fifty-seven employees of the Pennsylvania railroad, who had reached the pension age of seventy years, have been retired by the company. Of these, 49 were on the lines east and eight on the lines west. Of those retired seven, on the lines east, had been in the service of the company over fifty years. They are Charles H. Cantwell, yard master, Wilmington; James Martin, hostler, Hightstown; William H. Krogmann, watchman, Baltimore; John R. Nowland, yard master, Chester; Mark A. McGrilla, ticket agent, Philadelphia; Harry R. Given, engine watchman, Harrisburg; and Alvan B. Conner, agent, Felton, Del.—Philadelphia Record.

Cars Serve Double Purpose.

A railroad in Pennsylvania has adopted cars that may be used either for freight or for passengers, the seats folding against the sides.

Passengers on British Lines.

During the last year 1,228,316,000 passengers traveled by the railroads of the United Kingdom.

Old Women.

Coloridge is reported as saying that there were three classes into which all the women past seventy, that he ever knew, were to be divided:—1. That dear old soul; 2. That old woman; 3. That old witch.

Mold on Books.

During continued damp weather books often become musty and even moldy. This can be prevented by placing a few drops of oil of lavender and Canada balsam in the back corner of each bookshelf.

INTERNATIONAL SUNDAY SCHOOL LESSON

(By O. E. HILLERS, Acting Director of the Sunday School Course of the Moody Bible Institute.)

LESSON FOR AUGUST 29

GOD'S CARE OF ELIJAH.

LESSON TEXT—1 Kings 17:1-16. GOLDEN TEXT—Casting all your anxiety upon him, because he careth for you. 1 Peter 5:7 R. V.

We now skip thirty to forty years to consider the first of those great prophets whose lives are recorded in length, Samuel and David fought against man, armies and giants, but these men fought engagements in the moral and spiritual realm of equal and greater importance. Emphasize Elijah as a real live flesh-and-blood hero. His work was with the northern kingdom and he probably first met Ahab at Samaria, his capital in 912 B. C. (?) The Moabite stone (A. D. 1868) is a remarkable confirmation of the Bible story of this period.

I. The Challenge, v. 1. The lesson is a great illustration of faith. Sin had again made vast forays upon the people (ch. 16:30-33) and this "man of the hour," whose name means "Jehovah My Strength," (1) saw the conditions; (2) responded to the need, and (3) had faith in his cause because it was that of Jehovah. The source of his faith was the word of the Lord God (Deut. 11:18; 32:20). He that "liveth" and before whom the prophet stood in daily, hourly communication, Elijah was a man with a mission (Matt. 28:19) who trusted in God and considered it safe to obey. His power, "according to my word," was in ratio according to his life of faith (Rom. 10:17). He was also a man of prayer (James 5:17) and showed his faith by his works (James 2:17, 20, 26).

II. The Command, vv. 2-7. Elijah's faith was not audacious. He took each step as commanded by God (v. 2). There is a time for seeming retreat as well as for the spectacular charge. Elijah's first place of testing was "Cheitah," a gorge to the east of the river Jordan. This command was contrary to human reason. "Would it not soon be involved in his prophesied drought?"

Again, ravens frequently feed upon carrion, and he knew all the regulations regarding cleanliness. Thus to be secluded would prevent his observing the effect of the drought upon both king and people. Still the command is explicit. It was "there" (v. 4), and there only, that Jehovah was to be wrought upon in the most adverse circumstances and by the most unlikely means. "So be went." Having faced the peril, God hid him to preserve him, and at the proper time God also revealed him (ch. 18:13). It was a daily testing for Elijah at Cheitah, thus to be fed and to see the water evaporating, but it was a time of communion and after the brook was dry there came a new command (v. 8, 9). We are often called to sit by and see dry-brooks but if we are in God's way he will attend to that. We do not speculate on the use of the ravens, that the record is "poetical language," or the "Urethites" (Arabians), but accept the writer's plain intimation, ravens, a common bird but a most intelligent one, especially when used and directed of God.

III. The Continued Deliverance, vv. 8-16. Zarephath was (Luke 4:26) in the dominions of Jezebel's father, on the coast of the Mediterranean sea between Tyre and Sidon, a dangerous journey for Elijah through Ahab's kingdom (ch. 18:10). The word Zarephath means "smelting furnace," and it too was suffering from this same famine. Commanded to hide in Cheitah Elijah is told to "dwell" in Zarephath and that a widow was to be the agent to supply his need. Again Elijah's pride had to be overcome for there were abundant reasons for disliking such a journey, such an abiding place and such a dependence upon a poor widow. Elijah, however, "arose and went," a continuance of his life of obedience. He first asked for water and as she went he added his request for food. It was a particular widow to whom he was sent (Luke 4:25-27) and through her God was ready to work a miracle of salvation on his behalf. Thought about to prepare what she thought was to be her own and her son's last meal (v. 12), yet she at once proceeds to obey the command of the man of God as it was conditioned upon the word of Jehovah (v. 14). God, through his prophets, has commanded us, given us assurance and promised to sustain (Phil. 4:19), yet we hesitate. "She went and did" the seeming impossible, but according to the word of command, and those of her house did eat many days. Obedience saved her own, her son's and the prophet's lives. There is sound philosophy in Prov. 11:24 which found its complete fulfillment in Jesus who "came not to be ministered unto but to minister." Read carefully Prov. 3:7-10 and II Cor. 9:6-11. As with the Israelites in the wilderness the supply was only from day to day (v. 16) nothing ahead, no accumulation, yet a perpetual supply because based on "the word of the Lord" (v. 16).

God worked this miracle: (1) to uphold and to preserve his chosen messenger for his great work in Israel; (2) to show his loving kindness and sustaining grace to the poor; (3) to strengthen the faith of his prophet against his spectacular conflict on Mt. Carmel; (4) to the end that he might show Israel and all others down through the ages a great object lesson of his sustaining grace and providence. The returning food crops of the world each year are his unflinching proof of blessed provision. His word is as sure today as it was 2800 years ago, and in the unflinching grace from which we may obtain spiritual nurture each day. God's love and the holy spirit (typified by the "oil" v. 18) are his unending gifts for the sustenance of his which he gives us abundantly. He will also give us...

NOTICING NEWS

REVOLVING LADDER IS HANDY

Fruit Picked Without Damaging it or the Trees Which Bore It—Applicable to All Orchards.

The scientific picking of fruit requires that the operation should be performed without damaging the tree, which often occurs when ladders of the ordinary design are thrust into the branches. The revolving ladder support has been invented and patented by a California orange grower. While the idea is applicable to all orchards it is particularly suited for the orange grove, where the crop is not gathered at one time as in other fruits, but is collected at a number of successive pickings. A peculiar characteristic of the orange tree is that it frequently has on its branches fruit in many different stages of development, all the way from the bud to the ripe fruit.



Permanent Ladder for Fruit Trees.

The oranges are picked at different times, the occasion being influenced by the convenience of the grower and the condition of the market. There would be, therefore, more incentive to the owner to erect permanent supports of this character among the orange trees than in an apple orchard, for instance where the entire crop is removed at one operation. Then, too, the orange trees are more fragile than other trees, and the grower must necessarily exercise more care. The apparatus consists of a shaft with one end buried in the ground near the tree trunk and extending upright through the tree. The top is fitted with an arm horizontal with the ladder thereto. This device may be swung all around the tree so that every part may be reached and the fruit picked without disturbing a leaf.

RED RASPBERRY SPUR BLIGHT

Disease Recognized by Irregular Brown Spots on New Canes—It Can Be Controlled.

(By WALTER G. BACKELL, Colorado Experiment Station.)
Red raspberry spur blight makes its appearance about the middle of July and can be recognized by the irregular brown spots on the new canes. The fungus which is responsible for the discoloration invades the tissue surrounding the buds from which the fruit spurs arise and either destroys them outright or prevents their further growth and development. The disease can be controlled satisfactorily by spraying the young canes with bordeaux mixture when they are six to eight inches high and every two weeks thereafter until the picking season. The old canes should be removed as soon as the crop has been gathered, and a final application of the spray material should be given at that time. For this work we recommend an adhesive bordeaux mixture having a formula 2-2-50 and containing two pounds of resin fish oil soap to each 50 gallons.

BEEES IN THE FRUIT ORCHARD

Buzzing Little Honey Gatherers Are True Partners of Orchardist—Results of Work Plain.

H. W. Collinwood of the Rural New Yorker, says: "We can easily forgive the bee his short working days when we consider the good he does. There is no question about the debt fruit growers owe him. People talk about the wind and other insects in fertilizing our flowers, but I am confident that any man who will really take the time and pains to investigate for himself will see that the bee is nearly the whole story. I have seen the certain results of his good work in a neighbor's orchard. Those bees broke the trees down just as truly as though they had climbed on the trees to the million and pulled at them. The appearance of those bees after a few years of bee keeping would have convinced any fair-minded man that our little buzzing friends are true partners of the fruit grower."

The Orchard Location.

The north side of a hill is the best location for an orchard, because changes in temperature are not so great as elsewhere. On south slopes the buds start too early in the spring, cold air descends in hollows and closed valleys and is likely to kill the young buds. An orchard near a lake or large pond is not likely to be injured by frosts, because the water tends to make the temperatures more even.

Make Good Cuttings.

Grape cuttings can be made from the largest and best developed wood of the past year's growth. They should be cut into pieces about eight inches long, having at least two buds, and packed in damp sand or moss in the cellar until planting time this spring. Make cuttings as early as possible.

Keep Roots Moist.

One of the most important things to observe in starting an orchard, and in keeping it, is to keep the roots moist.

much of our coffee, because the berries are sweeter for days, before the berries are finally swept up and harvested, greater care would be exercised in purchasing this food. For this coffee is impure. But its moldy color is lost in the roasting, and the partial decay is concealed until it comes up harsh and bitter in the cup. This fact is not generally known to importers, for few of them have studied conditions existing prior to the arrival of their ships in port.

So writes F. C. Harwood. And Mr. Harwood knows. His long experience in the tropical coffee growing countries, his deep intimacy with plantation owners, his close study of their customs, their methods, and the "tricks of their trade" has acquired for him a fund of knowledge which places him far in the leadership of coffee connoisseurs, both here and abroad.

Denison's Coffees are selected by F. C. Harwood, personally, and it is here that his power in the Coffee Industry manifests itself to the qualification of Denison's Brands. His wisdom and critical discrimination is appreciated by Coffee Growers the world over, and their respect gives him first choice of the world's finest crops. Thus, only pure, hand-picked berries find their way into Denison Coffees. His care is your safeguard against impurity.

Try Denison's and realize your ideal Coffee put up in Cans, Cartons or Bags. Ask your grocer or write Denison Coffee Co., Chicago, for the name of the nearest dealer.—Adv.

AUTO HORN JERICHO TRUMPET

Does Not Make Any Walls Fall But Signals Smashing of Speed Laws.

"This lady has a Jericho horn on her auto." Patrolman Holmuth made this accusation to Recorder Gaskill against Mrs. E. B. Frost of Philadelphia, passing the summer at 110 South Dorset avenue, Chelsea. Students of the Old Testament will remember that when Joshua and his hosts blew the thum auto siren the walls of Jericho fell. Mrs. Frost denied indignantly that she broke any walls, even though Holmuth charged that 40 miles an hour is a lame gait when Mrs. Frost drives. "Five dollars fine," said Recorder Gaskill genially. "A warning, this time. Try to add to the city's quietude by muffling that Jericho horn, I beg of you, madam."—New York World.

See Sleds for Coast Defense.

Sled sleds are the latest craft to be considered by the United States navy for coast defense work. The navy is experimenting with a half-motor boat, half-hydroaeroplane, which neither flies over the water nor cuts through it, but slips along its surface. A 24-foot boat of this type has made 24 1/2 miles an hour at a very test. It is hoped to obtain a boat that will carry men at 55 or 60 miles an hour. It is said 200 of such craft could be built at the cost of a single scout cruiser and would be much more effective.

Novel Billiard Tables.

Billiard tables supported on solid rock are among the novel features of a house on one of the islands of the San Juan archipelago in Puget sound. Each table rests on a massive concrete base which extends through an opening in the floor and has its footing on bedrock, and is therefore as solid and as free from vibration as if it were a part of the island itself.

Unexpected Reply.

"Ethel, do you know you have hair just like your mamma's?"
"Oh, no, I haven't. I can't take mine off!"

Heed the teachings of adversity if you would avoid a second lesson.

Certain-ty

Roofing

This roofing is the highest quality available in the world and it is guaranteed 5, 10 or 15 years, for 1, 2 or 3 ply covering. When once laid, Certain-ty roofing never needs to be replaced for the reason that the guarantee is a definite insurance against all roofing troubles.

For sale by dealers everywhere at moderate prices.

General Roofing Manufacturing Company

Works largest in the world for the manufacture of roofing materials.

New York City, Chicago, Philadelphia, St. Louis, Boston, Cleveland, Detroit, The Francisco, Cincinnati, Minneapolis, London, South Africa, Adelaide, Melbourne, Sydney, Perth, Australia.

MORE USES FOR AEROPLANE TRIBUTE TO THE CANDIDATE

May be Made of Immense Value for the Purpose of Exploration. Had Known Him All His Life and Didn't Know What He Looked Like.

The announcement that Sir Ernest Shackleton has taken an aeroplane to the Antarctic calls attention to the possibilities of flying machines for exploration purposes. The rapidity and ease with which an aeroplane can travel over large tracts of country makes it a very useful machine for penetrating into strange country untried by civilized people, and Sir Ernest Shackleton has probably recognized this fact as did Capt. Amundsen who, a short time ago, equipped his North pole expedition with a flying-boat. Apart from Arctic exploration, however, the aeroplane is believed to have a great future as a discoverer of hidden treasure. Somewhere in the wild regions of Central Guatemala a gold mine of immense richness is said to exist. The routes across this country are practically impassable to travelers on foot, as forests of impenetrable growth, swarming with wild beasts, bar the way. A scheme is on foot, however, for an aviator to ascend from the borders of Mexico and make a bold dash into the heart of this wild country in an endeavor to solve the legends concerning its mineral wealth.

For many years explorers have been endeavoring to locate the site of Manoa, a city rich with gold and silver mines, which is said to exist in Venezuela. Ancient charts state that the treasure is in the vicinity of the great Lake of Parime, but at present it has not been traced. Here again the wild nature of the country is all against exploration on foot, but an aeroplane could surmount such difficulties, and a chart for the guidance of an aerial explorer in search of the city of gold has actually been prepared.

Over 50 years ago the Great Stony desert of Australia swallowed up the famous explorer, Leichardt. The mystery of his fate has never been solved, but an aviator could probably do so, if one could be found plucky enough to attempt a hazardous flight across the waste land which holds the secret of Leichardt's disappearance with his companions.

The scope for the aerial explorer is wide. There are thousands of miles in Arabia where no white foot has trod; the heart of the Sahara desert remains uninvaded, and in Alaska and Brazil there are large tracts of unexplored territory so well guarded by nature that only an aviator could invade them.

Our idea of a mean woman is one who refuses to pay the doctor after he has converted the late lamented's insurance policy into ready money.

The Nervous Ostrich (trying to follow an introduction with good conversation)—And—how is your wife in these trying times?
The Nervous Ostrich—My wife is in the hospital.
The Nervous Ostrich—In the hospital?
The Nervous Ostrich—In the hospital, of course; I've exceedingly pleasant time in it; I take it, then, that your wife is single, too.—London Sketch.

Quite Easy.
"I hear Jim is going to organize an aeroplane enterprise."
"He ought to find it an easy matter to keep his stock soaring."

A perforated rubber fly swatter has been invented, having the advantage that it will not scratch furniture.

On Time for Breakfast

New Post Toasties

Ever know a real boy who wasn't on time for meals when there was something he liked? Boys are always ready for breakfast when they're going to have the

These delicious, new corn flakes bring to your table all of the delightful flavour of sun ripened corn. They're made by a new method that keeps them crisp and firm even after cream or milk is added—they don't mush down as other corn flakes do.

Notice the little pearl-like "puffs" on each flake—a distinguishing characteristic; try them direct from the package without cream or milk and you'll get the real corn flavour.

Price is Right
Fit is Perfect
SHOE ST...