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Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Ant lion, the', 'Archaeological discoveries', 'Business and personal', 'Cholera and macaroni', etc., with corresponding page numbers.

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 458,

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Table listing sections I through VIII, including 'I. CHEMISTRY AND METALLURGY', 'II. ENGINEERING, MINING, ETC.', 'III. ELECTRICITY, ETC.', etc., with page numbers.

LEVELING AND LINING SHAFTS.

With the best of care, the main line of shafting and the intermediates and counters will sometimes get "out of kilter," from several causes. It is difficult to make a building perfectly secure in its foundations and superstructure; the walls settle, the foundations may be affected by frosts and by profuse rains, the floors become unlevel; the main shaft is unduly loaded and unevenly pulled by newly added machinery; oil holes become clogged, and other small causes may combine to disturb the relations of prime mover, main shaft, and the other lines that are intermediate between main shaft and machines.

It will not pay to go over the entire work of hanging the shafting as originally done, so some data should be established at that initial period to rectify by, when minor changes occur. It is a very good plan, therefore, after lining out, or squaring out from the prime mover to the main shaft, to keep the lines. In practice the writer has found that the brass nails, convex-headed, which are used for ornamental furniture purposes are good, or copper tacks, either of them being driven into the floor at convenient distances to designate the exact lines, the lines having been originally found by the plumb bob.

If these brass-headed or copper-headed marks have not been left on the floor from the original lining of the shafting, they should be made subsequently, taking, by square, the central line of the engine as a basis. This square having been established, plumb from the center of one end of the shaft or from one side of the shaft, and then at intervals to the other end. By drawing a connecting chalk line on the floor a determination of absolute line may be made by squaring to the engine. Of course, when the main shaft is lined all the other shafts may be brought parallel with it by means of rigid reachers, as light wood staffs, or flexible ones, as linen tape lines.

A shaft may be in line with the prime mover and in relative line with the intermediates, and not be right. It may be, also, perfectly straight, so that a line stretched from end to end through the boxes would show no deflection, and yet not be right. The shaft should be level; and then, if the pull on it is evenly balanced, or nearly so, there will be no "creeping," even if there are nether coupling hubs nor stay collars set up against the ends of the boxes to prevent end movement.

A handy implement for leveling the shaft can be made in any carpenter's or patternmaker's shop. It is a frame, well braced, made of light wood, pine or spruce, consisting of two upright arms of a length sufficient to reach from the shaft to the operator's shoulder. These have at the upper end a cross piece secured at a right angle, or an angle somewhat more acute, so that the elbow thus formed would embrace or rest on the shaft. These uprights are connected by cross bars at a convenient distance for handling the uprights and for reaching between pulleys, so that each upright can rest on the shaft. The lower cross piece should carry a spirit level, or one may be carried separately to use with the appliance. It is evident that the frame must be strongly braced to prevent any "wibbling," or sagging, and that the lower, or spirit level, bar must be at an absolute and exact distance from the forked ends of the upright. In use, the shaft to be tested must be at rest.

With this simple implement the exact level of a shaft may be found, or rather any deviation from the level may be ascertained. A combined level and plumb, such as is used by carpenters and masons, can be used to determine the accuracy of the implement at any time. It is handy to have in the shop.

TURNING METALS TO PATTERNS.

A workman in a machine shop had a job of turning, tapping, and finishing some ornamental brass nuts of an almost globular form—hemispherical with a moulded base. At first he drilled into the end of a bar of the metal of the proper diameter for finishing, tapped the hole, cut off the nut in a lathe, mounted it on a threaded arbor, and finished it with a hand tool. Each nut was treated separately. It was a process too slow to suit his tastes; and after ascertaining that the job would extend to several thousands of dozens of nuts, he obtained permission to contract for it. He procured the use of a lathe and a turret head screw machine. He removed the transverse feed screw of the tool carriage of the lathe, and substituted a strong spring.

On the back of the lathe he mounted a guide for the tool carriage in the form of a series of steel plates with scalloped edges mounted on a horizontal spindle. There were

four of these plates, each successive one having deeper indentations, until the fourth one presented a profile of the almost completed nuts. The spring held the tool carriage firmly against one of these scalloped guides, compelling the cutter to make a chip in accordance with the profile of the guide. The successive guides had indentations, or scallops just suited to the taking of a fair chip. The bar to be turned and the guides were of the same length. Soon as the tool carriage had reached the end, a star wheel and pin changed the pattern or guide. At first the lathe was allowed to stand still until the tool carriage was again returned to its starting point, but after a while a simple attachment reversed the longitudinal feed automatically, holding back the spring until the tool carriage came into place, thus making the lathe an automatic machine.

When the bar was turned into the nuts, they still, however, being slightly connected by their necks, they were broken apart and each one put separately into the chuck of the turret head machine, drilled, squared at one of the ends, and tapped. For the finish, a short threaded arbor was inserted in the chuck, the nut mounted and polished. The practical machinist will readily understand these processes and the increase of rapidity caused by the automatic turning and the use of the turret head machine, which carried all the tools ready fixed in place for use—the drill, the squaring up bit, and the tap.

It seems to be apparent that an extension of this method of turning to pattern steel, iron, brass, and other metals is feasible, and might be applied economically in many instances where reproduction of forms is required from the lathe. It is a modification of the Slate taper attachment to lathes, and is carrying only a little farther that principle which has already been extended to the crowning of pulley faces and the finishing of iron hand wheel handles.

Car Couplers on Massachusetts Railways.

According to the provisions of a law enacted last winter, requiring Massachusetts railroads to adopt safety couplers on all new freight cars after this year, the railroad commissioners of that State devoted Sept. 25, 26, and 27 to a consideration of the claims of various styles of couplers for superior excellence. There were applications for the examination of 173 different couplers, which were called up in alphabetical order according to the names of their inventors, some of whom were represented by counsel. In so long a list of course only the merits and demerits of each can be but briefly touched upon in the following synopsis of the results of the examination:

Among those presented were the Archer (hook and link), which has been in all the tests, and is recommended by the National Car Builders' Association for further trial. It has been in use on 100 cars of the Delaware and Hudson for two years, also on the Lackawanna. It couples automatically with itself and all others.

The Ames coupler is a combination of link and hook, fixed, automatic with itself but not with others, and was represented as strong, durable, unailing; it has been in use on 150 Boston and Albany cars four years, and about 50 Lake Shore cars six years; has not broken for two years; costs, all steel, \$20 a car; malleable iron, \$18; iron, \$14. The patent has been passed upon by both the Eastern and Western Railroad Associations. Mr. Adams, the master car builder of the Boston and Albany, testified to its success, and in reply to a question by Chairman Russell, said he should prefer it to any other if all roads would adopt it.

The Best automatic has link and pin, couples with "anything or nothing," uncouples easily without much slack if desired, and never if not desired, and both the link and pin are adjustable by one lever and with use of only one hand. The promoter said it was open to only one objection, and that was a loose link, which is liable to get lost or stolen. The pin is protected from ice and gravel, and free from breakage. Total weight, 250 pounds; cost, \$11.20 a car, exclusive of royalty. The pin is flat and broad. It is in use on 12 cars of the Denver and Rio Grande, where it has stood the severest possible tests. No cars are here.

The Barnes automatic couples by a hook underneath the head, movable from six different standpoints, works on shortest curves, and will uncouple at an angle when a car tips over. Eight pairs are in use on the Rochester and Pittsburg.

The Brown automatic has link and pin, and works in a double head (for high and low), inside of which is a simple device, costing only 15 cents, with gives the automatic action. Fifty cars equipped with it are in use on the Chesapeake and Ohio, and some on several other roads. The pin is fast, does not bend or break, and ordinary links are used. It will require new drawheads on most roads.

Byron's self-acting coupler is of the hook variety, somewhat like the Miller, but the hook has a deeper angle. The cars stand but 27 inches apart, while with others they are from 26 to 42. It will couple and uncouple on the shortest curve in use. It has been tried on one of 56 feet radius, and with both hooks drawn back there were 8 inches of space to spare. It will not couple automatically with other kinds.

The Beal coupler, link, and pin, the latter secure, works automatically with all, and is in successful use on the Florida Railway and Navigation Company's roads.

The Boston automatic comes from Minneapolis. It is of curved vertical hooks, automatic with each other only. Couples and uncouples easily; is strong, safe, and durable. It costs about \$30 a car, exclusive of royalty.

The Charles C. Burton coupler, link, and fast pin, works automatically with all others, is operated from sides and top, and costs about a quarter more than ordinary draw-bars.

The Carman Ball coupler has a fixed ball on the end of the drawbar, which enters opposite drawhead. It has not been in actual use.

The Conway ball coupler has a loose ball in each draw-head, uses link but no pin, works automatically with others, and costs about \$10 a car. It can be worked from side or top, but promoter said good railroad men object decidedly to working any coupler from the top of the car, as being hazardous and unnecessary. This coupler is one of the eight recommended by the master car builders for further test. It is in use on numerous roads. Two letters were read showing wherein it had failed, by the breaking of its working lever. Commissioner Kinsley remarked that it would have to be seen.

The Eureka coupler is automatic; is in use on the Grand Rapids and Indiana road on 400 cars, and has been for three years. Certificates from officers at the West were read.

W. L. Everett's coupler has been in use on the New Haven and Northampton road 18 months.

W. H. Flagg's attachment to the old fashioned pin and link coupler was explained.

Gifford's automatic coupler is in use on the Michigan and other railroads. It is a combination of a quarter circle and an inclined plane. Its cost in cast iron is \$8 per car; in malleable, \$13; and in steel, \$16. It is used on 8,000 or 10,000 cars now in service, and is the standard draw bar of the Erie Railroad. That road has 2,000 cars with it attached. Several other roads were named where it is used.

Manly Howe's coupler was shown in model in a new form. It has been tried successfully on the Albany road in another form, of which the new one is an improvement.

The Hatfield coupler has been tested satisfactorily on the Boston and Maine Railroad.

W. S. Huntington's coupler is in use on two cars on the Erie Railroad.

A. B. Holme's coupler has been used with great success on coal cars running from Scranton, Pa.

The Hine coupler has been used on the Chicago and Rock Island Railroad, the New Haven and Northampton, and two other roads.

R. Hitchcock's coupler has been used nearly a year on the Connecticut River Railroad; costs \$9 per car.

Hilliard's coupling is in use on the Grand Trunk road and the New York and Northern, and one other road.

Charles M. Hoag's coupler has been used to some extent on the Boston and Albany Railroad.

Hubbell & Co.'s coupler is a balance weight to hold the link level. No hooks, chains, bars, or rods are required, and it is improved by being made hard and smooth by use. It cannot be banged to pieces in 100 years. The St. Johnsbury and Champlain Railroad have used it 27 months, all the time, having but a scant number of freight cars on their road.

John Howe, Jr., showed a device for adjusting the ordinary coupler from the outside of the car.

The Janney coupler was explained at some length. It is in very general use. Among the roads having it are the Chicago, Burlington, and Quincy, the Chicago and Alton, and the Pennsylvania road. The latter has 3,500 cars equipped with it. Cars furnished with it cannot be telescoped.

Charles K. Cordrey presented the merits of his attachment for coupling and uncoupling. He had not made arrangements for exhibition on any railroad, nor is his apparatus in use on railroads.

W. Emmett showed his model for easy shackling and unshackling of trains, which he claimed greatly simplifies the work of the train men and reduces the danger. He had just got his patent, and had no car on a railroad in use with his apparatus.

Mrs. Susan P. Moulton showed a coupling of simple construction and low cost.

The Maulick coupler was shown. It is an attachment to the old-fashioned link and pin. It works with a spring, and is in use on a coal railroad running from Pittsburg, Penn., since February. The link and pin coupler, the exhibitor thought, will not go out of use for a long while, and this attachment makes it automatic.

Henry Mitchell showed a simple coupler, which is not yet in use. It costs \$18 or \$20 per car.

T. B. Nutting's coupler unshackles from the top of the car, and in case of accident will uncouple itself.

Simeon Nichols' apparatus works with a link and pin, and is easily manipulated from the top or side. It has been used on the Boston and Maine Railroad.

H. M. Sturgis' coupling is a coupling without a link or pin. It is of simple construction, and was patented last June, but is not yet in use.

Peck's coupler was shown. It has been tested on the Wheeling and Lorraine Railroad, and its superintendent certifies to the merit of the device.

The Marks coupler was explained, but the model was not shown. It is in use a year on the Cleveland road. A link is used, but not a pin.

The Loraine coupler was shown. It works automatically, and can be operated when there is a tension on the train. It is not yet in use.

The Leonard and Snow coupler was shown as very simple and at low cost, but not yet in use.

Powell's perfect coupler. It is in use on the Southern Kansas and on the Atchison and Santa Fe roads to some extent for six months past.

James Scofield's coupler was shown. The Texan Pacific road has had it in use five or six months. A certificate from the superintendent was read. The cost will not be more than \$1 a car.

The Skinner car coupler works with a link and pin, and is a new adaptation of the old style coupler. It is of recent patent, and is not yet in use.

Turner's coupler works in with the regular system and couples with any other. It has a hook and lever. Its cost is 60 cents. It has been used hauling freight trains of 30 and 35 tons per car, running over Alleghany and Ozark Mountains. The St. Louis and San Francisco and Baltimore and Ohio use it.

It appeared in answer to questions put by S. W. Hatheway, attorney for the Boston Automatic Car Coupler Company, that the Hine coupler claimed to be almost identical with the Boston automatic car coupler, and that the Janney coupler claims to have originated whatever is good for anything in the Hine. The Hine is in use on the New York, New Haven, and Hartford and the New Haven and Northampton railroads and others. It seems that in the use of the Janney coupler it is necessary for a brakeman to go between the cars and throw out the loose pin, so as to leave it ready to couple, and that this is not so in the Boston automatic. All three of these couplers are automatic swing hooks, dispense with links and pins, and couple with old style, and all three are anxious for tests.

Among the other couplers explained were the United States and the Union, both in extensive and successful use in New England; the Smillie, link and pin, in use on the Lackawanna; the Robinson, link and hook pin, patented July 22, 1884; the Thomas Wood, of London, Eng., hook and link; the Williams, patented last April, to be tested on the Fitchburg; the Wilson & Walker, of Fitchburg, combined link and hook, much like the Ames, but will uncouple by raising either link; the P. Ware, link and pin, automatic with others, costs \$6 a car, not yet in use; the James C. Bond, hook, automatic with itself, not yet in use; the Titus, hook like Miller, except that it swings, couples automatically with other hook designs except the Janney, and is in limited use on the Chesapeake and Ohio; the Colburn, which is an improvement on the Miller; the Vance, new and not in use; the Breyhan attachment, common link and fixed pin; the National link and pin; the Coombs, automatic, hook and link; the Prescott, in limited and successful use on Central Vermont; the Stebbins, hook and link, automatic with itself; and the M. Ross, opposite hooks, catching into draw-heads, and both to be lifted to uncouple.

Many of the devices were strikingly ingenious, and a few seem to have come very near perfection, and will bear close study and careful tests.

The commissioners accompanied by nearly the whole party of inventors and promoters and by a few practical railroad men made a tour of the railroad yards of Boston and vicinity. At East Boston they saw tested the Mark and the United States. Both scored successes, and elicited much admiration. Of course nearly all present were in a critical frame of mind, and some were not backward in pointing out what they considered defects. The Mark coupler failed twice in coupling with ordinary drawbars—once on account of a link being so bent that there was not room for the hook to enter, and the other time because the concussion displaced the raised pin in the opposite car. The United States failed two or three times—once when the force was so great that the car on which it was placed was thrown back, and once when a low link was propped up so as to strike the lifting device of the pin at its highest point. In the former case it was explained that the car should have had the brakes set, or the approach should have been more gentle; in the latter it was claimed that the force was insufficient, as more is required when the link strikes the dog at the top. A train hand said that the failures were wholly exceptional. Some of the inventors, however, shook their heads, and said that the device required too nice an application of link and power; in other words, that it must be struck at just the right height and with neither too much nor too little force, or it would often fail. Aside from this it was generally admitted to be a good coupler. The promoters of it were quite annoyed by what they said was an unheard of slip in its working, and they will doubtless ask to have it observed in actual use.

In the Fitchburg yards tests were made of the Janney (hook), the Boston of Minnesota (hook), the Williams of Brattleboro, Vt. (hook with a second shoulder), the Robinson of Ohio (link and pin), the Smillie of Newark, N. J. (link and pin, both attached), and the Archer (hook and link). All worked well, and almost equally well, but the tests were few, and could have served only to impart a general idea of the devices in action. After the commissioners have seen all and brought their preferences down to a few, they will necessarily subject them to longer and severer tests, or, better still, take the testimony of the train men and yard masters who have worked and observed them under all the circumstances of ordinary use.

At the Lowell Railroad, half a dozen varieties of couplers were tested. All the tests were substantially alike, and consisted of pushing one car slowly against another, and at another time throwing one car swiftly against another. Ef-

ports were thus made both to couple and to avoid coupling. The Ames automatic coupler of Canada was first tested. It consists of an inverted hook, which catches and holds the link automatically. This coupler worked well. The Byron coupler was not shown. It consists of a hook, which couples with the standard link. The Conway ball coupler, which has a loose ball in each drawhead, was the third one tested. It uses the link, but replaces the pin with the ball. It was one of eight recommended by a committee of the master car builders. The next shown was the Hubbell, which was a balance weight to hold the link level. The Union is too well known in this vicinity to need much description. It consists of a long latch fastened in the drawbar, which drops down of its own weight into the standard link. The Prescott is another invention using the link and hook. All the above worked satisfactorily in most of the tests to which they were subjected. The freight yard of the Boston and Maine was next visited, and tests made of the Holmes coupler, which uses a hook in place of the common pin. It worked well.

At the yard of the Boston and Providence road cars were examined which were equipped with the Cowell coupler. This is one of the eight recommended by a committee of the Master Car Builders' Association. It consists of a hook working horizontally, and does away entirely with the link and pin. It is similar to the Janney coupler, but has the advantage that it can be uncoupled from either car. The tests were eminently satisfactory, not a single failure being recorded. From this place the commissioners proceeded to the Boston and Albany's freight yard, west of Huntington avenue. The Ames coupler was first tested; it has a link of a peculiar form, the lower side having a "lug" or projection which enters the link of the next car; the link is weighted at the rear end, and is thus kept level. The Ames is another coupler recommended by the Master Car Builders' committee. The tests resulted very satisfactorily. Charles M. Hoag's coupler was next tested; it uses the standard link, and a double pin is the principal point of novelty. The Hitchcock coupler was the invention of the master car builder of the Connecticut River Railroad. It uses the standard link and a pin shaped somewhat like a half moon, which is worked up and down by a lever, though the pin works automatically by contact with another coupler. The Hein coupler has a horizontal hook, working automatically with one of its kind. Most of the tests of the above were satisfactory in their results.

The Old Colony freight yard in South Boston was next visited, and the Wilson automatic coupler, another of those recommended by the Master Car Builders, was first shown. It is very like the Ames coupler, but it was thought had some decided improvements, one being that it can be uncoupled from either car. The tests demonstrated that it is an excellent coupler, certainly equal to any shown during the week. The Davidson coupler, using the standard link in connection with a pin of a peculiar shape, was tested with satisfactory results.

The freight yard of the New York and New England road, on South Boston flats, was the last place visited. Turner's coupler was tested on four cars of the Baltimore and Ohio railroad. It uses a link and vertical latch or pin, but, as a special link has to be used, it is scarcely probable that it will come into general use. One gentleman said that it was a step backward. The tests were only partially successful, and utterly failed when a standard link was used. Peck's coupler was next tested. It uses a pin and link, both fixed, and the tests were quite satisfactory. A coupler patented by Mrs. Susan P. Moulton was the last one tested. It consisted of a barbed tongue, the barbs on two couplers coming together, catching each other. It worked only partially successfully.

At all the tests a large number of gentlemen were present, and many brakemen watched them with special interest, expressing freely their views, which appeared most favorable to the most simple styles of couplers, and any coupler that used automatically the link and pin especially commended itself to them.

#### To Make Koumiss.

Koumiss is considered a good restorative, and is undoubtedly a help to digestion. It can be made by any one. The following directions for making it are from the *Weekly Medical Review*:

Fill a quart champagne bottle up to the neck with pure milk; add two tablespoonfuls of white sugar, after dissolving the same in a little water over a hot fire; add also a quarter of a two cent cake of compressed yeast. Then tie the cork on the bottle securely, and shake the mixture well; place it in a room of the temperature of 50° to 95° Fahrenheit for six hours, and finally in the ice box over night. Drink in such quantities as the stomach may require. It will be well to observe several important injunctions in preparing the koumiss, and they are: To be sure that the milk is pure; that the bottle is sound; that the yeast is fresh; to open the mixture in the morning with great care on account of its effervescent properties; not to drink it at all if there is any curdle or thickening part resembling cheese, as this indicates that the fermentation has been prolonged beyond the proper time. Make it as you need to use it. The virtue of koumiss is that it refreshes and stimulates, with no after reaction from its effects. It is often almost impossible to obtain good fresh koumiss especially away from large towns. The above makes it possible for any physician to prescribe it.