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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

MANEUVERING POWER OF TURBINE STEAMSHIPS.

Gradually the disabilities under which the steam turbine labored at its first introduction are being removed; and, when we bear in mind that the practical steam turbine is still in its youth, it must be confessed that the development to perfection is very rapid. The latest success is recorded in connection with the new channel steamer "Dieppe," which has recently been built by the London, Bright and South Coast Company, in association with the Western Railway of France. These two companies having in view the supposedly poor maneuvering qualities of vessels driven by the steam turbine, decided, in placing the contract for the new steamer, to impose exceptionally severe conditions in the starting and stopping tests. A clause was placed in the contract requiring that, as part of the acceptance trials, the boat must be required to pass a certain mark at a given speed and be brought to a state of rest before passing a second mark boat placed at a specified distance from the first boat. The conditions were considered to be so onerous that there was considerable difficulty in getting a bidder, the contract finally being placed with the Fairfield Company. The two mark-boats were moored at a distance of 100 meters, or 109 yards, and the steamer passed the first boat at slightly over the specified speed of twelve knots an hour. The turbines were at once reversed, and the steamer stopped and began to go astern a few yards short of the second mark-boat. It is stated that the time taken in coming to a full stop was 40 seconds. This is an excellent performance for a vessel driven by screw propellers, and places the turbine steamer well on a par in respect of its stopping ability with those driven by reciprocating engines.

In this connection it is gratifying to observe that the value of turbine propulsion for commercial vessels is beginning to be recognized by our steamship companies; for in addition to the turbine steamer recently ordered for a steamship line running between this city and Boston, the Southern Pacific Railway has recently ordered a freight and passenger steamer for the Morgan Line, whose motive power will consist of Curtis turbines. The new vessel will be of considerable size, with a length over all of 440 feet, a beam of 53 feet, and a loaded displacement of about 10,000 tons.

STEEL CARS AND SAFE TRAVEL ON STEAM RAILROADS.

The time has certainly come when the steam railroads of this country should commence systematically to remodel their rolling stock, at least as far as the passenger cars are concerned, and this remodeling should take the form of the introduction of the all-steel car whenever new equipment is ordered. From whatever point of view we look at it, the all-steel is superior to the wooden car. It is stronger, stiffer, and if it be made with careful attention to the design, lighter. It is pre-eminently safer for the passenger, for it simply cannot be telescoped; and it is absolutely fireproof. When the New York city subway was opened, the management had the foresight and courage to adopt the all-steel car boldly as its standard type. It took courage to do this, for it was the common impression that steel cars would be far more noisy than those built of wood, and it was generally believed that such cars would be stiff and formal in appearance, and would not lend themselves to successful interior work. The popularity of the Subway steel cars and their general behavior in service have fully justified their introduction in the Subway. If anything, they are less noisy; they certainly run with greater steadiness; and, for our part, we confess that perhaps because of their hygienic appearance they give an impression of greater cleanliness. The Subway people are so well pleased with them that, as fast as the steel cars arrive, the wooden type is being withdrawn, and before long there will not be a wooden car left in the whole system. It goes without saying that the strongest recommendation of the steel car is the great protection it affords to life and limb. During the Subway strike it was demonstrated in certain collisions that occurred between trains made up of alternate steel and wooden cars that the energy of the collision was expended in crushing up the wooden cars, those built of steel coming through the ordeal practically intact.

The loss of life in collisions on steam railroads has been due chiefly to the telescoping of the cars and the subsequent fires that have broken out in the wreckage. Yet, although in a collision between two all-steel trains both of these prolific causes would be eliminated, it must not be supposed that the passenger would run no risk whatever. The comparative immunity from injury of the passengers in the rear part of a colliding train is due to the fact that the momentum of the rear cars is absorbed gradually in crushing up the forward part of the train. The wooden mail cars, baggage cars, and day coaches act as a cushion or buffer. In a collision between two all-steel trains, however, the shock would be comparatively evenly distributed throughout the whole length of the train, and motion would be, even in the last car, almost instantly arrested, unless, indeed, as might well happen, the cars mounted upon one another or slewed around crosswise of the track. The effect on the passengers would be to hurl them forward in their own cars until they fetched up against seats, partitions, or furniture, with a velocity not much less than that at which the train was traveling at the instant of collision. There would undoubtedly be many broken limbs and painful contusions; but there would be none of that horrible laceration which now occurs when the splintered timbers of a telescoping car shear their way through the crowded mass of passengers.

In building the all-steel day coach, special attention will have to be paid to the method of attaching the cross seats to the floor of the car. The supports must be of good tough steel, thoroughly well bolted through to the steel floor. Otherwise, if the present rather flimsy supports and fastenings were used, the sudden arresting of motion would tear every seat, with its occupants, loose, and cause the huddled mass to sweep forward along the floor of the car to fetch up against the front of the car, with disastrous effects to life and limb.

RAILROAD HOUSEKEEPING ECONOMIES.

The housekeeping side of a great railroad is generally kept in the background, and the annual expenditures and income from this source seldom figure in the year's balance sheet which the public sees in print. Under the general heading of "minor income and expenditures," however, there appear items which might well excite the interest and amusement of the casual student. Whatever else may be said about our great railroad systems, good or bad, they have never been accused of lack of careful, systematic operation in the expenditures of the great sums of money which must annually be made for efficient maintenance. There is no stricter and better business school from which a young man or woman can graduate than one of the great trunk railroad systems which criss-cross our continent in all directions.

A single railroad system will have upward of four or five hundred stations along its different routes, which must be supplied with certain household articles and utensils for good housekeeping. Every modern railroad appreciates the value of clean, sanitary stations, and these temporary stopping places for the traveling public are kept in better condition each succeeding year. Greater comforts and luxuries are supplied by rival roads, and the expenditures in this direction are directly noticeable in the increased patronage.

The "general housekeeper" of a great trunk railroad line is most frequently a man, and his business is to manage the stations, supplying them with all needful articles, and closely watching the waste to see how a saving can be effected. Under his bureau control there come numerous items of apparently small concern, but which in the aggregate amount to considerable sums. For instance, on the Santa Fé system last year, the "general housekeeper" purchased and distributed 26,000 brooms to keep the stations and offices of the company clean. Twenty thousand boxes of soap, 25,000 scrubbing brushes, and a similar number of hand-mops figured in the expenditures. The housekeepers of the individual stations and offices represent a formidable army. Upward of 10,000 of these were employed off and on last year by the Santa Fé road. At many of the small stations, the agent is his own housekeeper, ticket seller, telegrapher, and general freight agent; but at the larger stations scrubbers and cleaners are employed by the year.

The employés and officials of a big road must have pens, ink, paper, and even pins. Last year the pin item on the Santa Fé was no inconsiderable one. The total weight of the pins bought by the general housekeeper and distributed to the employes was 3,000 pounds. Forty thousand pens were also used, and fifty barrels of ink. There were enough lead pencils used to reach from Chicago to New York, and half way back again, if they were placed end to end.

An interesting question that comes up in every household is the disposition of the waste. The railroad housekeeper is careful to study out any economy, and the waste along the whole line is economically disposed of. Waste pins, pens, paper, old brooms, mops, bottles, and worn-out machinery of locomotives are gathered up along the route and sold for junk or "old scrap."

A small item, one would say, but a large one when considered in its true light. From waste paper alone last year the railroad above realized a profit of $5,000. Pens, shingles, and nails proved of important value. The total value of the "scrap heap" reached the enormous sum of $1,250,000. Of course the greater part of this waste came from the worn-out locomotives and cars which are sent to the scrap heap after they have ceased to be of further value to the company. But on the small household items mentioned, upward of $100,000 were realized. Everything is saved, and everything is economically disposed of. Even the ashes are sold or utilized for improving the roadbed.

The equipment of stations to-day with slot machines, literature, and restaurants has greatly increased the labors of the housekeeping department. In some instances the concessions are sold to private companies, but on some roads the rights to sell articles along the route are retained by the transportation company. On the Santa Fé route last year $11,500 were taken in the penny slot machines for chewing gum. This meant that a million and more pennies were dropped into the machines.

The supply of literature by the railroad company is enormous. Upward of five thousand train boys hawked the periodicals through the cars as licensed sellers, and half as many more sold books and magazines at the different stations. Several million dollars were taken in last year on the Santa Fé through this source. The distribution of literature over the whole route is a matter of exact business routine, which is managed entirely by a single head.

Candies, fruit, sandwiches, and similar edibles for the delectation of the travelers are important items. One trunk line annually sells over its route half a million pounds of candy, nearly twice as many sandwiches, and upward of 500 tons of fruit. This does not include what is sold in the waiting-rooms and restaurants of the stations. Here probably as much more of the sweet things are disposed of to hungry passengers.

A million bottles of soft drinks is the annual bill of one road, or rather the amount that thirsty passengers dispose of while waiting for trains. The restaurants on a large trunk line will use upward of fifty carloads of provisions in the course of a year. But these are distributed so generally and gradually that they never block the line of traffic.

The tendency of the public to eat, drink, and read while traveling is so steadily on the increase that more conveniences are being made to satisfy it in this direction. Traveling libraries have become features of the leading parlor cars, and patrons of the road can read their favorite authors or magazines without expense. The traveling café and dining car are as common to-day as the smoker or baggage. To supply these thousands of cars, with all the necessary provisions and articles of diet to suit the most fastidious, the general housekeeper in charge of this department buys in wholesale quantities all along the line. A single railroad system will use upward of 50,000 barrels of flour a year for the dining-car service, 40,000 pairs of poultry, 10,000 quarters of beef, and innumerable tons of fruits, pastry, coffee, and vegetables. To be at the head of such an extensive housekeeping department, a manager must buy economically, and dispose of the surplus and waste profitably. Fruits and vegetables out of season in the North in winter are generally purchased in the South and taken aboard the northbound trains at the most convenient point, and northern fruits and vegetables in summer are likewise shipped south in the same way. Thus all the delicacies of the country are used in and out of season at the lowest minimum of cost.

If we should add to the general housekeeping economics of a railroad the items which pertain more distinctly to the gardening or landscape department, we should find more interesting statistics. Every railroad has its landscape gardening department to-day, and tens of thousands of plants, trees, and shrubs are planted and cultivated every season. One eastern road puts out nearly a million bedding plants every season to decorate the grounds around the stations, and another raises cut flowers so that every office and important station is supplied with fresh-cut flowers every day through the summer season. Ten thousand cut flowers are weekly distributed for table decoration on the dining cars. It costs money to support this department, but the indirect results are apparent in the approval, and increased travel, of patrons.

The care of the linen of a single trunk line is a gigantic task. No hotel or series of hotels offers any

comparison. The napkins and table linen for the dining service of one road mount up into the tens of thousands, and the towels and bed linen for the sleepers represent nearly as many more separate articles. The annual wash of the sleeper and dining-car service amounts to an expenditure of $25,000, although it is nearly all done by steam and machinery. To keep up the supply of linen upward of ten thousand separate pieces of linen are purchased annually. On the great transcontinental trunk lines more money is spent on the table and bed linen than on such apparently important articles as car brackets for hats and coats or upholstered cushion seats for passengers. Yet so careful is the system that every napkin, towel, table-cloth, sheet, or pillow case must be accounted for, and not one can be lost without some adequate explanation accompanying the report of its disappearance. Strict business principles prevail throughout the whole department.

THE HEAVENS IN SEPTEMBER.

BY HENRY NORRIS RUSSELL, PH.D.

The clear evenings of autumn give us a good chance to study the heavens, which at this season are very full of interesting things.

The fine summer constellations, with whose outlines we have become familiar in the past few months, are now in the western and southwestern sky. Arcturus is low in the west, about ten degrees above the horizon at our regular time of observation (9 P. M. in the middle of the month). Above it are the other stars of Boötes, then the semi-circle of Corona and the "keystone" in Hercules, and higher still shines the superb white star Vega. Scorpio is vanishing in the southwest, and Mars (which is at present in this constellation), will soon set. Sagittarius, with the Milk Dipper, is still well seen.

The Milky Way in this constellation, and higher up in Aquila and Cygnus, is one of the finest hunting-grounds in the heavens for a small telescope. It is full of star-clusters and nebulæ—some of them visible to the naked eye—and abounds with magnificent telescopic fields, thickly spangled with stars.

The bright star on the meridian, rather more than half-way up to the zenith, is Altair. It is flanked by a fainter one on each side. The line of these three stars points downward to a pair of small stars, which are the brightest in the inconspicuous constellation of Capricornus. Both these stars are double, the upper one being resolvable with the naked eye, while the lower one requires a field-glass. East of Altair, at the same altitude, is the little lozenge-shaped constellation Delphinus, sometimes called "Job's Coffin." Above this, right overhead, is Cygnus, one of the finest of the constellations, abounding in double and variable stars, and other objects of interest.

About half-way up the eastern sky is Pegasus, which may be recognized at once by the "great square," composed of four second-magnitude stars, which has no counterpart in the heavens. This is a very large constellation, extending westward almost to Delphinus. The star at the northeastern corner of the square, however, does not belong to it, but is known as Alpha Andromedæ. From this star a line of bright stars, about equally spaced, extends to the northeast. The first of these, Beta Andromedæ, serves as a pointer in finding the great nebula of Andromeda. This lies a little above the second of two small stars which form a line extending up from Beta. It is easily visible to the naked eye, but the largest telescopes do not show in it anything like the detail which is shown on long-exposure photographs.

Gamma Andromedæ, the next star in the line, is a very fine double star, the brighter component being red, and the fainter one green. They are much too close together to be divided with a field-glass, but can be well seen with a small telescope. The green companion is itself a very close double, separable only by powerful instruments. Still following the line of bright stars, we come to Perseus, and beyond it to Auriga, whose brightest star, Capella, has just risen in the extreme northeast. Above Perseus, in the Milky Way, is Cassiopeia, and Cepheus fills the gap between this and Cygnus. Ursa Minor and Draco are on the left of the Pole, and Ursa Major is below them, in the northwest.

The southeastern sky is dull. The little triangle which marks the head of Aries is due east, below Andromeda. Pisces, Cetus, and Aquarius fill the large vacant region in the southeast. The last constellation is brightened up at present by Saturn, which is the most conspicuous object in the whole neighborhood. Below it, far toward the horizon, is the lonely bright star Fomalhaut, in the constellation of the Southern Fish.

THE PLANETS.

Mercury is morning star throughout the month. He is best visible about the 15th, when he is at his greatest elongation from the sun, and rises about 4.30 A. M., so that he is easily seen before sunrise. He is in Leo, about 5 deg. southeast of the bright star Regulus, which he much surpasses in brightness.

Venus is morning star in Cancer and Leo, and rises at about 3 A. M. in the middle of the month. She is now about 100 million miles from us, and presents the same phase as the moon does two days after first quarter.

Mars is evening star in Scorpio, setting at about 10 P. M. on the 15th. During the first few days of September he is very near Antares, and it will easily be seen how well the star deserves its Greek name—which signifies *the rival of Mars*—by its resemblance to the planet in color and brightness.

Jupiter is in Taurus, between Aldebaran and the Pleiades, and rises at about 10 P. M. in the middle of the month.

Saturn is in Aquarius, and is well seen in the evening, coming to the meridian about 10 P. M. He is the most interesting telescopic object now visible. A very small telescope suffices to show his rings, and his brightest satellite, Titan. The latter is west of the planet on the 2d, north of it on the 6th, east of it on the 10th, and so on, the period of revolution being about 16 days. In looking for the satellite, the observer should first find out whether his telescope shows objects right side up (as all instruments for terrestrial observation do), or inverts them, as telescopes used exclusively for astronomical purposes do. In the latter case an object that looks east of the planet is really west of it, and so on.

Uranus is in Sagittarius in 18 h. 1 m. right ascension and 23 deg. 42 min. south declination. He is in quadrature with the sun on the 23d, and crosses the meridian at 6 P. M.

Neptune is in Gemini, and rises about midnight.

THE MOON.

First quarter occurs at 11 P. M. on the 5th, full moon at 1 P. M. on the 13th, last quarter at 5 P. M. on the 21st, and new moon at 5 P. M. on the 28th. The moon is nearest us on the 29th and farthest away on the 16th. The time of perigee, when she is nearest the earth, falls very near the time of new moon. We may, therefore, expect unusually high tides about the end of September. The moon's tide-raising force varies with her distance, and when she is in perigee it is nearly 25 per cent greater than its average value. When this happens at new or full moon, when the sun and moon are pulling together, we get very high tides. This year the epochs of such tides happen to fall near the equinoxes; but this is a mere coincidence, which will not occur two or three years hence, and so the high tides which we may expect at the end of this September (and in somewhat smaller measure in August and October, also,) have nothing to do with the equinoxial season.

The moon is in conjunction with Mars on the 5th, Saturn on the 11th, Jupiter on the 19th, Venus on the 26th, and Mercury on the 27th. The conjunctions with Saturn and Venus are fairly close.

On the morning of the 20th there is an occultation of the bright star Aldebaran, visible in the United States. The times and duration of the occultation are different for different places, but in the Eastern States the star will disappear behind the moon's bright limb about 2 A. M. and reappears from behind the dark limb an hour or so later.

At noon on the 23d the sun crosses the celestial equator, and enters the "sign" of Libra and, in the old-fashioned phrase of the almanac, "autumn commences."

LUMBER GRADES.

A subject of increasing importance to every lumber producer and consumer is that of grades. That these grades should be uniform where practical is well recognized, and many efforts to arrive at some general rules have been made. In view of these movements to standardize grades, the Forest Service has undertaken to bring together the specifications of the various lumber and manufacturers' associations and to put them in such a form that they may be compared.

The object of the study is not to devise a system of standard grades, but to make simply such a compilation of the grades now in use as will be of service to lumber producers and consumers, though it is hoped that a great deal of information may be accumulated that will be of value in eventually preparing the way for a standard system.

It is planned to get the views of those concerned partly by interviews and largely by correspondence. A representative of the Forest Service will endeavor to visit the secretaries and members of grading bureaus of various associations and learn their views in regard to the practical workings of the various rules. A large number of mill men and manufacturers will be reached by correspondence and their views sought. It is especially desired to find the important points of difference in grades from the view points of both producer and consumer of lumber, and also to ascertain the chief difficulties in the way of devising and executing a system of standard grades.

The assistance of manufacturers and consumers of lumber is earnestly desired in this work. Suggestions concerning it will be gladly received by the Office of Forest Products, Forest Service, Washington, D. C.

SCIENCE NOTES.

New Rubber-Producing Plant.—The German periodicals describe a new plant which produces a gum similar to caoutchouc. It is a variety of *Landolphia thollonii.* It attains a height of 40 to 50 centimeters, and has numerous roots, from which a juice is extracted containing as much as 18 per cent of gum. It grows in sandy places and will bear drought. It is reproduced by sowing, and when the time of harvest comes, the large roots are cut, leaving the small ones to bud and multiply.

Preparation and Properties of Nitryle Fluoride.—MM. Moissan and Lebeau give, in a memoir presented to the Académie des Sciences, the results of the researches by which they have demonstrated that fluorine does not react at ordinary temperature on nitrous oxide and nitric peroxide, and that it gives with nitric acid a new gaseous compound, fluoride of nitryle, NO_2F. The density of the gas is 2.24; the fusing point, 63.5 C.; it is endowed with great chemical activity. Although it does not combine, cold, with hydrogen, sulphur, or carbon, it reacts at the ordinary temperature with boron, silicium, phosphorus, arsenic, antimony, and iodine. It decomposes, cold, with production of fluorhydric acid and nitric acid; it reacts on a large number of organic compounds.

Of the cereal crops of this country wheat suffers most from insect depredations. Of the large number of insects which depredate on this cereal, the three important species are the Hessian fly, the chinch bug, and the grain plant-louse, using the latter term to include several allied species which work in much the same manner. The chinch bug is notably a wheat pest, although its damage to other cereals and forage crops is very considerable. The losses from the depredations of this insect on wheat in single States have ranged between $10,000,000 and $20,000,000 in one year. A very reasonable average annual estimate of loss, taking the country as a whole, would be 5 per cent of the value of the wheat crop, which would indicate about $20,000,000 a year chargeable to this insect.

Variable Composition of Firedamp.—M. Lidoff has made exhaustive investigations on mine gas, and has arrived at the conclusion that what is understood by the term "firedamp" is an essentially variable compound. According to Dingler's Polytechnisches Journal, instead of consisting chiefly of methane, it frequently contains 60 per cent of it, while 37 per cent is ethane, and some carbonic acid is present. In many English mines the proportion of methane varies between 77.5 and 98.2 per cent, whereas in the valley of the Donetz it is between 52 and 70 per cent. It cannot be affirmed positively that a small quantity of argon is invariably present, but it is noteworthy that sometimes the gas consists, so to say, merely of carbonic acid.

A Foster Family of Ducks.—A curious experiment in the hatching of ducklings by a turkey was made recently on a model farm at Willerhof, in the outskirts of Schlestadt, in Lower Alsace. It succeeded admirably, as attempts not dissimilar have succeeded elsewhere. The bird was placed in a basket in which were two plaster eggs, and it was kept there by means of a framework. In a couple of days the two artificial eggs were replaced with a dozen duck's eggs. In due time nine ducklings were hatched. The turkey showed much attachment to its brood and protected it devotedly. The first time the ducklings took to the water, the turkey followed them, but soon drew back and patiently awaited their return and its vigilance did not relax even when they had grown up. When the fowl could not share their nest any longer, it left them in the evening to rejoin its fellow-turkeys, but when the coop was opened in the morning, it quickly sought its strange family, all the members of which are in good health.—La Nature.

THE CURRENT SUPPLEMENT.

Mr. Day Allen Willey opens the current SUPPLEMENT, No. 1548, with an interesting article on the new seagoing dredges which have been used for the deepening of the ship channel leading into New York harbor. Mr. R. S. Thompson writes instructively on the possibilities of heating with hot air. How Cognac brandy is manufactured is told in a short contribution. The excellent discussion of reinforced concrete which began in the last number is concluded. Prof. J. Joly writes on the latent image in photography. Wallingford, England, is a place of very considerable interest, although it can show no very striking relics of its former importance. Rev. J. E. Field, however, has managed to tell in an entertaining article much that is interesting about the old town. John S. MacArthur contributes an historical article on gold extraction by the cyanide process. The eclipse of the sun which occurred on August 30 lends peculiar interest to Sir Robert Ball's article on the subject, which is excellently illustrated with photographs. The cause of flower coloration is told simply and clearly by Dr. H. Mandoul.