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Contents.

(Illustrated articles are marked with an asterisk.)

Air brake hose coupling, valve, Colwell's*..... 292
Athens, British excavations at . 299
Bacteria, soil..... 298
Bicycle notes..... 301
Boiler tube cutter, Richard's*... 292
Burial, premature..... 294
Dental plugger, Wall's*..... 293
Electrical Exposition, New York 295
Exposition, Industrial, Berlin*.. 293
Gas cylinders, high pressure..... 298
Grass, Johnson (6846)..... 301
Inventions, progress of, for fifty years..... 294
Inventions recently patented.... 300
Lady, vanishing, illusion*..... 297
Lakes, great, water level of..... 294
Lawns and tennis grounds..... 295
Massachusetts, battleship, trial of*..... 296
Patents granted, weekly record. 301
Petroleum, salted 298
Photography, color..... 297
Plants, mimicry in..... 297
Rabbit drives and hunts*..... 299
Rice culture in Louisiana*..... 289
Road carriage competition, a great..... 292
Sand floating on water..... 298
Science notes..... 294
Sciences, National Academy of. 291
Spectrum rays, invisible..... 294
Steam plow, the Ingleton*..... 292
Steamships and navigation, modern..... 290
Steel, stamping on (6845)..... 301
Telescope, new type of..... 292
Trade names, descriptive..... 294
Vanity Fair illusion*..... 297
Water wheel, Haag's*..... 298

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1062.

For the Week Ending May 9, 1896.

Price 10 cents. For sale by all newsdealers.

PAGE

I. AGRICULTURE.—The Castor Oil Bean—Ricinus Communis, Linn.—By D. F. DAVENPORT.—A valuable crop for the South especially.—How the plant should be treated.—The preparation of the beans for market..... 16969

II. ARCHÆOLOGY.—The Babylonian Expedition of the University of Pennsylvania.—An interesting account of work done among the ruins at Babylon by the American exploring expedition.—5 illustrations..... 16967

III. BIOGRAPHY.—Willy Burmester and Alexander Petschnikow.—Notes on two celebrated German violinists, with portraits.—2 illustrations..... 16971

IV. CIVIL ENGINEERING.—History and Methods of Testing Building Materials.—Continuation of this lecture before the American Institute, describing various testing machines for different classes of tests.—7 illustrations..... 16975

The Proposed Railway up the Jungfrau.—The celebrated project for a railroad and elevator to reach the top of the Jungfrau, Switzerland, fully illustrated and described.—4 illustrations..... 16974

V. HORTICULTURE.—Angulos Uniflora, Var.—A beautiful flowering plant recently shown at a Royal English Horticultural Society Exhibition.—1 illustration..... 16970

VI. MEDICAL AND HYGIENE.—The Laborde Method of Artificial Respiration.—By EDWARD MARTIN, M.D.—An excellent article on the restoration of life in case of asphyxiation.—A simple and practical paper, a valuable contribution to first aid to the injured..... 16981

VII. MISCELLANEOUS.—Alchemy and Pharmacy.—Their mystery and romance.—The art of foretelling.—By C. J. S. THOMPSON.—A most interesting article on the work of the alchemists and the supposed supernatural basis of their science.—3 illustrations..... 16980

Engineering Notes..... 16973
Electrical Notes..... 16973
Miscellaneous Notes..... 16973
Selected Formulæ..... 16972

VIII. NATURAL HISTORY.—Living Barometers.—Animals and plants as prognosticators of weather changes..... 16970

IX. NAVAL ENGINEERING.—The Lengthening of the Union Steamship Scot.—A difficult operation now in course of execution by Harland & Wolff, of Belfast, Ireland.—The lengthening of a great ship.—3 illustrations..... 16975

X. PHOTOGRAPHY.—Hints on the Development of Instantaneous Exposures.—By CHARLES L. MITCHELL, M.D.—A valuable paper giving exact details for the manipulation of this class of photographic work..... 16979

Some Odd Dodges in Lantern Slide Making.—By T. N. ARMSTRONG.—A very timely article on the production of successful lantern slides from poor subjects..... 16980

XI. PHYSICS.—The Hampson System of Liquefying Gases.—A recently devised compact apparatus for producing liquid gases.—2 illustrations..... 16982

Note on Visibility of Objects..... 16982

XII. RAILROAD ENGINEERING.—Notes on English Railways.—By J. W. THOMAS, JR.—Graphic notes on the peculiarities of the English railroads, their advantages and disadvantages, and striking features of their operation..... 16977

XIII. STATISTICS.—Growth of Population of Great Cities.—By ELMER LAWRENCE CORTHELL, D.Sc.—A valuable review of the leading cities of the world, their growth and population, with a table of curves thereof.—1 illustration..... 16971

XIV. TRAVEL AND EXPLORATION.—Antarctic Exploration.—By WILLIAM S. BRUCE, late naturalist to Antarctic expedition, 1892-1893.—A valuable review of the present status of Arctic and Antarctic work, with special reference to the latter field of discovery..... 16968

OUR FIFTIETH ANNIVERSARY PRIZE ESSAY COMPETITION.

Though it is doubtless well known to the majority of our readers that the SCIENTIFIC AMERICAN ranks as one of the oldest journals in the United States, they may not be aware that it has now been making its appearance, week by week, without interruption for a period of half a century.

We feel that it is due at once to our readers and to ourselves to make some special commemoration of so interesting an event as the fiftieth anniversary of the formation of the present firm, and we have decided that this shall take the form of a profusely illustrated special number, which will be issued on July 25 of this year.

It has been the aim of the SCIENTIFIC AMERICAN to keep the public faithfully informed, week by week, of the world's current progress in the arts and sciences; and it is our intention to devote the anniversary number to a review of this progress during the past half century.

One of the most interesting features of the issue will be the publication of a prize essay on the subject of "The Progress of Invention during the Past Fifty Years," for which we are offering a premium of two hundred and fifty dollars.

The conditions governing this competition will be found on another page, from which it will be seen that all manuscript should be received at this office on or before June 20, 1896. The papers will be passed on by a select jury of three, whose names will be announced in a later issue. We are desirous that all the essays submitted should receive careful attention, and to this end we request that intending competitors will forward their manuscript at their earliest convenience.

We also draw attention to the arrangements which we have made to secure a vote upon the question as to what invention introduced within the past fifty years has conferred the greatest benefit upon mankind. The result in any case will be of special interest, and particularly so if, as we hope, the majority of all of our large body of readers and subscribers will express their opinion.

MODERN STEAMSHIPS AND NAVIGATION.

The modern steamship is a favorite subject for exemplifying modern progress. In early days man dreaded the ocean, and the cruise of Ulysses along the shores of the Mediterranean and Æneas' voyage with its constant landings are records of the old time coasting navigation. Little by little man forced his way upon the more open seas, until at the present time the ocean is crossed with almost the regularity of a ferry, and probably with greater relative regularity. The five hundred foot hull is driven remorselessly through seas at a speed that would have swamped the ship of fifty years ago. The twenty to thirty thousand horse power expended in driving the engines of a liner represent the consumption of a ton of coal every two or three minutes. So regular is the operation of engine and boilers that under similar conditions of sea the screws act as a log and measure the ground covered as accurately as the regular log and log line. Every adjunct available for increasing the efficiency of the service is employed.

In all its appliances arranged to be operated on the unstable platform supplied by a steamship in a gale of wind, the seagoing steamship embodies some of the greatest triumphs of modern engineering and science Yet in spite of this the unavoidable weaknesses and imperfections of the service go to prove how well founded was man's dread of the sea. Ship after ship collides with another vessel, sinks after striking a rock, misses its port in a fog and runs on the beach, or by pure luck avoides a similar catastrophe and tries hard to attain the tribute of silence for its narrow escape. The mere fact that the shores of our coast are patrolled by members of the life saving service, part of whose duty is to burn a warning light if a vessel is seen dangerously near the shore, proves the crudity of our most advanced methods of navigation. The fact that the captain of the St. Paul, which went ashore on the beach at Long Branch, was exonerated from all blame shows that man has not yet achieved his mastery over the sea with its concomitants of fogs, gales and ocean currents. Recent strandings and collisions in the harbor of New York go to prove the same thing.

The ingenuity of the inventor has done much to ameliorate these conditions. Gas buoys float upon the waves, and, charged with compressed gas, give a brilliant light for three months or more without any attendance. Along dangerous channels or near shoals electric buoys are established supplied with current from the shore, so that light is turned on at sunset from the shore station miles distant. Wave action is utilized most ingeniously in the whistling buoy and bell buoy to give audible warnings to navigators.

The modern lightship is no longer an almost helpless hulk, whose only safety is in her anchors. She is a well built ship, with steam or power signaling plant, and perhaps with steam propelling engine to bring her to port if her cables give away. Along the coasts the most elaborate system of patroling and of life saving stations finds development, the bicycle even having recently been adopted in the patroling of hard beaches. The almost romantic history of the inventor Francis and his metallic lifeboat and the accounts of the many rockets and mortars devised for carrying lines to wrecked ships go to show what the inventor has done to save life and property from wrecked ships.

In lighthouses proper, the advance from the old reflecting light with candles as illuminants to the modern lantern with Fresnel lenses, with a four-wick oil lantern, Wigham gas burner, or electric arc light, giving an illuminating power of hundreds of thousands of candle power, tells what science and invention have done to avert disasters.

This work, all of which may be termed shore work, is really a concession to the imperfections of navigation. The problem of safety at sea should be attacked on the ship itself. The unsinkable ship, whose engines cannot be totally disabled, has not yet been invented. She is approximated to only. In the best of the ocean steamers the unavoidable imperfections bear eloquent testimony to man's inability to cope with the sea.

The first thing that impresses a novice who takes the tiller in a boat for the first time is the extreme difficulty of keeping a moving vessel upon a fixed course. He finds that unceasing attention and constant changes of the rudder are required. The tiller cannot be held in one position for more than a few seconds at a time. On the modern liner the same thing holds. The power the helmsman can exert by the steam steering gear is instant in effect and ample in amount, but is not sufficient in either factor to enable him to hold the ship upon a constant course. As the ship rolls and lists, one or the other propeller, if she is a twin screw ship, has the greater effect, and her head constantly tends to go to starboard or to port, and the tendency has to be counteracted by the helm. Every wave parted by the bow exerts some degree of deflecting power, also to be met by the helm. Looking at a six or eight inch compass card, these deflections may seem of little account, but when referred to a radius measured by a day's or hour's run, or even by the ship's length, they appear in their true magnitude.

A single degree of deflection on a radius of five hundred feet, taken as the ship's length, represents a deviation of nearly eight feet from the course. An error of one degree for an hour's run would give a deviation of nearly 2,000 feet, and for the day of over four miles. But a degree on the compass card is very little. A point, the regular unit of the compass card, is eleven and a quarter degrees, and many a ship yaws from side to side over an arc of two points, giving a length deviation of eighty or ninety feet. In all accurate work the surveyor or geodosist uses the compass as little as possible; not only on account of its variations, but because it is impossible to read it to a small enough fraction of the circle. With a vernier a circle can be read down to seconds; with the compass a degree can barely be fractioned. The compass with this imperfection is accurate enough for the steamship navigator because it is too good for his steering capacity; the ship cannot be held down to a compass course. Compass errors are constantly corrected by observation, and the instrument is only used in running from one observation to another. But perfect navigation would imply perfect dead reckoning. It is doubtful if man's powers will ever mount to the height of perfectly controlling a ship at sea, or even of enabling her to live up to her compasses.

The futility of dead reckoning received a startling illustration in the stranding of the St. Paul. A few days of fog put her miles south of her proper position and far ahead of her reckoning. Groping along with constant soundings she ran ashore upon a beach of reasonable regularity of pitch, and narrowly escaped serious damage or total wreck.

The most prominent improvement in modern steamships develops a new imperfection. Twin screws are now almost universal in the more modern types of first-class ships. In the old single screw system trouble was experienced from the screw lifting out of water as the ship pitched. Every approach of a screw to the surface weakens its propelling power. This is so well recognized that in many small vessels the screws are carried below the line of the keel to give them "solid water" to work in. In the twin screw ship the lifting trouble is intensified. Not only does pitching raise her screws toward the surface, but rolling and listing do the same. The screws carried well to the sides approach alternately the surface as the ship rolls in a moderate sea, so that standing by the taffrail the blades can be seen showing their tips out of water. The pitching trouble is diminished by the increased length of modern ships, but the rolling of the screws out of water takes its place.

The rolling interferes with the direction of motion of the ship, as it changes the relative propelling power of the two screws. The ship is pushed first to one side and then to the other, the total of the propelling force is reduced and the constant shiftings of the rudder also go to impair her speed. If she takes a list and holds it she may need a port or starboard helm to be

maintained for a considerable time, the deflected rudder operating to destroy speed. In overcoming the trouble described there would seem to be a field for ingenuity and invention. The modern steamship and modern navigation are as yet far from perfect. Dead reckoning fails to give position because the direction of course is uncertain, and speed cannot be accurately maintained or determined. All the troubles co-operate to produce uncertain results, and really scientifically accurate work at sea is still far from realization.

There are problems of the most difficult kind to be dealt with in controlling the ship and in supplying means for ascertaining her work once she is so controlled.

The National Academy of Sciences.*

The stated or spring meeting of this, the most distinguished of American scientific associations, was held in Washington for four days, beginning on April 21. It was the first session held in Washington since the election of Prof. Wolcott Gibbs to the presidency of the academy, and the meeting was looked forward to with much interest. In accordance with a rule established at the meeting held in Philadelphia last autumn, the business and other private affairs of the academy were discussed in secret session, beginning at ten o'clock in the morning, after which the members adjourned to luncheon, which was served in the United States National Museum, and the afternoon was then given up to the public reading of papers with their discussion. This practice was found to work excellently, and the friends of the members, or those interested, who desired to listen to the papers, accordingly knew when to come, and were not, as was the case previously, compelled to be in attendance all day waiting for the adjournment of the business sessions of the academy.

The attendance of members was unusually large, and among those present were: Cleveland Abbe, Washington; Carl Barus, Providence, R. I.; John S. Billings, New York; Lewis Boss, Albany, N. Y.; Henry P. Bowditch, Boston, Mass.; William H. Brewer, New Haven, Conn.; William K. Brooks, Baltimore, Md.; Edward D. Cope, Philadelphia; Samuel F. Emmons, Washington; Wolcott Gibbs, Newport, R. I.; Theodore N. Gill, Washington; G. Brown Goode, Washington; Benjamin A. Gould, Cambridge, Mass.; Arnold Hague, Washington; Asaph Hall, Washington; Charles S. Hastings, New Haven, Conn.; George W. Hill, West Nyack, N. Y.; O. C. Marsh, New Haven, Conn.; Alfred M. Mayer, Hoboken, N. J.; Thomas C. Mendenhall, Worcester, Mass.; Edward S. Morse, Salem, Mass.; John W. Powell, Washington; Ira Remsen, Baltimore, Md.; William A. Rogers, Waterville, Me.; Ogden N. Rood, New York City; Henry A. Rowland, Baltimore, Md.; Charles S. Sargent, Cambridge, Mass.; Charles A. Schott, Washington; Samuel H. Scudder, Cambridge, Mass.; William Sellers, Philadelphia, Pa.; A. E. Verrill, New Haven, Conn.; Francis A. Walker, Boston, Mass.; Charles A. White, Washington; and Arthur W. Wright, New Haven, Conn.

The following programme gives a full list of the papers presented before the academy:

The Geological Efficacy of Alkali Carbonate Solutions, by Eugene W. Hilgard; On the Color Relations of Atoms, Ions, and Molecules, by M. Carey Lea; On the Characters of the Otocœlidæ, by Edward D. Cope; Exhibition of a Linkage whose Motion Shows the Laws of Refraction of Light; Location in Paris of the Dwelling of Malus, in which he made the Discovery of the Polarization of Light by Reflection; and (1) On Experiments showing that the X Rays cannot be Polarlarized by passing through Herapathite, (2) The Density of Herapathite, (3) Formulæ of Transmission of the X Rays through Glass, Tourmaline, and Herapathite, by Alfred M. Mayer; Biographical Memoir of James Edward Oliver, by George W. Hill; Biographical Memoir of Charles Henry Davis, by Charles H. Davis; Biographical Memoir of George Engelmann, by Charles A. White; Legislation Relating to Standards, by Thomas C. Mendenhall; On the Determination of the Coefficient of Expansion of Jessop's Steel, between the limits of 0° and 64° C., by the Interferential Method, by Edward W. Morley and William A. Rogers; On the Separate Measurement, by the Interferential Method, of the Heating Effect of Pure Radiations and of an Envelope of Heated Air, by William A. Rogers; On the Logic of Quantity, by Charles S. Peirce; Judgment in Sensation and Perception, by John W. Powell; The Variability in Fermenting Power of the Colon Bacillus under Different Conditions, by A. W. Peckham (presented by J. S. Billings); Experiments on the Reflection of the Roentgen Rays, by Ogden N. Rood; Notes on Roentgen Rays, by H. A. Rowland; Some Studies in Chemical Equilibrium, The Decomposition of Diazo-compounds by Alcohol, and On Double Halides containing Organic Bases, by Ira Remsen; Results of Researches of Forty Binary Stars, by T. J. J. See; On a Remarkable New Family of Deep Sea Cephalopoda and its Bearing on Molluscan Morphology, The Question of the Molluscan Archetype, an Archi-mollusk, and On some Points in the Morphology and Phylogeny of the Gastropoda, by Addison E. Verrill; Source of X Rays, by Albert A. Michelson and S. W. Stratton; The Relative Permeability of Magnesium and Aluminum to the Roentgen Rays, by Arthur W. Wright; The State of Carbo-dioxide at the Critical Temperature, The Motion of a Submerged Thread of Mercury, and On a Method of Obtaining Variable Capillary Apertures of Specified Diameter, by Carl Barus; On a New Type of Telescope Free from Secondary Color, by Charles S. Hastings; The Olindiadæ and other Medusæ, by William K. Brooks; Budding in Perofhora, by William K. Brooks and George Lefevre; and Anatomy of Yoldie, by William K. Brooks and Gilman Drew.

As is shown by the list of papers, those on physical sciences predominated, and the Roentgen rays was a popular topic. Notwithstanding papers on this subject by Michelson, Rood, Rowland, and Wright, it was evident that as yet no theory as to their origin was tenable. Experiments by one authority seemed to indicate conclusively that his opinion was correct, whereas a second authority pointed out a new series of experiments that clearly indicated another point of view. No accepted conclusions were possible, and it was agreed that the question of their origin was a complex one.

The naturalists were represented by Cope, Verrill, and Brooks, each of whom presented papers before the academy, principally technical.

The members chosen to the council were Benjamin A. Gould, Henry P. Bowditch, George J. Brush, Ira Remsen, Othniel C. Marsh, and Simon Newcomb. These gentlemen, together with the officers who are ex-officio members, constitute the governing body. The academy appointed Ira Remsen, of Johns Hopkins, John Trowbridge, of Harvard, and George J. Brush, of Yale, as delegates to the sesquicentennial celebration of Princeton University, which will be held in Princeton on October 22 of this year.

The third day's session was made conspicuous by the announcement of the names of those who had been chosen members of the academy. Although it is possible to elect five persons at the Washington meeting, such an event seldom occurs, and this year but two names were accepted. The first was Charles Doolittle Walcott, director of the United States Geological Survey, who is perhaps the first authority on the Cambrian in the United States, and who has worked his way from the ranks of the survey to its highest place, succeeding Maj. John W. Powell in the directorship in June, 1894. The second academician chosen was Robert Simpson Woodward, now professor of mechanics in Columbia University, New York City. Prof. Woodward was for some years connected with the United States Naval Observatory in Washington, and then passed to the service of the United States Coast Survey, whence he was called to Columbia. Both of the gentlemen elected are well known in scientific circles and are members of the American Association for the Advancement of Science.

*Report of meeting prepared for SCIENTIFIC AMERICAN by Marcus Benjamin, Ph.D.

Cycling Notes.

The charities of Paris receive $3,000 as their share of the recent cycle meeting.

In France, bicycles are taxed at the rate of about $2.25 each per year; the tax yields about $400,000 per annum.

"Pedaleurs" and "pedaleuses" are the terms which the Parisians now employ to designate cyclists of the two sexes.

During the year 1895 there were exported from England cycles and cycle parts of the value of $6,959,050.

Cycles are used in large numbers in Johannesburg, South Africa. It is said there are 4,000 in use by all classes in that place.

A paper published in Paris devoted to builders invites architects to discuss the accommodation of bicycles in private houses.

Strange to say, the wheel now forms no inconsiderable portion of the miscellaneous supplies forwarded to the missionaries abroad.

An Englishman named Jefferson has started on a 6,000 mile bicycle ride to Irkutsk, in Siberia. His machine and baggage weigh sixty pounds.

The Naples authorities have just imposed a tax upon wheels used for pleasure or sport. This tax is ten francs. If the machines are used partly for business purposes, they are only taxed five francs.

A few of the New York postmen have tried the experiment of using wheels in making their rounds, but the roads have proved so poor that it is feared they will have to abandon the use of the wheel.

The only cycles which are exempt from taxation in France are the wheels in the hands of dealers which have not been sold and those owned by various government officers for the use of their messengers.

It would really seem as though the horse was discredited even in the far West, for a short time ago Little Black Bear, a Nez Percé Indian chief of Oregon, traded thirty head of horses for a bicycle.

Though Moscow has nearly five thousand wheelmen, only about one-half have permission to ride in the city limits. Russia asks $12.50 duty on each wheel imported into that country, no matter what the price may be.

Queen Margarita, of Italy, while riding in a part of the park at Monza from which the public is excluded, was stopped by a guard who scolded her for trespassing, and asked her name. She sent the man her photograph and a ten franc piece bearing her effigy with that of King Humbert's.

The experiment which has been tried in New York of mounting policemen on wheels has turned out in a very satisfactory manner. The bicycle police have rendered most efficient service in the pursuit of wheelmen who violate city ordinances, and in the catching of runaways and criminals.

Many wheelmen do not pay sufficient attention to the lubrication of the chain. It is really remarkable how much easier a wheel will run which has its chain cleaned for every twenty-five or fifty miles ridden. Both the stick graphite and the paste graphite may be used together with advantage.

The following is given as a receipt for a fine lamp oil: Fill a pint bottle with two-thirds of the best lard oil and one-third of headlight oil, to which add a piece of gum camphor about the size of an egg. The camphor is supposed to cause the oil to give a very white light, and it is said that the lamp will not go out easily.

Cycling is not a very dangerous recreation after all, as is proved by statistics. In England only 30 deaths were produced by cycling in twelve months. On comparing this number with the total number of the fatal highway and street accidents through England and Wales, it will be found that barely two per cent of them were caused by cycling.

What can be done in case of emergency was demonstrated a short time ago by a wheelman who had his tire badly punctured on the way home from Coney Island. He detached his injured tire, and, securing a heavy piece of rope, substituted the rope for the tire and made the journey home, some eight miles, in safety. The club of which he was a member has had the rope framed.

It is an ordinary sight in London to see bicycles chained to the railing outside of the fashionable and exclusive clubs along Pall Mall and Piccadilly. The house committees of the various clubs having declined to allow a wheel to be taken inside the clubhouses, some of the clubs have rented small places near by where liveried attendants look after and clean the wheels of members.

A curious story is told of a French cyclist who wheeled up to a gendarme and asked him for his sword, saying that a mad dog was running ahead and he wanted to kill it. The officer gave the wheelman his sword and the latter disappeared. He presently returned and handed back the sword dripping with blood. He had overtaken the infuriated animal and dispatched him without dismounting from the wheel.

The San Francisco News Letter brings forward an interesting point. It wonders if any enterprising boy will ever open stands where bicycles can be cleaned while you wait. After a long trip a rider would gladly pay a small sum to any boy who would do the job properly. Berlin has opened establishments for cycle cleaning. For a small annual subscription the wheel is called for, cleaned as often as desired and returned. In many of our riding academies cleaning is now a feature of the business.

In London the way of the transgressing cyclist is hard. A member of the nobility, who lost control of his machine going down a steep hill, was fined for furious riding. A German baron was fined for riding on the wrong side of the street. Mr. Arthur Balfour came to grief while riding on his bicycle in Whitechapel. He got jammed in a crowd of vehicles and had to take the pieces of his bicycle to Downing Street in a hansom cab. He has had two other accidents within a short time.

A wooden bicycle path is to be erected in Kalamazoo, Mich. It will be constructed of heavy plank; the grain of the lumber will run with the course of the track, the boards being sawed through the center upon a circle corresponding with the course of the track. The piece will then be reversed, the straight sides being placed together, thus forming a section of the track. The end joints will alternate and all uneveness will be planed down. In this manner the track will offer as little resistance as possible, says the American Wheelman.

In driving out a refractory crank key or other part of similar dimensions, where there is danger of "burring" the edges or destroying the thread, if only a hammer or wrench is employed, it is a good plan to use a copper penny to protect the part. In case of a crank key to be removed, for instance, put a piece of shingle, or almost any kind of wooden chip, on the under side of the crank boss, against the key, and hold the copper penny on top of the key or cotter pin. You may strike the penny with absolute freedom from fear of injuring the pin, and drive it out, no matter how tight.