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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1020.

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PROBLEMS IN ECONOMICS.

We are apparently just emerging from a long financial depression, which has more or less affected every trade and profession, and the acknowledged universal condition of the well-to-do, not less than those in medium circumstances, is that of impecuniosity or an approach to it. For more than twelve months, or perhaps twice that length of time, the prevalent practice has been that of economy, the expenditure of a dollar has been preceded by all sorts of calculations as to how to retain it, and now when a great craze seizes the public we are confronted by a curious anomaly. Business men, clerks of both sexes, typewriters, and even servants are ready with their hundred dollars for investment in a wheel. Now this involves two problems, one of which is to discover by what argument the majority of the vast number of purchasers convince themselves that they require a wheel, and the other is by what process do many of them produce the amount of cash required for the purpose.

It may very readily be imagined that a number, but a small number, compared with the whole, want the machine for practical use, for it really accomplishes a saving in time, labor, and perhaps money. Some even may require it for physical exercise, but the vast majority purchase it as an instrument of sport or pleasure.

Having decided, with or without reason, to own a wheel, there seems to be no lack of ready cash for the purpose. Now a hundred dollars is no inconsiderable sum for the majority of such as buy wheels to expend on a thing of that kind. If the amount were required to pay a doctor's bill, it would not be so readily forthcoming. If, for prudential reasons, it should be buried in the vaults of the savings bank, it would be deposited only with the feeling of suffering a present inconvenience for a future convenience; but when it goes for a bicycle it goes easy.

If the amount cannot be commanded in a lump, it can be raised in installments, and so the hundred dollars is got rid of, but it is a hundred dollars all the same.

We are the last to find fault with this particular craze, and we do not advise against the expenditure of money for the purpose, but there seems to be a lesson to be learned from all this, which may be beneficial.

In purchasing a bicycle, have not thousands learned that, in order to secure the money, they were obliged to economize in one way or another, and in so economizing have they not found that they had been indulging in many expenditures that might have been avoided? Have they not found it easier to save a hundred dollars than they thought, before they felt they must do it for the indispensable wheel?

SUMMER STUDY FOR CITY CHILDREN.

In this hurrying last decade of the century, when everybody is "trying to get time," the problem of where the young may get it has been partly solved by shortening the hours spent in the school room. The daily session closes in popular city schools at one o'clock. Thus time is found for riding and dancing lessons; for fairs, parties and the theater; for ball games and gymnasium practice; for private theatricals, candy pulls and the other amusements which somewhat relieve the monotony of school life.

In private schools, the year begins late in September, or, as in New York, the first or second week of October, and closes early in June. The summer vacation is, therefore, from three to four months long. During nearly all of this time, a considerable number of families are settled in the country to lead fairly regular lives.

It is thus that the children can best recruit for another winter of study and amusement. To parents who make this rational provision for their children, and who have thus, also, time for reflection, must sometimes come the questions: "When are my children to get an education?" "Is the best preparation for study in the winter, total suspension of directed mental activity in the summer?" "Is it wise to allow the vacation to be spent in carrying out programmes for each day in the week of diversions such as tennis, driving, dancing, rowing, sailing, wheeling, riding, shooting?"

Would not all this exercise be just as beneficial and enjoyed with even more zest if say two morning hours, five days in the week, were devoted to regular study?

It is for boys and girls who have no taste for books, who never turn to one for companionship, that regular mental work is most desirable.

How necessary for usefulness in life is the equipment of a well disciplined mind.

Summer study can easily be adapted to the needs of the pupil, and the proper teacher will see that it is made attractive. If, during the school year, the pupil has from any cause lost progress, the time cannot be so well spent as in making good these losses, so that he may start in the autumn on an equal footing with his classmates. If, from lack of capacity, poor teaching or overcrowding in classes, there are subjects in mathematics, where they are most likely to be found, in grammar or any other study which have not been understood, this is an opportunity to review them and have the rough places made smooth.

A good beginning in a language may be made in a summer; or the foundations having been previously laid, a book of Cæsar or Virgil may be read, or two or three plays of Schiller or Moliere.

But for the study of science it is the very best time of year, and offers in every respect the best conditions ever to be had by pupils who live in the city. Many a stone wall is not only picturesque, but the burial place of fossils which are a clew to the geologic history of the ground whence they were gathered. What a pity not to learn it, when one may so easily! Even to children under twelve, elementary lessons in botany and zoology may be made delightful.

Tracing the life of a dandelion from its early leaves to its winged seeds, and learning the oyster's place in the animal kingdom and the delicacy of its organs, amounts to discovering two new worlds to a child who has never known what the dissecting knife and the microscope may reveal.

The fact is that Earth's everyday wonders are as if they were not to thousands of grown people for lack of early eye opening. The actual knowledge to be gained in a summer of the classification and peculiarities of plants and animals is not half so valuable as are the incidental lessons in observation sure to be gained.

Tests of Agricultural Implements.

Bulletins No. 4 and No. 7 of the Utah Experiment Station contain interesting results from tests of draught of farm wagons, plows, mowing machines and harrows, as measured by a self-recording dynamometer.

The conclusions as stated in these bulletins are as follows:

That colters add to draught of plows by some 15 per cent. That trucks or wheels under the end of the plow beam decrease draught by about 14 per cent, add uniformity to the furrow and lessen the work of the plowman.

When the traces are not in line with the draught of the plow the draught is increased.

Lenthening the hitch slightly decreased the draught. A share badly sharpened increased the draught 36 per cent over a new share. A dull share drew harder than a sharp one, but not as hard as a badly sharpened share. Draught decreases with the depth and with the width per square inch of soil.

Walking plows gave slightly less draught than sulky plows with rider. Sulky plows drew easier down hill, but much harder up hill than walking plows. A share straight on its land side and bottom took land well and gave a slight decrease of draught. A loss of draught was found on a sulky plow when its adjustment to take land was made from the pole.

A wagon with fellies 1¼ inches wide drew on moist, but close, blue grass sward 41·6 per cent harder than wheels with fellies 3 inches wide. On a dirt road, slightly moist, the narrow tires drew 12·7 per cent heavier than the wide tires.

Draught on plank road is one-fiftieth of the load, and not one-seventh of the draught on a dirt road in its ordinary condition after a rain.

A load over the hind wheels drew 10 per cent easier than over the front wheels.

Lowering the reach, or the coupling pole, on the hind wheels decreased draught; wagons draw easier when the traction has an upward incline, and harder when horses are hitched to the end of the pole.

Loose burrs reduced draught 4·5 per cent.

An old mowing machine repaired drew easier than a new one.

The draught was 8·7 per cent greater for a well sharpened sickle than for one more nicely sharpened.

A pitman box set tight gave less draught than one set quite loosely.

When cutter bar is not near right line with pitman rod the draught is increased.

When guards are out of line the draught is increased.

When cutter bar inclines upward draught is decreased.

When the sections of the sickle do not strike in the center of the guards the draught is increased.

The draught was decreased ten pounds by the driver walking.

A loss of force was observed when the wheel at the end of cutter bar failed to work well.

Muck Land on Fire.

For three months a Blackford County, Ind., farm has been burning underground, and it has been impossible to extinguish it. The farm is owned by Frank Williams, auditor of Wabash County. Mr. Williams' farm contains sixty-six acres of muck, which, when dry, will burn like sawdust. Three months ago fire started in the muck land. Little attention was paid to it until within the last week, when it was discovered that the fire was burning under ten acres and was still spreading. Within the last few days the ten acre patch has been a glowing furnace.

Reis's Place in Telephony.

BY A. E. DOLBEAR.

In the German exhibit at the world's Fair at Chicago was displayed a bust of Phillipp Reis, of Friederichsdorf, Germany, and it was labeled with a card stating that he was the inventor of the electric speaking telephone. A monument built by the German people in his memory bears the same statement as an inscription. Reis's work on the telephone was all done between 1860 and 1863, yet in this country we have heard of him chiefly for what it has been alleged he did not do. Within a year or two it has been written in good English by persons who certainly ought to know, that Reis's telephone was only a tone telephone which would reproduce sounds of various sorts but not speech, and this in spite of the fact that Reis said emphatically in one of his lectures that "words even were reproduced" by his apparatus, and in spite of the explicit testimony of a good number of persons yet living who were witnesses of his work in his own hands that they heard it transmit speech, such for instance as Prof. Quincke, of Heidelberg, Dr. Messel, of London, Dr. Hagen, of Cambridge, Mass., now deceased. The question is not as to whether the speech was transmitted well or ill, but was it transmitted at all. If it was transmitted at all, then he was the inventor of the telephone. Improvements might come, but the apparatus to be improved was already invented. Henceforth it was simply a question of relative efficiency.

After improvements in both transmitter and receiver had been made and the telephone became of commercial importance, the owners of the improvements saw that to hold a monopoly on the business it was needful to show that Reis did not invent a speaking telephone, and to accomplish this, technical advantage was taken of every available thing. Reis's description of his apparatus was strained beyond measure, his plain statements were ignored, the direct testimony of eye and ear witnesses was not allowed to be heard, and as Reis himself was dead, he could not be heard. Worse than that, inventors were allowed to patent apparatus which embodied what Reis showed in his, without any improvement, if the description of it and its mode of operation was different from Reis's. As proof of this, compare the apparatus described in the famous Berliner patent about which there is now so much concern —a patent which was applied for in 1877, and issued in 1891. There is not an essential thing in that which was not shown in Reis's devices, and for the purposes of speech transmission the latter will work as well as the former; but they are described in terms which will apply equally well to Reis. Now a change in description of a piece of apparatus does not make a change in its mode of operation. The latter is automatic. That which makes the transmitter of to-day better than the Reis transmitter is the substitution of hard carbon, and nothing else, in the same place and for the same purpose for platinum which was used by Reis. If Reis had chanced to employ such carbon in the place of platinum, he would have had a good speaking telephone, and he might have described its mode of operation just as he did describe his platinum-tipped electrodes.

The whole stress of the controversy was not upon the apparatus and its necessary automatic action, but upon Reis's description of its mode of operation, and so successful was this attempt that one judge declared that "a century of Reis would not make a speaking telephone." This can only refer to the description, not to the apparatus, for, as I have said above, the substitution of a bit of hard carbon for the platinum terminal would have made a perfect transmitter.

Who made that substitution? Neither Bell, nor Blake, nor Berliner, nor Edison, but Hughes, of London, and he gave it to the world. Like many another testamentary gift, the legatee failed to receive the legacy through crafty legality.

Again, in 1866, Mr. Yates, of Dublin University, while experimenting with Reis apparatus, placed a drop of water between the terminals of the transmitter, for the express purpose of preventing the abrupt breaks in the current, and succeeded in transmitting speech perfectly, as one can see would be the case. There were several witnesses of this living when the telephone cases were being heard here and abroad, but their testimony was excluded. Nothing would answer but the printed page, printed at the time; and as it happened the experiment was not described, only remembered, it followed that what was good enough for true history was not good enough for law.

Once more. Emphasis has been put upon the statement that the inefficiency of the Reis transmitter is due to its breaking the current at every vibration, so it can only transmit pitch and not speech, whereas it is easy to show it is nothing of the sort; and that when the transmitter is spoken to gently it transmits fairly well, in spite of the breaks which may occur. Sudden breaks in the current make so strong a sound in the receiver of any type as to persist in the ear for an interval long enough to drown weaker sounds if they be present. If the Reis transmitter be provided with a shunt circuit, so there will be a current in the receiver all the time, whether the movable terminals be in contact or not, one may discover at once whether the apparatus works the way it has been alleged to work and as the courts have decided it does work. One may hear and understand nearly everything said, and this proves that the Reis transmitter has the proper microphonic action. This does not make it a commercial instrument, but it serves to show that all the arguments made against it were wrong and were based upon untrue assumptions.

Many substances have been tried in the endeavor to find a substitute for hard carbon. None have been found its equal for such a purpose, but the metal osmium works fairly well, while silicon and boron, the chemical relatives of carbon, can also be used.

Some day the whole story of the telephone will be written. Distinctions will be made where they exist and where they do not exist; identity will be noted. It is now very certain that then there will be no need to change the inscription upon Reis's monument.—The Electrical Engineer.

Professor Franz Neumann.

Professor Neumann, the eminent physicist and mathematician, died on May 23 at Königsberg at the age of ninety-seven. At a recent meeting of the Paris Academy the secretary, M. Bertrand, in announcing the loss the academy had sustained by the death of such a distinguished correspondent in the geometry section, pronounced the following short éloge on Professor Neumann's contributions to knowledge:

"Franz Neumann, professor of physics and mineralogy at the University of Konigsberg, made his début in science more than seventy years ago by some beautiful works on mineralogy. Soon after he directed his studies toward physics, and by an admirable 'Mémoire sur la Théorie des Ondulations,' which was presented to the Berlin Academy in 1835, he took his place among the masters of science. Neumann, like Cauchy, but by very different means, was led to consider luminous vibrations as taking place in the plane of polarization, while Fresnel thought them perpendicular; he knew how to follow in the most minute details, always in accordance with the observation, the mathematical consequences of his hypothesis. But Fresnel's theory is not contradicted by any of the experiments; so doubt continues, and the ever renewed discussions, whatever their conclusion may be, will remain a noble homage to the man of science and profound physicist who was the first to start them.

"Neumann's memoir on induction showed again the great mathematical skill of its author. In it Neumann translated by general formulæ the discoveries of Faraday and Lenz's laws; it is to him that we owe the expression of the potential of a system of two closed currents of which merely the existence, independently of the very elegant form which he has given it, has played such a great part in science.

"Franz Neumann was a great professor. Even at the age of ninety he attracted numerous auditors; his lessons, received and written out by learned students, have been studied in all the universities of Europe. The study of physics was his aim; but when he came across a fine mathematical problem he excelled in interesting his auditors by initiating them occasionally into the highest theories of analysis. It is with justice that in 1863 the section of geometry, making amends for a long neglect, elected this illustrious physicist into the Academy."

The Effect of Volcanic Action Upon Earth Currents.

Signor L. Palmieri, of the Vesuvius Observatory, has taken observations during the past six years upon the action of earth currents on a telegraph line extending between the observatory and Resina. He has found that when Vesuvius is inactive or during periods of minimum activity, the earth currents flow upward, irrespective of the azimuth at which the wire is placed, increasing and diminishing inversely as the activity of the volcano. When this activity reaches a certain point the currents cease, and if the volcanic action still further increases, the earth currents begin flowing downward, increasing with the activity of the crater. The experimenter, therefore, concludes that in the case of wires inclined to the horizon and out of the reach of volcanic interference the earth currents flow upward in whatever azimuth the wires are placed.

The National Meet of the League of American Wheelmen.

The National Meet of the League of American Wheelmen was held this year at Asbury Park, N. J., where the visiting wheelmen, who numbered thousands of ladies and gentlemen, enjoyed the bracing sea air and ocean bathing. The place is admirably adapted for a bicycle meet, as the roads are superb and large hotels numerous. Almost every club throughout the country seems to have sent representatives. The Denver wheelmen, seventy-eight strong, attracted much attention, and were pronounced the best dressed men at the meet, and, for numbers and appearance, the delegation from Colorado took the prize at the great parade which occurred July 9.

Bicycle Notes.

The doorkeeper of the Belgian Chamber of Deputies has provided a rack on which members can dispose their wheels upon arrival, for a large number of them have now adopted the practice of taking a morning spin before the opening of the session and arrive at the Legislative Palace mounted.

An efficient electric bicycle lamp has been devised at last. The electrical part of the lamp is a dry battery composed in some cases of three shells one-half inch in diameter and four inches long and in others of six of these shells. A continuous light is furnished for one hundred and forty-four hours without recharging. The current is regulated by means of a switch; the lamp can be recharged at a cost of twenty-five cents by purchasing of local agents one more of these shells, just as a man buys cartridges for a gun. The advantages of the lamp are that the vibration does not affect the light at all and there is no smoke, no leakage and no odor about it and it is far more reliable than the ordinary bicycle lamp.

Private Arthur E. Weed, of Company F, Ninth Infantry, left New York on a bicycle at 3 P. M., June 25, 1895, with a message to Col. Kline, at Madison Barracks, reached Sackett's Harbor at 20 minutes to 4 June 29. Starting on June 9, Lieut. Wise and Private Weed made the trip from Madison Barracks to Governor's Island in eighty-eight hours. The return trip made by Weed alone was made in ninety-six hours and forty minutes. The distance is 397 miles. Weed rode a twenty-one pound wheel and carried the regulation soldier's equipment, which weighs thirty-five pounds. Sackett's Harbor, where Madison Barracks are located, is 10 miles west of Watertown, N. Y.

The Customs Department of Canada has decided that tourists' bicycles may be admitted free of duty on affidavit that the machines are the rider's personal property, and not brought into Canada for the purpose of sale.

The injustice of requiring cyclists to carry lamps at night while other vehicles are not required to do so has been recognized in New York City. Mayor Strong has signed the Vehicle Light Bill. All passenger cabs, hacks and buggies will now have to have a lighted lamp at night the same as a bicycle.

An interesting test case came to an issue in Chicago July 1, when Judge Payne denied the bill for an injunction restraining the owners of the Fort Dearborn office building from interfering with a tenant while taking his bicycle to his office on the twelfth floor of the building. The judge, who is himself a wheelman, held that the bicycle was a vehicle not different from a horse and buggy as far as the right to exclude from the premises was concerned, and that the owners of the building have a right to make regulations regarding the admission of vehicles.

Perley Burritt arrived in Chicago at 12:45 o'clock, June 28, completing a ride on an eighteen pound bicycle from Jacksonville, Fla., to Chicago. The total distance covered was 1,385 miles. Burritt started on his ride on June 13, at 6.20 A. M. Burritt says that the ride was undertaken for pleasure. When he started on his ride he weighed 100 pounds. He gained twelve pounds on the trip. He carried baggage weighing twenty-five pounds strapped on his back.

A coupler by which two bicycles can be attached side by side is being introduced in New York City.

A dispatch from Waltham, July 1, states that Arthur W. Porter, of Waltham, the crack cyclist, did a mile in the face of a strong wind in 1:51 4-5.

Well authenticated stories about the scattering of tacks for the evident purpose of puncturing tires come from various places. It caused havoc at Sag Harbor, Sunday, June 23, where some person strewed tacks over the road with a liberal hand. Of fifteen wheelmen who reached the hotel at Sag Harbor, every one had a puncture and some had three or four. This form of malicious mischief should be severely punished.

The sum of 100,000 marks was included in the German Army estimates, the present year, for the supply of bicycles to the army. Two wheels are assigned to each battalion. The bicycles are to relieve the cavalry of a great part of its intelligence duty and to take the place of mounted orderlies. An Austrian officer has recently invented a military bicycle with which a very high speed has been obtained. The peculiarity of this bicycle is that the saddle is placed very low. The Russian, Portuguese and Belgian armies have now adopted the bicycle, regular instruction, practice and drill being provided for.

Military experts believe that there are few parts of any civilized country where a wheelman cannot in a day cover at least twice the distance possible to a horseman and in several consecutive days' riding the difference is still greater. The wheelman can go across country or over almost any line practicable for a mounted man and often where the latter could not go, though of course good roads are desirable for bicycles as well as for ammunition or baggage trains. The wheel can be easily lifted over stone walls or high fences, and unless the ground has been too recently tilled or the grass is too high, most open country is found to be practicable for the expert army wheelman.