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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1040.

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IMPROVEMENT OF BOSTON HARBOR.

A movement is on foot to procure from Congress the necessary appropriations for the deepening of the channels at Boston, so as to admit vessels of the largest class. A depth of 30 feet is necessary, while at present only from 23 to 27 feet at mean low water are available. Boston is now one of our most important shipping ports and enjoys a great and growing commerce. There should be no delay in granting the most liberal appropriations for a work at once so necessary and advantageous to the whole country.

THE UTILIZATION OF WIND AS A MOTIVE FORCE.

For many centuries wind has been used in the countries of the old world as a motive power. In some of the low lying lands of Central Europe the lumbering old windmill is still one of the characteristic features of the landscape.

In this country the windmill has of late years been greatly improved and brought extensively into use. It is estimated there are over half a million windmills now running, and the annual increase in sales is estimated to be upward of 50,000. They are mainly used for pumping the domestic water supply; in many of the Western States a farm is scarcely considered to be complete unless it can boast of its windmill pump.

In some cases the mills are put to such work as cutting feed for stock, grinding corn, and the various lighter mechanical work of a farm. The success of the improved windmill in America has encouraged the manufacturers to push the trade in European countries and there is to-day a growing demand in the old world for these very useful and economical machines.

The chief drawback to the use of wind-driven motors is that the power is intermittent and uncertain. It has often been proposed to store up this power, so that the supply can be drawn upon in calm weather. This can undoubtedly be done; but whether such storage can be accomplished with economical results is open to question.

Water might be raised a certain height and stored in tanks prepared for the purpose. But on the basis that one horse power would require the lifting of 33,000 pounds one foot in one minute, it is evident that it would require large storage tanks and much time to lift enough water to provide a supply of any practical value. To this must be added the cost and care of a water motor to utilize this stored-up energy. A simple calculation shows that to furnish a constant supply of one horse power for a day of ten hours would require the daily storage of 47,000 gallons of water at a height of 50 feet. To accommodate this would require a tank 20 feet square and 16 feet high. To the expense of such a tank must be added the cost of the strong tower which would have to be built to carry at such a height this load of nearly 200 tons. The cost of receivers and motors for the utilization and storage of compressed air would in like manner largely neutralize any apparent utility of such device.

To store up sufficient electrical energy to run a one horse power motor for a day of ten hours would require a set of cells whose weight would be from 1,600 to 1,700 pounds. They would occupy some 20 cubic feet of space; and with the motor, belting, shafting and general fittings complete, the plant would cost about $500.

There would be a certain amount of drawback to the use of this system in the fact that the handling of a battery necessitates some technical knowledge and skill; a consideration that must necessarily limit the range of its application. Of the three systems of storage, the last mentioned would seem to be the best; and with further improvements in the way of automatic devices for regulating the charging and discharge of the batteries, we may look for a more extended use of this system in the future.

THE CHICAGO TIMES-HERALD MOTOR RACE.

It was extremely unfortunate that the weather should have interfered so seriously with the Chicago Times-Herald motocycle contest, which came off at that city on Thanksgiving Day. The recent storm had left the roads heavy with snow and mud. We are told that "for miles on the west side the boulevards were unbroken fields of snowbanks and slush." Six machines lined up for the start: The Duryea, of Springfield, Mass.; the Morris & Salom electrobat, of Philadelphia; the H. Mueller motocycle, of Decatur, Ill.; the R. H. Macy, of New York; the De la Vergne, of New York; and the Sturges electric motocycle, of Chicago. The Roger motocycle, with a view to giving it a long distance test, was started from New York to Chicago by road on November 15; but it was stalled by snow when it reached Schenectady.

Two of the machines covered the distance fixed for the race; the first being the design of an American inventor, Charles E. Duryea, of Springfield, Mass. His vehicle, a gasoline motocycle, covered the fifty-four miles in 10 hours and 23 minutes; a really creditable feat, when we consider the wretched state of the roads. The H. Mueller, also an American machine, was second, making the journey in 1 hour 35 minutes longer time. The De la Vergne, the Morris & Salom, and the Sturges electrical machine made no effort to cover any great part of the course.

The R. H. Macy had to retire after covering half the distance on account of broken running gear.

Although it is to be regretted that the recent storm should have spoiled this most interesting contest as regards the number of contestants and the rapidity with which the course was covered, we must bear in mind that the great severity of the test speaks all the more favorably for the excellence of the vehicles which completed the journey.

The storm of a day or two previous had completely paralyzed vehicular transportation in the very district where the Duryea motocycle completed a fifty-four mile journey at a five mile gait, and came in to the winning post none the worse for the trying ordeal. No better proof could be given of the all-round excellence of this vehicle. The greatest care must have been exercised in the proportioning of parts, and the general setting up, both of the motor and carriage, to enable it to battle for ten hours against the combined obstacles of mud and snow.

It is, moreover, greatly to the credit of the manufacturers that all this strength should have been obtained without the sacrifice of general appearance. As shown in the illustration, the Duryea motocycle is certainly an elegant "turnout," and for looks it could hold its own with the average horse carriage of to-day.

Undoubtedly the motocycle has come to stay. For private use, as compared with the horse carriage, it has many points in its favor. The space required for stabling would be merely that occupied by its own bulk; and its running expenses would be limited to the fuel consumed and such repairs as might occasionally be required.

We think that this new means of transportation is destined to play an important part in the question of city traffic. In the main thoroughfares of the larger cities traffic is badly congested. The adoption of the motocycle will largely relieve this, for the reason that it occupies only about one-half the space of the horse carriage; moreover, it turns in a much smaller circle, and is in every way more flexible in a crowded thoroughfare.

The metaphorical allusion to a flow of water in speaking of city traffic is well chosen. The "stream of traffic" is subject to the same laws as any fluid moving in a fixed channel. The more easily the particles adjust themselves to each other, the more rapid will be the flow, other things being equal. Nothing hinders the flow of traffic so much as a line of vehicles moving on a fixed track and having the right of way over other traffic. If such a thoroughfare as Broadway, in New York City, were asphalted from end to end, and its vehicular traffic carried on by various forms of the motocycle, its capacity would be largely increased.

The force of this statement will be realized by any one who has watched the ease with which the bicycle can thread its way through a crowded thoroughfare. Making allowance for its larger bulk, the motocycle shows an equal facility of control.

The general adoption of this vehicle, and the consequent removal of many thousands of horses from the streets of our cities, would result in greatly improved sanitary conditions. The introduction of the trolley and the cable car removed the nuisance in part, it is true, but it still exists. A gusty wind will raise at any time in dry weather a cloud of dust, which is composed more than anything else of pulverized manure. The gravity of this nuisance, viewed from a sanitary standpoint, is not generally appreciated. The adoption of any device, such as the motocycle, which will abolish the horse from a city's streets, would be welcomed by its sanitary officers as largely conducive to public health.

Wire Flywheel.

Among the most recent and novel applications of wire, attention is drawn in Hardware to the wire flywheel lately erected at the Mannesmann Tube Company's works, Germany, and especially notable, in view of the well known fact that heavy flywheels, driven at high velocities, present such dangers of breaking asunder from the great centrifugal force developed. The wheel at the factory mentioned is described as a cast iron hub or boss, to which are attached two steel plate disks or cheeks, about 20 feet in diameter. The peripheral space between the disks is filled in with some seventy tons of No. 5 steel wire, completely wound around the hub, the tensile resistance thus obtained being found to be far superior to that of any casting.

This huge flywheel is driven at a speed of about 240 revolutions per minute, or a peripheral velocity of 2·8 miles per minute, or approximately 250 feet per second, which is said to be nearly three times the average speed of any express train in the world. For such a constructed flywheel the length of wire is estimated at about 250 miles. The use of paper is also regarded with favor for large flywheels, the tensile strength of paper being enormous, and it is quite possible that some of the new big wheels will be built up with a paper rim.

Wonders of the Mississippi.

A writer in Longman's Magazine says: The Mississippi has in the course of ages transported from the mountains and high land within its drainage area sufficient material to make 400,000 square miles of new land by filling up an estuary which extended from its original outfall to the Gulf of Mexico for a length of 500 miles and in width from 30 to 40 miles. This river is still pouring solid matter into the Gulf, where it is spread out in a fan-like shape over an extended coast line, depositing 362,000,000 tons a year, or six times as much soil as was removed in the construction of the Manchester ship canal, and sufficient to make a square mile of new land, allowing for its having to fill up the Gulf to a depth of eighty yards. Some idea of the vastness of this operation may be conceived when the fact is considered that some of this soil has to be transported more than 3,000 miles; and that if the whole of it had to be carried in boats at the lowest rate at which heavy material is carried on the inland waters of America, or say for one-tenth of a penny per ton per mile over an average of half the total distance, the cost would be no less a sum than $1,190,000,000 a year. Through the vast delta thus formed the river winds its way, twisting and turning by innumerable bends until it extends its length to nearly 1,200 miles, or more than double the point to point length of the delta, continually eroding the banks in one place and building up in another.

Paper Pulp Shoe Heels.

One of the latest features of wood pulp industry is the manufacture in Haverhill, Mass., of shoe heels from that material, white pine and other kinds being used for the purpose. In carrying out this art the plan as described consists in reducing the wood in the usual way in digesters, after which the pulp is put into a tank and mixed with the substances necessary for imparting to heel stock the necessary requirements such as alcohol, litharge, tar, degras and fish glue, a thorough mixing of these with the pulp being followed by soaking the same a day or two, so that the fiber may be penetrated, when another application of materials occurs. The object at this stage is to harden the pulp somewhat, so that it can be rolled into thick sheets and handled, shellac and borax accomplishing this, the pulp thus having the consistency of cement. At this point slakened lime is put in, and as this hardens when dry, the pulp must be rolled into sheets and cut into heels before the hardening takes place. With needed rapidity the pulp is now drawn from the tank in sheets, it being just thick enough, and there being specially arranged rollers and adjustments at the bottom of the tank for effecting this. A series of pressures through press rollers reduces the sheet to the right thickness, and the sheet is next placed quickly upon the bed of a cutter; the wheels are now started, and in a moment the platen falls, forcing a hundred or more cutters upon the sheet, shaping out a heel each.—N. E. Lumberman.

Artificial Fuel.

Anthracite briquettes have heretofore failed as fuel because the material has never been used in a sufficiently finely divided state. According to this invention, anthracite small coal ("duff") is passed through a disintegrator which will deliver it in such a condition that it will all pass through a sieve of at least twenty wires per linear inch, a finer condition being preferable. It is then mixed with (say) 6 per cent of equally finely powdered pitch, and the mixture is passed on to a pug-mill, wherein (say) 6 per cent of coal tar or other liquid hydrocarbon is incorporated with the mass. The mixture prepared in this way is heated by superheated steam and compressed into briquette moulds at a pressure of abou ttwo tons per square inch. If it be desired to render the briquettes smokeless, they may be gradually heated to about 800° or 900° C. It is claimed for these briquettes that each cakes separately in the furnace, that they are not deteriorated by rain, and that they are hard enough to bear tipping from a wagon or from sacks.—W. H. Biggs and R. R. Greenhow, Glamorgan.

Diastasic Ferments.

A mixture is made of sand (90 pounds), starch (10 pounds), and water (10 pounds), and the whole heated by steam until the starch is gelatinized. Wheat or maize flour is a convenient form of starch to employ. The steamed mass is cooled to 100° F., and then mixed with a small quantity of the spores of maize smut (Ustilago maydis). This is spread on trays and placed in a room kept at 80° F., the air of which is kept humid. The mould spores grow rapidly and in about thirty six hours the moisture is shut off, when the product quickly dries. If the growth be allowed to continue longer, spores are formed which are useful for subsequent operations.

The finished product, either before or after drying, is extracted with water; when it yields a solution rich in diastase, and which can be employed as a substitute for malt.—C. L. Hart, Chicago, U. S. A.

Cycle Notes.

The toll for wheelmen on the Brooklyn Bridge has been reduced from three cents to one cent, and legislation is now expected which will make the bridge free to all riders. The system of stopping to buy a ticket, which was collected a quarter of a mile further on, has also been abandoned, and the rider now drops a cent in a box at the end of a stick as he rides past the ticket seller's booth.

The question is often asked, "How long will a machine or the tires thereon last?" Everything depends in answering this upon the machine's weight, its quality, the weight of the rider, the character of the roads ridden and the care taken of the machine. But taking average conditions, a wheel should be ridable for four to six seasons, or at least 10,000 miles. With proper care, a well made pair of road tires should last the same length of time as the above estimate of a wheel's life, a pair having been known in England to have traveled 25,000 miles and still be serviceable.—The Wheel.

Cementing a tire to the rim is a task generally left to the repair man, as the thoughts of the trouble attached to heating the cement and preparing it for use are enough to make the average person forego any desire to try the job himself. A way to cement a tire to any kind of a rim without heating the cement is by taking hard red cement, grind as finely as possible and let it stand for several hours in a large mouthed bottle, first having covered with benzine. An occasional shaking should be given it, until the cement is thoroughly dissolved, when it is ready for use. The rim should be cleaned with a cloth saturated with benzine, and a heavy coat of the cement applied to the rim with a brush. Then apply benzine to the part of the tire that sets in the rim, put on the tire and inflate hard. A tire cemented on the rim in this manner will never work loose. In order to remove it, benzine should be forced under the tire to soften the cement. The application of cement will suffice for any number of tires, as once on the rim it always remains. To keep this cement ready for use, it should always be corked.—N. Y. Recorder.

[And to prevent explosion, see that there is no fire or flame within a mile of the benzine.]

In Vienna, Austria, all bicycle riders before obtaining permission to ride on the public streets are required to pass an examination. They are required to ride between boards laid on the floor without touching the sides or edges of them. At the word of command they must be able to dismount either right, left or backward; until the rider passes this examination satisfactorily, a license to ride on the public highway is refused him.

An American tourist is said to have recently sent his bicycle from London to Paris by mail at a cost of a few pence, and received it in perfect order. The English parcels post now carries mail packages not over twenty pounds in weight, and not of a higher value than $100, from any point in England to any place in France at what appears to be a ridiculously low tariff. The bicycle weighed just twenty pounds. The wheels and handle bars were removed from the frame and carefully wrapped in heavy paper, so as to make a compact bundle, before the postage was paid, and when the wrappings were removed at the tourist's hotel in Paris, the machine was in perfect condition.

In East Orange, N. J., the Board of Education has just erected a special building for storing the bicycles ridden by pupils. It is 60 feet long and 16 feet wide, with racks on both sides and a passageway between for the wheels. The wheels are stored here during school hours, the building being locked up by the janitor, and opened at noontime and at the close of school. This is probably the first building that has ever been erected as an annex to a school for the purpose of storing the bicycles of the pupils.

When the bicycle is put away for the winter, it should be thoroughly cleaned and vaseline or gun grease rubbed over all the bright parts, and the bearings should be flushed with oil. The tires should also be thoroughly cleaned, and the machine inverted so as to rest on the handle bar and saddle, so that the weight will not rest on the tire. A bicycle stand is still better, or the wheel may be suspended from the ceiling. The tires should be kept fairly hard during the winter.

A new horse and bicycle riding academy, of large dimensions, is now being erected in New York City, at Sixty-sixth Street and Central Park, west. A novel feature will be the bicycle ring upon the roof. 300 × 90 feet; there will also be a riding ring, 200 × 90 feet, and an inclosed bicycle ring, 234 × 90 feet.

The latest invention of the French is a bicycle for use on land and water. It is described in Hardware as follows: "The wheels are preferably of copper, their side plates inclosing a large central air space. The rear wheel, forming the drive wheel, has on its sides lateral blades to engage the water when the bicycle is so used, and its felly is toothed to enable it to take hold of ice when the rubber tire, which is only designed for land use, is removed. To hold the bicycle upright when used in the water, side weights are connected by suitable bails to the wheel axles, but when the machine is used on land, these weights are raised by chains which pass through a tube depending from the frame bars, links of the chain engaging a stop or pin to hold the weights raised. The saddle of the machine is of a form designed to prevent the water from splashing up against the rider, and has at its rear end a lateral mud and water guard."

Demand for Five Weeks Old Chickens.

At a large stock farm in Maryland, where a specialty is made of poultry, it is stated that 20,000 young chickens have been marketed in the year past, and that a single hotel in New York City would be glad to make a contract for the entire production. A "baby white" Plymouth Rock "broiler" is said to be the especial favorite, and one explanation of the manner in which they have come to be so popular is thus given by the Rural New Yorker: "A few years ago the family of one of our American millionaires went to Paris and ate a dinner at which little birds were served—one for each guest. They were smaller than ordinary broilers, one whole one providing about meat enough for each person. This seemed like an agreeable fad, and when they returned to America this family demanded these little birds in place of broilers. This fashion has spread among the rich until a plump chicken five weeks old will often sell for as much as a large broiler. Of course this means a gain to the feeder of at least a month's feeding. It just illustrates how changes in fashion strike below the surface into the production of articles of food. The rich and fastidious demand delicacies—fruits, vegetables and meats out of their natural season. This demand stimulates inventive genius, and men are found who invent the appliances needed to produce the artificial conditions required to grow plants and animals out of their seasons. These appliances are improved and extended until what was once a luxury becomes cheapened to a necessity, and rich and poor alike enjoy it. That is the history of forced fruits and vegetables, broilers, hothouse lambs, etc."

The Cost of Bad Roads.

The office of road inquiry of the Department of Agriculture has completed an interesting investigation relating to the use of the common roads of the United States. Returns have been received from about 1,200 counties, showing the average length of haul from farms to markets or shipping points to be 12 miles; the average weight of load for two horses, 2,002 pounds; and the average cost per ton per mile, 25 cents, or $2 for the entire haul. Estimating the farm products at 219,824,227 tons in weight, and making estimates on other articles carried over the public roads, it is calculated that the aggregate expense of this transportation in the United States is $946,414,665 per annum. Reports have been asked from the United States consuls abroad of the expense of hauling where the roads are good, so as to render possible a calculation which will show how much of this large outlay is due to bad roads. The estimate is ventured, however, upon information in the office of road inquiry, counting the loss of time in reaching markets, the enforced idleness and the wear and tear to live stock and hauling machinery caused by poor roads, that two-thirds of the cost might be saved by an improvement of the roads.

The British Cruiser Blake.

H.M.S. Blake recently had an eight hours' natural draught trial and a four hours' forced draught trial of her propelling machinery, subsequent to having her boilers retubed and fitted with Admiralty pattern ferrules in Chatham yard. Both trials were satisfactory, the original specified indicated horse power of 20,000 having been easily maintained. The Blake, it will be remembered, has two sets of triple expansion engines for each screw, and the designed piston speed was 840 feet. There are six double-ended boilers, each with eight furnaces, and an additional single-ended boiler for auxiliary machinery. The detailed results are as follows:

Date of trial	November 6, 1895.			
Nature of trial	Four hours full power, forced draught.			
Draught of water	Forward, 24 ft. 10 in.			
" " "	Aft, 27 ft.			
Speed of ship, knots	20 by log.			
Steam pressure in boilers	147 lb.			
Air pressure in stokeholds	2·3 in. of water.			
Revolutions per minute	Starboard, 96·5. Port, 99·1			
	Forw.	Aft	Forw.	Aft
Vacuum in condensers	26·8	26·3	26·9	26·5
Mean pressure in cylinders:				
High	54·7	50·8	55·8	52·5
Intermediate	39·0	40·2	37·2	35·9
Low	14·4	13·2	14·5	14·5
Indicated horse power, mean for each s t	4,938	4,773	5,008	4,860
Total (starboard and port)	9,711		9,868	
Grand total	19,579.			

On preliminary trial the ship made 21·5 knots, and the indicated horse power was 20,132.