GATHERING AND STORING ICE.

Our engravings illustrate the most recent improvements in the methods and tools employed for gathering and storing ice. They are selected from the *Science Record* for 1875.

Fig. 1 is a general view from a winterscene on the Hudson river, one hundred miles above the city of New York. At various convenient points along the banks of the river are located immense storehouses, within which the ice is deposited, and kept for summer use. Fifty thousand or a hundred thousand tuns are frequently deposited in a single storehouse.

Fig. 1.—ICE GATHERING ON THE HUDSON RIVER, NEAR NEW YORK.

The storehouse buildings are composed of wood, with double walls, and are very rough-looking. In summer the ice is loaded into barges, towed down stream to New York, delivered therefrom directly into ice carts at the dock, and thence distributed to customers at the doors of their dwellings. Ice is thus ordinarily supplied in New York at a cost to the user of about one quarter of one cent up to one cent per pound, depending on the quantity taken and the relative abundance of the supply. An open winter yields a poor crop of ice, and the price during the ensuing summer is fixed at a higher figure.

In gathering ice, the work commences as soon as the ice reaches a thickness of nine inches. The plots of good ice (for the thickness and quality of the ice vary greatly at different points on the river) within convenient distance of the ice houses are staked out and marked with hemlock brush. Then, with ice plows, the men mark out the ice in suitable squares (36 by 22 inches), cutting the groove about an inch in depth (see Fig. 1). Following the markers, plowmen with plows of deeper blade sink the groove to a depth of three inches, and continue this operation until a sufficient depth is attained. Just enough ice is left to hold the blocks firmly together. The next operation is to separate a raft of the blocks (generally 112 in number) by taps of the heavy ice chisel. These rafts are towed by horses into a canal cut from the pond to the ice house, where the raft is secured by pikemen, and thrust toward the slope of the ice house. Before this is reached, men with tridents have broken the raft into single cakes, which, as they reach the slope, are guided to the cleats attached to endless chains, which,

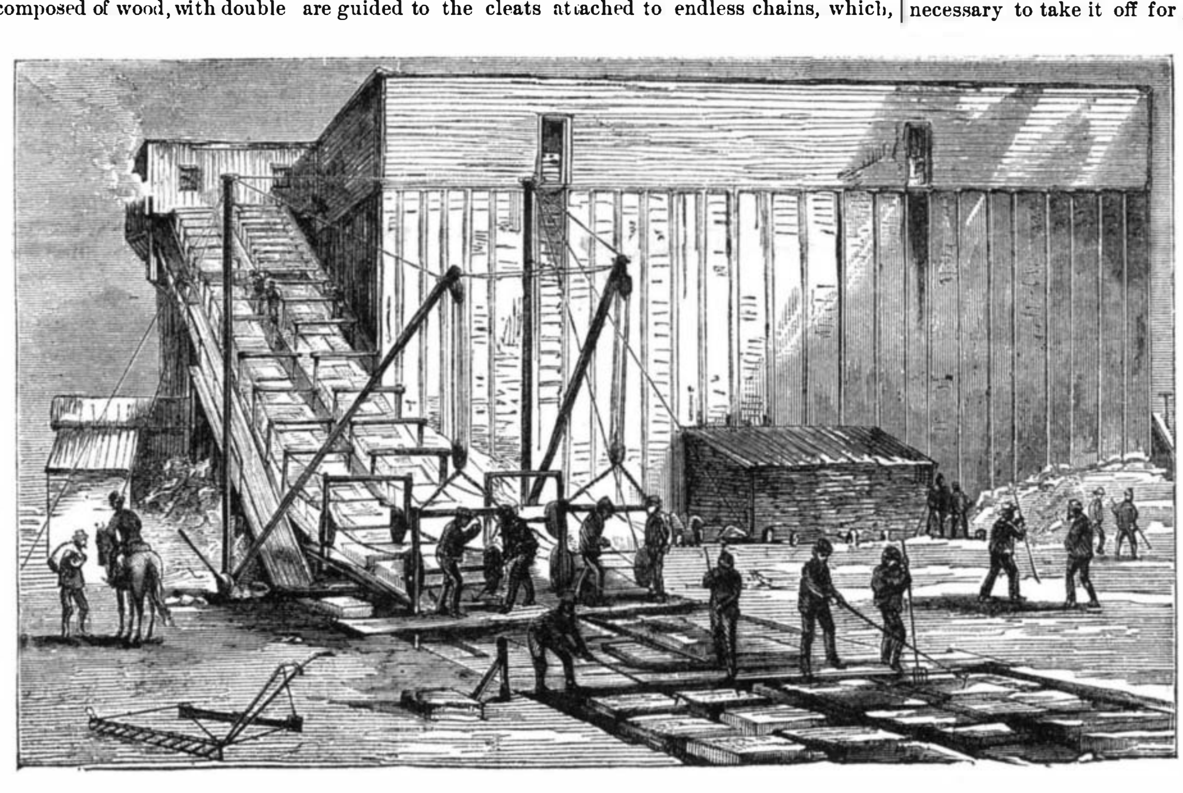

Fig. 2.—THE STEAM ICE ELEVATOR.

moved by steam power, carry a steady stream of ice to any desired gallery of the storehouse (see Fig. 2). From this point, the blocks glide swiftly down an incline until they reach the doorways, where bar men dexterously switch cake after cake into the slide which leads into the house. The work of stowing is quickly done, and the blocks are so arranged that a space of two or three inches between the cakes gives circulation of air and means of escape for the water from the melting ice. When the house is filled, loose hay is thrown over the top, and the house is closed.

The form of the ice plows is shown in Figs. 1 and 2. One of the runners, which is smooth, rests on the ice and serves as a bearer; the other runner is provided with a series of teeth or shares, which cut a groove in the ice.

Fig. 3.—SMALL ICE ELEVATOR.

The New York Canals.

The State Engineer and Surveyor, in his annual report on the canals of New York, says that the navigable canals and feeders aggregate a length of about 907 miles, and, with the lakes and rivers artificially connected with them, make 1,393 miles of navigation. The total cost of these canals, including their equipment and extraordinary repairs, is given at $100,717,995.

It appears from the report that the improvement of the chief of these works—the Erie Canal—is not yet completed, either in width or depth, in accordance with the original plan. It is estimated that, for the expenditure of $379,000, a uniform depth of seven feet can be secured. The State Engineer expresses great confidence that the progress made in the use of steam, for towing purposes on the Erie Canal, will soon cause steam to supersede all other kinds of motive power.

Speed of Trains and Weight of Rolling Stock.

The current report of the Railroad Commissioners of Maine contains suggestions in regard to reducing the speed of trains and the weight of rolling stock on railways, to the end of diminishing the wear and tear of the latter and of the track. In a communication from Superintendent Sawyer, of the St. Croix and Penobscot Railroad, that officer writes: "With two engines in equally good repair, we ran one at a speed of 26 miles an hour, 42 miles daily, with a mail train, and at a speed of 14 miles an hour daily with a freight train: total, 84 miles daily until it had run 14,000 miles, when it became necessary to take it off for general repairs. The other ran 84 miles daily at a speed of 14 miles an hour, with a freight train, until it had run 21,000 miles before requiring general repairs, and was even then found in better condition than the one running at the higher rate of speed. Wood and oil were consumed nearly in the same proportion. It is fair to suppose, also, that the rails, sleepers, bridges, etc., suffered the same additional wear. It is my opinion that an increase of speed of 12 miles an hour, beyond 14 or 15 miles, will increase the cost of repairs at least 75 per cent.

"In relation to wheels, I think that, at a lower rate of speed, a 350 lbs. twenty-eight inch wheel is more than equal to a 500 lbs. 32 inch wheel at a high speed. A heavy axle will jar off at high speed before a light one will become unsafe with the same number of miles run at low speed. A 25 tun engine is of sufficient weight for general use. If additional power is required with a snow plow on heavy freights, rather increase the number of engines than the weight of them; there is less risk in moving snow with power and force than with momentum. As

Fig. 4.—TRANSFERRING ICE FROM THE GALLERY TO THE STOREHOUSE.

to passenger cars, a fifty seat passenger car can, in my opinion, be run more economically than the ordinary car. The first cost is $1,000 less, the weight and wear on the rails are less, the cost of repairs is less, and it requires less power to move six fifty seat cars, there being a difference of 18 tuns in favor of the six light cars."

Correspondence.

A Fever Case.

To the Editor of the Scientific American:

In the coal regions of Pennsylvania is a town of five or six thousand inhabitants, situated in a valley so narrow that, for a considerable distance, only one street is possible. Down the valley runs a stream or creek which has a fall of about 200 feet to the mile. Sometimes the stream has a depth of 3 or 4 feet, at others only as many inches; it runs under the front and back yards and houses, and is used as a very convenient sewer to carry off filth of every description, to bless the inhabitants along the river where the current is not so rapid. This creek is generally covered with heavy hemlock plank, while in every yard is a door through which garbage may be emptied.

During last October, a citizen sent his teamster to dig some earth from the cellars of two of his stores; the earth was thrown into the street and then hauled some half or three quarters of a mile up town, and spread over a vacant lot adjoining some dwelling houses. The earth taken from the cellars had a pungent odor, and a peculiar watery, iridescent appearance. On the night following its removal from the cellar, the proprietor of the place, who had superintended and assisted at the digging, was taken with violent cramps, which lasted several hours, and then gave place to a dull, languid feeling, with pains like rheumatism and a discoloration of the skin, the hands and arms swelling and becoming quite purple. The next day the teamster was taken ill, and the doctor pronounced the symptoms to be those of typhoid fever. The day following a young man, working in one of the stores from the cellar of which the dirt was taken, was also taken violently ill, and the doctor pronounced the case to be similar to that of the teamster. Upon the same day a girl about 14 years old, living in the dwelling adjoining the lot where the dirt was thrown, was taken with the same symptoms, which developed into violent typhoid fever and culminated in death a few days later. There were soon more than a dozen cases of the fever, as it began to be called, and in two weeks the number reached upwards of 60. The symptoms generally were violent headache, pain in the back of the neck, and high fever, with loss of appetite and general languor. When the fever subsided, the tongue became coated with a thick coat of dark green matter, which remained until the patient was convalescent. The fever averaged, probably, in each case from 12 to 15 days, but was followed by extreme weakness, loss of memory, dimness of sight, etc., lasting from 3 to 6 weeks additional.

The majority of cases did not result in a radically typhoid condition, as I understand it, the bowels being seldom attacked. In every case where a patient took a relapse from exposing himself too soon, the result was fatal, and in very few other cases did it prove so. The evidence hardly seems indisputable that the fever was contagious, as sometimes only one person, and sometimes several, in a large family took it. In one case a person who came more than a hundred miles from home, to nurse a patient, left him upon his convalescence, and was home only a few hours when she was taken with the same complaint, and went through a regular six weeks' course, although hers was the only case in the city of 25,000 inhabitants where she resided.

The question has arisen whether the half dozen wagon loads of putrescent mud, the atmospheric conditions, or the possibly foul emanations arising from the natural sewer, in which the water had been rather low for some time, caused the fever. If any of your readers can throw light upon this subject, we would be happy to hear from them, as six weeks' experience with this fever has sadly broken into twenty-eight years of otherwise uninterrupted health. H.

East Mauch Chunk, Pa.

Cotton Manufacturing in the South.

To the Editor of the Scientific American:

It is a well known fact that cotton factories at the South have been making money while many of those at the North have been compelled to suspend operations in whole or in part. Some of the reasons for this state of things are as follows:

1. Labor is cheaper at the South than at the North.

2. In consequence of a milder climate, the necessary expense of living is less there than in New England, as is also that of heating factory buildings, etc.

3. Coal is abundant in the South, and cheap water privileges can be obtained in every direction.

4. The purchase of the raw material direct from the producer saves the profits of numerous middlemen, the cost of several buildings, and long transportation.

To these advantages I am satisfied that still another of great importance can be added. The Southern factory should buy the cotton in the seed, gin, and then spin it, without packing into bales; and it is to urge some of your inventive readers to arrange machinery for this purpose that I write this communication. Some of the advantages of such a system would be as follows:

1. The yarn would be stronger. Baled cotton cannot be prepared for carding without beating, and thus weakening the fiber to a greater or less extent.

2. There would be less waste. Frequently much cotton is discolored and otherwise injured by foreign substances that have been packed with it. I understand that at the North and in Europe it takes from 108 to 115 lbs. of cotton to make 100 lbs. of yarn; and although the waste is not so great at the South, it is nevertheless considerable.

3. The cotton seed would be pressed at the same establishment, and the oil and oilcake sold for many millions each year.

4. The interest on gins and gin houses, which are now idle the greater part of the year, would be saved to planters.

5. The raising of cottons on small farms would be encouraged. The plantation system is not adapted to free labor, and is steadily breaking up; but until cotton can be readily sold in the seed, few small farms will be opened in the cotton section, for the reason that a man cannot afford to buy and operate a gin if he only plants a few acres of cotton. Better cottons and more per acre will be obtained on small farms than on large ones. The reason of this is that a hand can plant and cultivate two or three times as much cotton as he can pick. During the picking season, the entire field should be gone over at least once a day. Even under the slave system, planters who put in an acre of corn for each acre of cotton, and sent the smallest pickanniny into the field to pick cotton, were often unable to pick fast enough; and now that they have so little control over their workmen, the result is sometimes disastrous. But the small farmer if he is unable to get extra hands when he needs them, can generally rely on wife and children to help.

I am confident that, under the system proposed, the South can manufacture cotton cheaper than New England, or Old England either; and that if the proper effort is made, it need not be long before her income from cotton will be double what is now.

Manhatton, Kansas. ALBERT GRIFFIN.

Telegraph Alphabets.

To the Editor of the Scientific American:

In your issue for March 13, you published a communication from John Millis, of Addison, Mich., in regard to telegraph alphabets, which is calculated to mislead your many readers, inasmuch as it gives an utterly erroneous and empirical view of the subject. Mr. Millis states that the Morse "alphabet is defective, as the sound of a dash is very much like the sound of a dot with a succeeding space." Judging from this, I should say that Mr. Millis is as yet but a beginner in the art, for when most persons begin to learn to telegraph they fancy they perceive the same thing. The fact is, to any one at all practised in reading by sound, the defect is by no means as stated in the communication under review. No operator could possibly mistake a dash sounded for a dot with a succeeding space; and I do not know an instance, even among very ordinary sound operators, in which a mistake has occurred for the reason given by Mr. Millis.

The defect is in the spaced dot letters, C, O, R, Y, and Z. This was long ago recognized. Bain avoided it; but his alphabet was longer than the Morse. In the European code, also, the defect is avoided; and were it not for the difficulties involved in a change, the Western Union Telegraph Company would have adopted it some time ago. It was seriously proposed at one time, as I clearly remember. This being the acknowledged and long felt-defect in the Morse alphabet, to which innumerable errors can be traced and by reason of which they are occurring every day, how does Mr. Millis' proposition meet the case? In the Morse system, there are five such letters, Mr. Millis proposes to increase them to seventeen. In other words, his alphabet, besides being cumbrous and inadequate to speed, increases the chances of errors more than three times.

It may not be inappropriate to suggest that the composition of telegraph alphabets be left in the hands of the great body of experienced telegraphers, not only in this country but in Europe, who may well be presumed to know the difficulties and wants of existing systems.

Washington, D. C. WM. E. SAWYER.

The Sun's Orbit and Rate of Motion.

To the Editor of the Scientific American:

As you have been kind enough to publish several of my articles, relative to the retrograde motion of the sun in space, you will still confer a favor by publishing the following, relative to the size of the orbit of the sun and the rate of his motion.

The sun annually retrogrades sufficiently to keep the earth rotating 20 minutes and 23 seconds before she comes to her sidereal place in the heavens. Those 20 minutes and 23 seconds are the 70$\frac{2}{3}$ portion of a day, and, strange as it may appear, I am going to measure the sun's orbit by them.

As astronomers have not given, so far as I am aware, the computed distance of the earth from the sun since observing the transit of Venus, I will assume a distance; and when the distance is announced, the correction, if any, can be made.

Assuming that the distance of the earth from the sun is 92,000,000 of miles, the circumference of the terrestrial orbit will be 552,000,000 of miles. Now, in a sense, the earth sweeps around the whole in twenty-four hours. How many miles, then, are in the arc which the earth rotates past in twenty minutes and twenty-three seconds? Answer: 7,811,320 miles. That is the number of miles the sun travels in a year. Multiply the 7,811,320 miles by the number of years in precession, to wit, 25,800, and you have for the circumference of the solar orbit, 201,532,056,000 miles, and for its diameter, 67,177,352,000 miles: which shows that the diameter of the sun's orbit is nearly twelve times as great as is that of the orbit of Neptune; and when the two orbits are compared, the latter is like the eye or hole in the center of a large circular saw, compared to the saw itself.

Gloucester, N. J. JOHN HEPBURN.

Aerial Flight.

To the Editor of the Scientific American:

Will your various correspondents on this subject pardon my saying, after a careful study, that they are all on the wrong track? The first thing to be done is to comprehend the rationale of bird flight. This, I apprehend, is grossly misunderstood. It is supposed to be due solely to the mechanical movements of the wings, guided by instinct. Now, how could this be? Mere muscular effort will not reasonably account for the ascent in the air, still less for the propulsion forward. I would ask naturalists to consider, more particularly than they yet have done, the weight of the larger birds, the loads they sometimes carry with them, the great altitude to which they ascend, and the length of time they continue on the wing. Think of birds of passage flying for consecutive days without a single break on the journey, and that often against a strong head wind, the wings moving, in many cases, over 500 times in a minute. What a labor to be accounted for! It is manifestly above bird strength. If, again, they do rest upon the wing, all the greater is the mystery, for they would now have to be both kept from falling and glided onward by a power we know not of, otherwise one of these two catastrophes would ensue: Either they would fall to the ground, or they would fail in their journey; they would gain any direction but the right one. Upon the muscular effort theory, they would have before them a labor quite exceptional, so herculean that nothing in Nature is to be compared with it. Before they had gone many miles, they would fall to the earth exhausted, and die. Despite appearances, it must surely be that birds in their flight are not entirely dependent upon muscular energy: there must be no labor in the question at all. A beneficent Creator has given them the power of flight as their natural mode of transit; hence to fly, to them, is as instinctive, as natural, as it is for the heart to beat or the lungs to be incessantly inhaling and expelling large volumes of air. The animal flame internally performs unremitting labor, but without effort expended; toil there is none, but on the contrary, relief. To the winged tribes, it is a labor to walk, hence they are doomed to fly, and that is manifestly one of the crowning pleasures of bird existence.

The winged insect tribes afford more striking proof, I think, that flight is not entirely the effect of mechanical effort. The common bluebottle flies but little; he darts from place to place as if his wings seemed to do no more than balance him.

I do not think it possible to explain the phenomena in question without calling in the aid of some force hitherto unsuspected, which, for want of a better term, might be looked for under the name of "will power." If something could be laid hold of by investigation in this new channel, and applied to the balloon, aeronauts might, with greater cheer, prosecute their labors, and save some money and some necks, by making the discovery known. Huxley may be approaching the line of thought. MOUNT NEBO.

Dunedin, New Zealand.

Early Steam Navigation.

To the Editor of the Scientific American:

In reply to the question: "What was the name of the first steamship that crossed the Atlantic?" you answer: "The Savannah," built by Crocker and Fickitt in New York, in 1819.

My father, Dr. C. P. Van Houten, of Amite City, La., who will be 82 on April 15, 1875, writes me as follows: In 1816 he engaged with Allaire and Stoutinger, steam engine makers in Fulton's old works in Jersey City, he having previously served his time at the business. He afterward engaged with Daniel Dodd, engine maker, of Elizabethtown (now Elizabeth), N. J. Dodd soon placed him in charge of his works; and during his time, in 1818, the steamship Savannah received her engines and boilers from Dodd's shop, was fitted out and made a voyage to Russia, calling at Liverpool. She was the first steamship that crossed the Atlantic.

Matteawan, N. Y. P. L. VAN HOUTEN.

Frozen Water Mains.

To the Editor of the Scientific American:

The present severe winter, with its continued low temperature and severe frosts, has been a cause of much loss and damage to the systems of water supply. Steam fire engines have been rendered helpless, and burning towns left to the mercies of the elements. A remedy might be found in laying an additional pipe under all mains and service pipes, through which steam could be injected and the mains thus kept from freezing. The steam pipe should be immediately under the water pipe, and it could be arranged with a branch terminating at each fire plug. The steam pipe should also be supplied with means of relieving the pipe from the water of condensation.

The steam fire engines could be arranged to force steam into the pipe to thaw out the mains and fire plugs, and the action of frost might be very much resisted by forcing steam through the pipes occasionally in seasons of extremely cold weather. C. F. H.

Hazleton, Pa.

Small Steam Engines.

To the Editor of the Scientific American:

I have been much interested in reading the various statements as to the results accomplished by small steam engines, but why does not some one manufacture them for sale? The demand for small motors, for driving lathes, coffee mills, washing machines, and many other uses, is very great and rapidly increasing. Only yesterday, I was inquired of by a man who said he had examined all the advertisements in the SCIENTIFIC AMERICAN and other papers he could find, but nowhere could he find a steam engine of from one half to