ing some of the last conscious moments of his life in compiling for his service a complete list, or, if we may be allowed the expression, a complete natural history of double stars, commencing with his father's first discoveries, and terminating only with his own decease."

Another writer says: "The real work of Herschel's life began when, in conjunction with Mr. South, afterwards Sir James South, he deliberately set to work to map out the whole of the known stars. Double stars, nebulæ, and finally the stars of the Southern hemisphere, were alike catalogued and placed by him.

"These enormous labors carry us down to the year 1838, when Sir John, who had been knighted by William IV., and who was made a baronet at the coronation of the present Queen, returned from the Cape of Good Hope, where he had resided four years at his own expense, for the purpose of completing his catalogue. Every honor that a scientific man can desire fell to his lot He had awarded to him the Astronomical Society's gold medal; Oxford made him a D. C. L.; he was a Fellow of the Royal Society, and of all kinds of British and foreign societies and academies; and, had he chosen to accept the office, he might, no doubt, have been President of the Royal Society.

"He still continued his work, but henceforward it was of a more varied character. His mind had imbibed from his father a metaphysical turn, and he had, earlier in life, published his 'Preliminary Discourse on the Study of Natural Science,' a work which contributed more than anything else to the popular recognition of his acquirements. Like many others, he translated Homer, and in the *Cornhill* he published a poetical version of a part of Dante's 'Inferno.'

"His other works were numerous, but of late years his principal contributions to literature were either articles in the quarterlies, or papers in *Good Words*, intended to explain in popular language, such subjects as volcanoes, comets, the sun, light, and the outlines of mathematical problems of astronomy.

"Few philosophers of an age which has produced a Faraday and a Brewster have attained distinction equal to that of Sir John Herschel. His mathematical acquirements and his discoveries in astronomy, in optics, in chemistry, and in photography, were all of a very high order, and, being aided by an admirable style, secured for him the widest reputation among men of science, both in England and abroad.

"Sir John Herschel married, in 1829, Margaret Brodie, daughter of the Rev. Dr. Alexander Stewart; by whom he had a family of nine daughters and three sons. He is succeeded in the title by his son, Mr. William J. Herschel, of the Bengal Civil Service."

A writer in *Appletons' Journal* thus speaks of the celebrated Herschel family. "The little that is known of Sir John's ancestors is honorable. Abraham, Isaac, and Jacob, as the representatives of three generations were called, were sound Protestants, in days and in places where Protestantism was a reproach. Abraham Herschel, the great-great-grandfather of John, was expelled from Mahren, his place of residence, on account of his Protestantism. Isaac, his son, was a farmer near Leipsic. Jacob, son of Isaac, declined agricultural pursuits, and gave expression to the family aptitude for music by making it his profession, by bringing up five sons to the same calling, and by developing musical ability in all his ten children. Among the five was the astronomer, Frederick William, who was born at Hanover in 1738, and came to England at one-and-twenty, a professional musician, but caring even more for something else than music—for metaphysics. To the end of his life, when he was known all over the world for his astronomical discoveries, his chief delight was in metaphysical study and argumentation. Perhaps we may ascribe to this taste, prevailing in the little household at Slough, the tendency of his scientific son to diverge into metaphysical criticism whenever his theme, or any interruption of it, in the course of composition, afforded occasion."

"Sir John grew up among four elderly persons, three of whom at least were devoted to the same pursuits. His father was fifty-two at the time of his birth. His mother was a widow when Sir W. Herschel married her. As the marriage was a remarkably happy one, we may assume that the lady sympathized in her husband's pursuits, or at least honored them. The other two were Miss Caroline Herschel, celebrated as the discoverer of five comets, and a brother, who gave assistance in the observatory. How soon the child became aware of how the nights were passed by these students, we have never heard. Perhaps he was unaware that, while he was sleeping the night away, his father and aunt were awake to the utmost stretch of their faculties, he at the telescope, communicating with her by a set of mute signals; and she in another room, noting his observations, and making calculations for him by lamp light, nothing moving but the pendulum and her pen, and nothing heard but the clock and an occasional movement of the ponderous machine.

"But the house was kept quiet by day, for the watchers to sleep; and this must have been impressive to the child, and so must the visits of awe-struck strangers. Few were admitted, it is said; and none were allowed to use the great telescope; but here and there one was favored with an admission to the observatory, to be shown the method of commanding the field of search, or to be permitted (as one has recorded) to read small print at midnight" by the light from the small star in the foot of the goat." It is not surprising that John should have evidenced his love of natural philosophy before he left Eton.

His lifelong and very conspicuous veneration for his father points to a happy childhood and youth under his eye. Comfort abounded at home, as far as money could procure it. The astronomer had four hundred pounds a year from the king; his lady had a considerable jointure; and the sale of his improved specula afforded a considerable income. It was from a thoroughly happy home that the boy went to Eton, and afterward to Cambridge."

INSTRUMENT FOR PARTING LADIES' HAIR.

Joseph L. Meek, of New York city, has been turning his attention to the growing wants of ladies in dressing their hair. He has provided an instrument, by the use of which, it is claimed, ladies may be able to part their hair with that geometrical accuracy so much desired. As will be seen it consists of a yoke, which, placed over the crown of the head,

holds a slotted guide, by means of which the comb is, in making the part, forced to follow the medial line between the ears of the fair, whose ears are supposed to be in an exact horizontal line when their heads are level.

Hydraulic Mining.

A correspondent of the *Evening Post*, writing from California, says that the ancient river bed from which so much gold has been taken in this State is in many places covered with earth to the depth of two or three hundred feet. Once, perhaps, they say here, it ran in a valley, but now a huge hill covers it. To dig down to it and mine it out by ordinary processes would be too expensive; therefore hydraulic mining has been invented. Water brought from a hundred or one hundred and fifty miles away and from a considerable hight, is led from the reservoirs through eight, ten or twelve inch iron pipes, and, through what a New York fireman would call a nozzle five or six inches in diameter, is thus forced against the side of a hill one or two or three hundred feet high. The stream when it leaves the pipe, has such force that it would cut a man in two if it should hit him. Two or three and sometimes even six such streams play against the bottom or a hill, and earth and stones, often of great size, are washed away, until at last a great slice of the hill itself gives way and tumbles down. At Smartsville, Timbuctoo and Rose's Bar, I suppose they wash away into the sluices half a dozen acres a day, from fifty to two hundred feet deep; and in the muddy torrent which rushes down with railroad speed through the channels prepared for it, you may see large rocks helplessly rolling along.

Not all the earth contains gold. Often there is a superincumbent layer of fifty or more feet which is worthless, before they reach the immense gravel deposit which marks the course of the ancient river; and from this gravel, water worn and showing all the marks of having formed once the bed of a rushing torrent, the gold is taken. Under great pressure this gravel—which contains, you must understand, rocks of large size, and it is not gravel in one sense of the word, at all—has been cemented together, so that even the powerful streams of water directed against it make but a feeble impression; and to hasten and cheapen the operation, a blast of from 2,500 to 3,000 kegs of powder is inserted in a hill side, and exploded, in such a way as to shatter and loosen a vast bulk of earth and stones, whereupon the water is brought into play against it.

You know already that the gold is saved in long sluice boxes, through which the earth and water are run, and in the bottom of which it is caught by quicksilver; and so far the whole operation is simple and cheap. But in order to run off this enormous mass of earth and gravel a rapid fall must be got, into some deep valley or river; and to get this has been the most costly and tedious part of a hydraulic mining enterprise. At Smartsville, for instance, the bed which contains the gold lies above the present Yuba river, but a considerable hill, perhaps two hundred and fifty feet high, lies between the two, and through this hill each company must drive a tunnel before it can get an outfall for its washings. One such tunnel, driven for the most part through solid and and very hard rock, has just been completed. It cost $250,000 and two years labor, and was over three thousand feet long; and until it was completed not a cent's worth of gold could be taken out of the claim.

CANDLES WITH PERPENDICULAR AIR PASSAGES.—Our English cotemporaries report the introduction, by a well known firm, of a candle with holes, close and parallel to the wick, throughout the length of the candle. The idea of the makers is, that air will be supplied, by these passages, to aid combustion; but how the air through the holes can do more than the air immediately surrounding the flame, we are unable to perceive. A tubular wick, to supply air to the interior of the flame, might increase the combustion, but the perforated candle seems only suitable for an advertising trick.

Sea-Bathing.

There are circumstances necessarily connected with a visit to the sea-side, which greatly tend to increase its beneficial effects. In almost all instances the used up man of business or of pleasure, the man suffering from general debility, occasioned by his mental or physical powers having been overtaxed, or from continued residence in close, unhealthy towns, and persons suffering from general languor and lassitude, or undergoing difficult and tedious convalescence from the effects of severe illness or accident, are benefited. To these people it is not the sea air alone, nor yet change of air; but it is change of scene and habit, with freedom from the anxieties and cares of study or business, the giddy rounds of pleasure, the monotony of every day life, or of the sick room and convalescent chamber, which produce such extraordinary beneficial effects—a seemingly perfect renovation of wasted energies and renewal of the powers of life—effects not to be obtained by means of any purely medical treatment.

With bathing in the open sea, there is to be considered, first, the shock experienced on entering water at its natural temperature, when shivering, convulsive respiration and oppression of the chest are always experienced, although but for a moment, and pass away on immersion and free action in the water; secondly, the stimulating effects of the saline substances; thirdly, the mechanical action and pressure of the large moving mass of water and the motion of the waves acting as douches, which, combined, are not in all cases well borne by delicate persons and children. The direct effect of cold bathing is sedative and benumbing, and causing the blood to recede from the surface of the body into the grand arterial trunks, congesting the brain and internal organs, depressing the vital powers, and as it were bringing on death. It is this direct effect we have to guard against, and this we can only do by encouraging sufficient and healthy reaction, indicated by the genial glow, feeling of general vigor, and increased appearance of blood to the surface of the body, sometimes wearing the aspect of a healthy skin, but at others exhibited by small red patches like measles, diffused redness as in scarlatina or spots like flea bites. It is, therefore, how to avoid the direct evil effect, and how to encourage sufficient and healthy reaction, that we have to consider.

First, the duration of a cold bath should not be too prolonged, and it is to be laid down as an unexceptional rule, that a certain degree of vigor and power of reaction are essential in all by whom cold sea bathing is to be attempted. Thus it is not advisable that old people, the weak and delicate, including children, or such as are disposed to internal congestion or hemorrhage, should take a cold sea bath. General lassitude, with tendency to sleep, headache, or toothache, sensitiveness of the breast, increase of appetite, and constipation, are frequent results of a cold bath at the commencement of a course of sea bathing.

For bathing, therefore, in the open sea, it is desirable to prepare the delicate and unaccustomed by giving them a few preliminary tepid baths, which produce a gently stimulating action on the skin, acting at the same time as a sedative to the nervous system; and by gradually lowering the temperature of these baths, the patient becomes strengthened to undergo the shock of a cold bath without risk, the severity of which very rapidly becomes diminished by the force of habit in bathing. The latter part of the month of July, is the most suitable time to commence a course of cold sea-bathing, the delicate or invalided having been previously inured by tepid baths.

In the morning, before ten o'clock, the temperature of the sea is at its lowest, and it is, therefore, at this time unsuited to the uninured and delicate, while it is most bracing and invigorating to the strong, and to such as can aid reaction of the circulation by the exercise of swimming. The sea reaches its maximum temperature at twelve o'clock, and continues the same until five; it is, therefore, during this time the delicate should bathe, the earlier the better, but in this, of course, persons must be guided by the tide.

Beet Root Sugar.

The London *Grocer* gives the following statistics:—The number of manufactories at present engaged in the manufacture of this article is on the increase in Central Europe. It appears that there are no less than 1663, which are divided as follows: "Great Britain and Italy have each 1 manufactory; Sweden, 4; and Holland, 20. Next comes Belgium, with 135; then Austria, with 228—136 of which are in Bohemia, and 26 in Hungary; and Germany, with 310. Prussia possesses 230 of this number, the greater portion of which—namely, 143—are in the province of Saxony. The South German States have fewer in proportion, Wurtemberg having 6, Bavaria 5, and Baden only 1, which is, however, perhaps the largest in Germany or elsewhere, consuming annually a million cwt. of beet root. Russia and France have about an equal number of these manufactories—namely, 481 and 483. The most of the sugar in France is made in the Department du Nord, which has 167 manufactories, or more than a third of the whole. At present, this article is not produced in any of the following European countries: Spain, Portugal, Denmark, Greece, Turkey, or Roumania. In America, it is still in the very first stages of development. It was unsuccessfully attempted for several years in the State of Illinois, but a manufactory has lately been set going in the State of Wisconsin.

THE fastest railroad train in the world, probably, is said to be a new express on the Exeter and Great Western Railways, from Plymouth to London, the journey of one hundred and ninety-four miles being arranged to occupy four hours and a quarter.

Improved Switch for Railroads.

The object of the steam switch is to use the locomotive as a general switchman on railroads. The hand and steam switch are both constructed and operated on the same plan of turntables. The turntables, D, are vibrating tables placed under the rails of the switching track, so as to move them either way as far as required, and limit their motion. There may be one or several of them used under each switching rail; and their centers of vibration on the crossties, on each side of the track, are on a common line between a right and left switch. Where only one turntable is used under each switching rail, it is placed where the rails in a right and left switch intersect, which is about one third of the length of the track from the switching end. Across the face of each turntable, there is a Λ-shaped recess for the rail to rest in and for limiting its motion. The narrow part of this recess is to be just wide enough to receive and hold the rail and allow its vibration, while the wider part is to be wide enough for a full left and right hand switch. The wider part of the recess must be governed by the movement of the track where it is placed, and the narrow part, by the width of the rails used. The turntables are made full, both on the upper and under sides, near their centers, so as to offer the least possible friction to their full vibration. They may be secured by bolts directly to the crossties or to small bed-plates attached to them, and in such a way as to prevent the access of water, and thus prevent their freezing fast in winter. An arm from each turntable, on each side of the switching track, projects outside of it so as to gear it to the disk, E, either horizontally or vertically, by teeth in both, or otherwise. If vertically, an additional post is required in the rear of each disk. Their centers and attachment to the crossties are the same as those of the turntables, and just outside of them, as both are secured to the same crosstie. The recesses across the faces of the turntables may be continuous and permanent, or adjustable, or confined to their circumference. The shoulders of these recesses between the rails must be low enough not to interfere with the flanges of the car wheels, while outside of the rails they may be nearly as high as the rails themselves. The wide or narrow ends of these recesses may be toward the switching end of the track, if preferred.

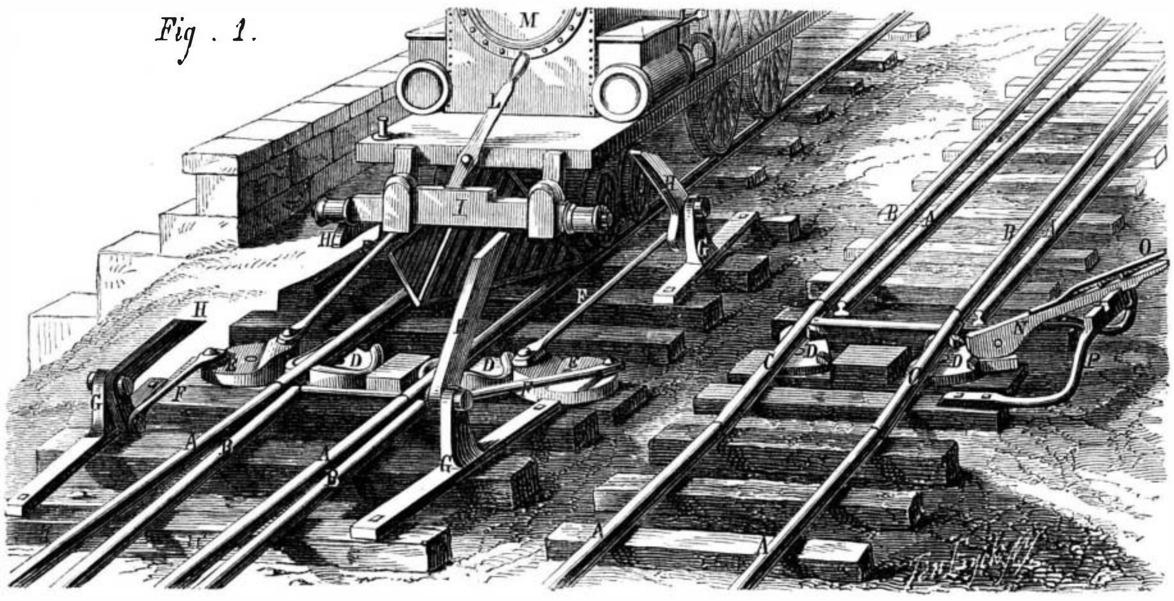


Fig. 1.

STRAIT'S TURN-TABLE AND HAND AND STEAM SWITCH FOR RAILROADS.

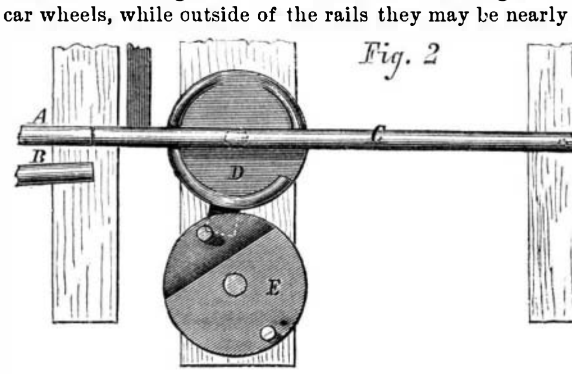


Fig. 2

By hinging or otherwise attaching a lever, N, to either arm of the two turntables, so that its outward end will rise and fall a few inches, so as to fasten in a guard, P, just outside of the track, with two lever recesses on its top, one for a right and the other for a left hand switch, it can be used as a hand lock switch. The spring, O, attached to the top of the hand lever, is to hold the lever securely in its place. The turntables, D, may be of any size and shape, to vibrate the best, and between the rails may be either connected or disconnected.

The disks, E, are two tables of the same size as or a little larger than the turntables, secured on the same crossties by bolts through their centers, just outside of them, and so geared either horizontally or vertically, that both will have a similar vibration. At opposite points on their circumferences, the four connecting rods, F, are movably secured at one end, to give them their reciprocating motion. The four stationary posts, G, are placed just outside of the track and in its line either way, far enough from the switching track, either up or down it, to allow it to be fully switched before the foremost wheels in a train can mount it. The other ends of the four connecting rods, F, connect and fasten to the short arms of the vibrating levers, H, and alternately elevate and depress them on each side, as the shifting bar, I, is set.

When the operating roller on the shifting bar, I, in front of the foremost pair of wheels in a train, acts on the vibrating levers, K, on one side of the track, it depresses the levers to a horizontal line, and switches the track to that side, while the levers, H, on the opposite side, are correspondingly elevated. Both levers on the same side have a similar motion by the pressure of the operating roller on either. The lever on either side, when operated on by the corresponding roller on the shifting bar, I, communicate their motion to the rods, F, the rods to the disks, E, the disks to the turntables, D, and the turntables to the switching track, C. M represents a locomotive, truck, tender, or car, and L the lever, for shifting the roller bar, so as to act on either side, as may be required. By means of cords and pulleys the shifting bar, I, and its rollers are placed under the control of the engineer or an assistant, to regulate the switching of the track.

The recesses on the faces of the turntables to receive and hold the rails and regulate their motion, can be made by the insertion of four short bolts, at the proper points near their circumferences, so that their heads will be just above the rail flanges. The more these recesses are lengthened in the line of the track the more their vibration can be decreased; the lower the stationary posts may be made, the less may be the elevation of the vibrating levers.

The connecting rods, F, all have a pulling motion when acted on by the operating rollers; and the depression or elevation of one vibrating lever on one side of the track, insures the same motion to the others. These rods, by means of swivels or brackets, can be tightened or lowered so as to equalize their strains and motions. In switching forward, the operating rollers have to be attached in advance of the foremost pair of wheels in a train; and in front of the hindmost pair, in switching backwards or backing down.

There is generally a space of about thirty inches outside of the track on both sides, and between the bottoms of the cars and the crossties. The stationary posts and vibrating levers are located and operated in this space, but sufficiently outside not to be in the way of the tracks. The vibrating levers are intended to operate in a space of from twenty to twenty-four inches in hight, and the angle of the vibrating levers is about 110°, to equalize their motion on each side of their centers.

By this arrangement trains may pass and repass freely either way, either on the side or main track, A. Each of the four stationary posts and vibrating levers stands as a sentinel to shift the track as may be required. The turntables and disks may be from ten to sixteen inches in diameter; the posts, from ten to twelve inches high, and the vibrating levers, from thirty to fifty inches long .The posts may be set as far up and down the adjoining track, both ways, as may be necessary to insure a full switch before the foremost or hindmost pair of wheels mount the switching track. The rollers may be made of rubber, wood, iron, or a coil of steel springs. The vibrating levers may be made of cast or wrought iron, and if made of wrought iron may be tipped with spring steel, where a high speed is required. The operating rollers, instead of being attached to a common bar, I, may be separately attached, adjusted and operated.

As the motion of either of the levers, H, correspondingly changes the positions of all of the others, it makes no difference how they are left, or what are their positions when tampered with; for the rollers on either side, when they pass, bring all on one side, to a common level, and elevate those on the other side correspondingly. Each lever can be used also to switch the track by hand, when necessary.

Patented, May 9, 1871, to H. Strait, whom address, for further information, 66 Pearl street, Cincinnati, Ohio.

Convex and Concave Mirrors.

The manufacture of concave and convex mirrors has always been a work of great difficulty and expense; and it seems strange that hitherto the slight flexibility which all glass possesses, has never been taken advantage of for the purpose. Recently the task has been achieved by taking a disk of plate glass, nearly 40 inches in diameter (and of this size, glass three sixteenths of an inch thick is easily flexible), and cementing it into a cast iron dish, turned perfectly true all over its inside. The air chamber under the glass is exhausted through a tube passing through the dish, and so little vacuum pressure is required that, by inhausting the air with the mouth, the atmospheric pressure on the glass will give it a concavity of nearly three quarters of an inch in the center. This is, we believe, a greater deflection than is ever required for reflecting telescopes. By blowing in the chamber, the glass is, with similar ease, forced outwards.

This extremely simple and ingenious invention has been produced by Mr. Nasmyth, of Manchester, England. It seems that there can be no difficulty in fixing a ring of iron round the glass to secure its retaining the concave or convex form, and if so, some of our ingenious mechanics will soon be able to produce lenses of perfect and immaculate translucency of any required diameter. The lens made of glass surfaces, with a filling of bisulphide of carbon, has already been used in the spectroscope, and has so proved itself valuable for instruments requiring the most delicate transparency; and if, by Mr. Nasmyth's invention, we can build up lenses of any size, the revelations of the hitherto constructed telescopes will soon be thrown into the shade by the researches of instruments of unprecedented power.

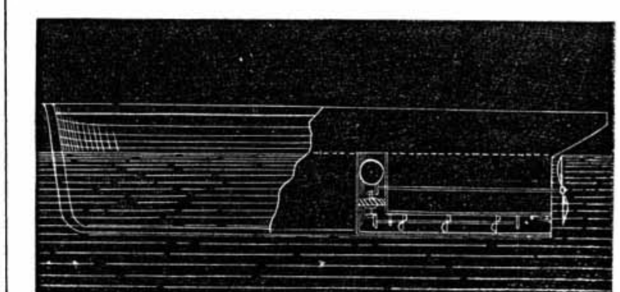
A SELF-MOVING SHIP.

One of our correspondents at Nashua, N. H., sends us the subjoined diagram of the mechanism of a new self-moving vessel, now building on the stocks at that place, and which is to be launched and tried on the 4th of July next.

It appears that much interest is felt at Nashua concerning the success of this novel ship, and public opinion is divided as to its merits. If it succeeds it will be the first self-moving vessel ever floated, Nashua will at once become renowned, orders for similar ships will come in from all parts of the world, and the coffers of the Nashuan shipbuilders will overflow with riches.

It is a little singular that two great enterprises, both of analagous character, both expected to culminate on the same glorious day, should, without any collusion, have been projected by two different individuals, both men of genius, in different parts of the country. There is Mr. Paine, in Newark, N.J., who expects to get an almost illimitable amount of power from the natural forces generated in a quart cup of acid and zinc; and here is Mr. Hamilton, in Nashua, N. H., who expects to accomplish the same thing by simple cold water. Truly, if these experiments should succeed, the 4th of July, 1871, will be a memorable day in the annals of science.

But all expectations based upon their success will result in disappointment. In the case of Mr. Hamilton's vessel, the water will rise within the wheel cistern to the level of the exterior water, and there remain. No current will flow through his flume; his wheel and screws will stand idle, and his ship will float powerless on the wave. Himself and worthy coadjutors will then be able to comprehend those simple but immutable laws of hydraulics which block their way, but with which at present they are evidently unacquainted.



The Nashua *Telegraph* thus describes the new vessel and its machinery:

"For some days public curiosity has been excited by the sudden appearance of a miniature shipyard on an open lot just north of the South Common. Within ten days the hull of a small ship has gradually assumed shape under the saw and hammer of two industrious workmen, who ply their tools with an earnestness that admits neither of flagging nor any interruption. At present the thing looks much like the skeleton of a fossil megatherium. The extreme length is thirty-two feet, beam six feet, and the depth of hold eight feet. The propeling power is to be a turbine wheel, set at the bottom of a flume rising five feet from the ship's bottom. The water enters the flume from the ship's sides just below the water line. This opening is provided with a valve to prevent the water from returning when the ship lurches in a rough sea.

"How is the water to leave the ship? asks every one. From the bottom of the flume, near the turbine wheel, a tunnel eighteen inches in diameter extends along the ship's bottom to the extreme stern. The tunnel is to be so constructed as to constitute a vacuum, and is to be supplied with a set of revolving fans to accelerate the egress of the water, and with valves to prevent the inflowing of the water from the stern. The water in the flume will have a head of five feet, furnishing a power of nine-horse. Now the inventor, who is one of the workmen, expects to secure one hundred revolutions of the screw before the outer valve in the tunnel is reached by the out-flowing current of water, or a rate of speed equal to five miles an hour. A moving vessel always makes a trough in the sea at the stern, and the faster the vessel moves the greater the trough. This trough will lessen, to a considerable extent, the pressure on the outer tunnel valve, and the remaining force necessary to overcome the pressure, open the valve, and release the water, is expected to be created by the movement of the vessel itself. The principle is that which will empty the bowl of a common clay pipe drawn rapidly through water. Once in motion, the ship is expected to attain a rate of speed only equalled by the power of the turbine.