the torpedo vessel, composed of steel plates, is quite small, being eleven feet long, thirty-two inches deep, and twenty inches broad. The midship section is rectangular, while the top and bottom of the hull are planes perfectly parallel. The sides are vertical from stem to stern, the water lines being moderately sharp at both ends. The displacement is greater than might be supposed, considering the small dimensions of the hull, 2,000 pounds being scarcely sufficient to balance the weight of the whole apparatus. The propellers are of the two bladed type, three feet two inches in diameter, with a pitch of five feet. Both propellers revolve round a common center, yet in opposite directions. The constructor put the hidden machinery in motion in our presence; the compressed air being admitted through a tubular cable attached to the stern of the torpedo, the propellers were instantly put in motion, revolving in a contrary direction with a velocity far too great to admit of the number of turns being counted.

The fact has never been published that Captain Ericsson submitted plans to the Emperor Napoleon, in 1854, of an armored, nearly submerged torpedo boat, propelled by steam, intended to run close to an enemy's ship and, by pneumatic power, project a cylindrical vessel containing explosive substances against the hull at a considerable depth below water line. This plan of projecting the charge Captain Ericsson has now applied to his submarine torpedo.

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(Illustrated articles are marked with an asterisk.)

PUBLISHERS' NOTICE.

All new subscriptions, or renewals of old ones, will be commenced with the new volume, July 5, unless a request to commence at some other date accompanies the order.

The volume from January to July, consisting of twenty-six numbers, may be had in sheets, by mail, at the regular subscription price, namely, $1.50, or in substantial binding, at the office of publication, for $3, or by mail, including postage within the States, for $3.75. The first volume of the SCIENTIFIC AMERICAN for 1873, in sheets, and a copy of the SCIENCE RECORD, for either 1872 or 1873, will be mailed on receipt of $3, or a volume of the SCIENCE RECORD for each year and the last or coming six months of the SCIENTIFIC AMERICAN (optional to the subscriber) will be sent for $4.50.

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STREET TRAVEL.

The following is an extract from the new charter of the city of New York, which shall be the text for a few timely remarks:

"The Common Council shall have power to regulate the use of the streets, highways, roads and public places by foot passengers, vehicles, cars and locomotives."

It has been an amusing sight, doubtless, to many who have been comfortably seated at windows looking out upon Broadway, to notice the various incidents of a block of vehicles in that great thoroughfare. But the matter, practically considered, is not one for amusement, and begins to lose much of its humor when the lookers-on venture out, and essay to cross the street. The mode of formation of one of these jams is at once interesting and instructive. The wheels of two vehicles interlock, it may be, or a balky horse causes a temporary stoppage, when, at once, all the vehicles of the line press forward from up and down the street, and pour in from the cross streets, making confusion worse confounded. This seems to be the average driver's chief aim, to press into the thickest of the jam and then engage in a wordy war.

Travelers who wish to reach the ferries over the North River have experiences from which they would gladly be delivered. A jam exists, we will suppose (and it is readily supposable), on one of the longitudinal streets, and a close line of horses and vehicles is to be seen, unbroken at the crossing. As the head of the line advances a foot or so, all the followers do the same, each horse's nose being kept well up to the vehicle in front; and the impatient traveler, if he will cross, crawls under horses, through mud and mire that are appalling, at certain seasons.

This sort of thing has long ceased to be a joke, and there is plenty of room for regulation of the travel if good can come of it. Let us first examine the present system, or want of system. The principal business of a down town street, considered with reference to its vehicles, consists in loading and unloading trucks, and conveying merchandise in other trucks along it. The streets, with regard to their capabilities for this kind of service, may be divided into three classes:

1. Streets in which two trucks can pass each other with trucks on either side backed up against each curb.

2. Streets through which only one truck can pass, when both sides are occupied by trucks backed against the curbs.

3. Streets in which there is no room for the passage of a third truck, when both sides are occupied by trucks at right angles to the line of travel. In these streets, and there are many of them, the present system of loading and unloading is to back the trucks over each sidewalk, thus leaving space for a third vehicle to go between. By some strange process of reasoning, unknown to the ordinary mortal but quite plain to those eccentric individuals, the drivers, these narrow streets are selected by them as the best places in which to feed their horses and let them stand while they are waiting for jobs.

The conclusions naturally drawn from these statements will be:

I. That there are many streets in which the travel of vehicles should be permitted to take place only in one direction. Excepting Broadway, this regulation would apply to nearly every street in the lower part of the city. It is easy to see how much this rule, of itself, would expedite business, and at trifling inconvenience to the drivers of the vehicles. Broadway, from its central position, should be open to travel in both directions, but confusion in this street would be very much lessened by arranging one side for vehicles going up, and the other for those moving in an opposite direction. A division in the center, composed of short panels of low railing and equal open spaces, alternately, would keep vehicles going in either direction to their proper sides.

II. That there are many streets in which trucks should not be permitted to take positions at right angles to the street for the purposes of loading and unloading, and that in no street should these operations be carried on so as to obstruct the sidewalks. There are several ways in which loading and unloading could be readily effected without encroaching upon the streets or sidewalks: by having courts in warehouses into which the vehicles could be driven; by excavations under the sidewalks opening upon the streets and leading to vaults below, through which goods could be drawn and delivered; or by using cranes and hoists projecting from upper stories of the warehouses. Other means will probably occur to the reader, but those who would be affected by the change might well be trusted to find out the means. Only let the regulation be issued that, after a certain date, no vehicles shall be allowed to stand at right angles to the street and that no obstructions to the sidewalk shall be caused in loading or unloading, and it is easy to foresee that plans will be devised so that the business of the merchants shall not suffer. So radical a change demands, of course, the most careful arrangement of details, and nothing but a mere outline is here attempted. It scarcely admits of doubt, however, that regulations of this nature, rigidly enforced, would effect a change, in the crowded and impassable condition of our down town streets, that would excite the admiration of all our citizens and might, in time, even elicit feeble admiration from the drivers.

INVENTION THE MOTHER OF NECESSITY.

We have always labored under the impression that the only individuals who ever reversed the old saw: "Necessity is the mother of invention," and made it read "Invention is the mother of necessity" were those infatuated geniuses who too often squander their worldly goods in fruitless efforts to carry out impracticable schemes. We have been mistaken, for we have encountered one of those instances in which the inventor, after having worked out his machine, to his satisfaction, in his brain, discovered himself placed by his invention in dire necessity for material for its physical embodiment. He was not a landsman, afflicted with chronic impecuniosity, but a sailor, and an officer of a cruising whaler. His device, which, by the way, is quite an ingenious machine for cutting up blubber as it comes from the animal, necessitated the employment of many cog wheels and other gear, for which, ordinarily, metal would be employed. But at sea one cannot carry a foundery, and besides, no iron or steel was to be had; and even if it were, no tools were probably at hand to get it in shape. Finally, after sundry trials, the huge bones of the whale were thought of, and from these, harder and stronger than ivory, by the aid of a common lathe and a few chisels, a number of cog and bevel wheels, rods, etc., were made, which, for accuracy and neatness of execution, will compare favorably with the work of many professional model makers.

The model, thus ingeniously constructed, was brought to this office a few days since, and letters patent applied for on the device. It affords fresh evidence of that perseveringenergy which is inherent to all inventors, and, besides, proves that a mind capable of conceiving a useful and valuable idea is never at a loss to devise means, even from the most slender and least promising of resources, for carrying the same into execution.

BOILERS AND BOILER OWNERS.

At about 9 o'clock on the morning of June 22, a boiler, at the Old Duncan Salt Works, Bay City, Mich., exploded with great violence, injuring two men, it is supposed fatally. The part of the boiler which gave way, says our informant, was the crown sheet, over the fire box, which collapsed from pressure, and the whole front of the fire box, with the fire grates, was blown out. The boiler was of the locomotive pattern, and was almost worn out from long use. A gentleman who lives in that vicinity told us that the rivets which originally headed the bolts which held the crown sheet in its place had either rusted or burned off, and that all that held the sheet was the thread in the plate. Added to this were a corroded safety valve and the absence of anything in the shape of a gage. That there was plenty of water in the boiler there is, probably, no doubt, and the accident is undoubtedly attributable to the age of the boiler and the lack of the proper steam indicator. The building is a complete wreck, and the engine and boiler are in a sadly demoralized condition.

Commenting on this, a valued correspondent, Mr. J. E. E., of Pa., who was on the spot immediately after the occurrence, says:

"There is an invention wanted; it is a salamander and ironclad man to run old and worn steam boilers without gages or indicators, of which the safety valves and pumps are out of order. The boilers have from one half to two inches of scale internally, and a similar thickness of mud in the bottom of the boiler. All the stay rods are rusted or eaten off. The iron armor of the man must be so constructed as to withstand the weight of an ordinary steam boiler or two, as well as that of the falling *débris* of a mill; it will also be required to stand the test of being blown (with the man inside) to a hight of 100 feet in the air and the fall from that hight into the ruins of an old mill, and then of being boiled for two hours in water or steam, and all this without injury to the occupant, as it often is the case that the boiler contains hot water and steam when it goes off. Such an invention would find ready sale among the owners of old oil and salt wells, where hundreds of boilers remain idle until eaten with rust, and then they are expected to stand 150 lbs. on the inch or burst. Such an invention might have saved the lives of two men yesterday at Bay City, Mich."

UNDERGROUND RAILWAYS IN AMERICAN CITIES.

The city of Baltimore now boasts of the possession of a splendid underground railway, the first ever constructed in this country. From all accounts, the new works are highly creditable to the city and the enterprising individuals under whose auspices they have been executed. Two distinct lines of tunnels have been made at Baltimore, at an expense of some five millions of dollars, whereby nearly all of the various railways now centering in the city have their tracks united. The conveniences of the public and the mercantile facilities of the city are thus greatly improved.

The Underground Railway consists of the Baltimore and Potomac tunnel, of which the western portal fronts on Gilmore street, whence it extends in a northeasterly direction through the city, under some twenty-nine streets and avenues, emerging at North avenue, where it joins the track of the Northern Central Railway.

The Union Tunnel extends, from tide water at the Canton portion of Baltimore, northerly and then easterly under some thirteen streets and avenues to the Northern Central Railway.

The total length of the Baltimore Underground Railways is 3¼ miles, of which about two miles are closed tunnels, and the remainder open cuts, over which the streets are carried on bridges.

The tunnel arches are from 22 to 23½ feet high and from 26 to 27 feet wide, five rings of brick thick, backed with rubble masonry. Only a portion where the ground was soft and springy required the invert arch. The springs of the arches are of masonry.

The Baltimore Underground Railway passes through the finest section of the city, where the people of wealth and fashion reside; but no one is disturbed, and the streets and avenues are not in the least interfered with.

Passengers from New York to Washington can now pass through Baltimore by the new Underground Railway, thus shortening the time of transit from twenty to forty minutes. The tracks of the Philadelphia, Wilmington and Baltimore, the Northern Central, the Baltimore and Potomac, and the Western Maryland now connect with the Underground Railway.

It will be remembered that the Legislature of this State at its recent session granted concession for an underground railway in this city, to extend from the Battery under Broadway to Central Park, a distance of five miles, with a branch under Madison avenue to Harlem river, a distance of six

miles additional—eleven miles in all. The soil is admirably suited to the work, while the route is almost a straight line. This road will doubtless enjoy the largest and most remunerative traffic of any city railway in the world, as it passes directly under a thoroughfare which is at once the business heart of the city and the central line of travel. Arrangements for the construction of this road are now in progress.

SNAKE POISONS.

Twenty thousand people, it is stated, yearly die, in Hindostan alone, from the effects of the bites of venomous serpents. It is a strange fact that this poison, so deadly and virulent in its effects, may be swallowed with impunity. Its action seems to be the complete paralyzation of the nervous centers through the medium of the blood, in which it spreads through the body with lightning rapidity. Applied to the mucous membrane it causes violent local inflammation; and absorption quickly taking place, the symptoms of general poisoning are soon apparent. The effects of the venom depend, first upon the nature of the snake, the quantity and quality of the poison, and the circumstances under which the bite is given; second, on the species, size and vigor of the living creature receiving the wound.

M. Fayrer, professor in the Medical College of Calcutta, has recently published a work on the serpents of India, in which, referring to the action of the virus upon the blood, he says that, though he has been unable to detect any change in the appearance of the corpuscles, yet there is no question but that some alteration takes place. In inferior animals the bites of vipers destroy in the blood the coagulating faculty, while, on the other hand, by the venom of colubrines, coagulation after death is not interrupted. Again, when inoculated by the poison of the cobra, the blood immediately coagulates, but remains liquid if the bite be given by the daboia. Experiments made in this country with the rattlesnake show that the effects of its venom upon the human blood are quite apparent. Dr. Burnett, in a paper read some time ago before the Boston Natural History Society, gives an account of a microscopical examination, during which the smallest quantity of poison, taken from the fangs of a large rattlesnake, was presented to blood freshly drawn from the finger. A change was immediately perceived; the corpuscles ceased to run and pile together, and remained stagnant, without any special alteration of structure, and the whole appearance was as though the vitality of the blood had been suddenly destroyed, exactly as in death from lightning. This agrees, also, with another experiment, performed on a fowl, where the whole mass of the blood appeared quite liquid, having little coagulable power.

Analyses of cobra poison have lately been made by Mr. Henry Armstrong, of London. The matter, extracted from full grown serpents, was forwarded from India in small vials, and appeared to be a brownish, sirupy liquid; from which, when the vessels were uncorked, a quantity of gas escaped. Examinations were made, first, of the crude substance, second, of the precipitate caused by the addition of alcohol, and finally of the residue obtained by evaporating the filtered spirits, with the following results: The raw poison evaporated with sulphuric acid in *vacuo* deposited a friable mass which contained 43·55 per cent carbon and 13·43 per cent nitrogen. The white precipitate dried with sulphuric acid, under similar circumstances, appeared as a pale brown substance, easily pulverized, and leaving, after incineration, a light mineral residuum. It contained 45·3 per cent carbon and 14·7 per cent nitrogen, and also 2·5 per cent of sulphur was determined. The alcoholic solution, similarly evaporated, left a light brown friable mass, composed of 43·04 per cent carbon, 12·45 per cent nitrogen, and 7 per cent hydrogen. It was found impossible to crystallize the poisonous substance, neither water, alcohol, ether, bisulphide of carbon, or any other dissolvent employed leaving the slightest trace of crystals after evaporation. Nitric acid and alcohol determined a coagulum; heat produced the same effect. The salts of copper and potash caused the violet color characteristic of the presence of albuminoid matter.

The liquor, it appeared, resisted decomposition and maintained its activity even after being kept for considerable time, and the characteristics of the poison were noted to be equally powerful in all the three states above mentioned.

M. Fayrer considers that to cobra poison may be ascribed a nature similar to that of vaccine virus, and believes that much may be discovered by extended experiment. He says that viper venom acts directly on the blood and secondarily on the nervous system, and adds that it may be that, by careful and reasonable employment, this powerful poison may be converted into a useful remedy, and that there is nothing to prove why, by extended experiment and study, a complete and prompt antidote may not be found.

From all accounts it appears that the rattlesnake (*crotalus durissimus*) indigenous to this country is endowed with a poison even more virulent than that of the cobra or viper. There is reason for belief that its action is the same upon all living things, vegetables as well as animals. It is even fatal to the snake itself; and we find it stated that, on being irritated while confined in a cage, the animal has been known, in moving suddenly, to strike its own body, and to die from the wound as quickly as would any other creature. A remarkable physiological fact is here presented of a liquid, secreted directly from the blood, which proves deadly when introduced into the very source from which it was derived. Serpent poison acting as a powerful sedative, active stimulants are probably the best antidotes. Hence, in parts of the United States infested with venomous reptiles, it is the practice to administer large drafts of whisky, or to chew and swallow tobacco. The liquor stimulates the nervous system until the depressing effect of the poison is overcome by natural curative action. Tincture of iodine externally applied and administered by hypodermic injection into the cellular tissue near the wound is said to be of considerable efficacy, and in advanced cases chloride or iodide of potassium, largely diluted with water, is given in addition. Sucking the wound immediately after being struck often delays the spread of the poison. The negroes in the South favor an odd remedy, which consists in killing a chicken, splitting it in the back, and bending the warm flesh directly over the bite. They believe that the poison attacks the fowl in preference to transfusing itself through the human body. The Mexicans and Indians use a plant which they call the *golondrinera*, which Dr. Torrey on examination pronounced a species of *euphorbium*. Botanically it is known as *e. prostrata*; and we find it described as a plant of frail, delicate appearance, somewhat like the gold thread, and having long, reddish stems that spread and interlace with each other. Its flowers, which appear from April to November, are very small and white, with dark purple throats. They are axillary, and have four petals and four sepals. All parts of the plant contain an abundance of milky juice in which the medicinal properties reside, and which is extracted by bruising the portions in a mortar. A considerable quantity of water is added and several ounces of the mixture administered to the injured person. The plant grows plentifully in dry gravelly places, by roadsides and in farm yards. The remedy, which acts as an emetic and cathartic, is said never to fail in a cure and to be attended with no danger in its administration.

TO EUROPE IN A BALLOON.

To accomplish this has long been the favorite project of the well known aeronaut Mr. John Wise, and for the past twenty years he has kept the matter before the public. During this period, he has made a large number of balloon ascensions, and gathered, as he believes, indubitable evidence of the existence in the aerial regions, at a hight of from one to two miles above the earth, of a constant easterly wind current, and has alleged that if proper efforts were made it would be practicable, by maintaining a balloon within this current, to pass easily and speedily over from this continent to Europe. In 1859 Mr. Wise undertook a preliminary land voyage, and succeeded in moving in an easterly direction for a distance of some twelve hundred miles—to wit, from St. Louis, Mo., to Jefferson county in this State. But the results of that excursion appear to have dampened the interest of financial people, and the daring balloonist has, until quite recently, been unable to find anybody who, for the sake of science or any other consideration, was willing to risk the expense of a few thousand dollars for another trial.

We are glad, however, to be able to chronicle the fact that the Messrs. Goodsell, the enterprising publishers of the *Graphic* daily illustrated newspaper in this city, have pledged themselves to supply all the funds necessary for a new flight to Europe; and in a few weeks from the present time, as soon as the balloon can be manufactured, Mr. Wise will be again in the air.

Our readers are no doubt familiar with the form of contracts for building houses, ships, railways and various kinds of machinery; but probably they have never read the details of a contract for the building of a balloon and a voyage therewith to Europe. We will therefore give the text of the bargain between Messrs. Goodsell, the financial parties to the contract, and Messrs. Wise and Donaldson, the aeronautic directors of the expedition:

CONTRACT FOR THE CONSTRUCTION OF THE GRAPHIC COMPANY'S BALLOON, AND ITS NAVIGATION FROM NEW YORK TO EUROPE.

This memorandum of agreement, made at the city of New York, the 27th day of June, 1873, by and between The Graphic Company, proprietors and publishers of the *Daily Graphic*, party of the first part, and John Wise, of Philadelphia, party of the second part, and Washington H. Donaldson, of Reading, Pa., party of the third part, witnesseth:

That the said The Graphic Company will build a balloon of not less than 130 feet in hight and 100 feet in diameter, and will fully equip and provide the same with valves, balance line, ropes, car and gallery, life boat or raft, and all other appliances necessary to insure strength and safety in so far as may be practicable. It agrees that the construction of the same shall be commenced at once and pushed to completion as rapidly as possible, and before the 20th day of August next if practicable; and the said The Graphic Company will furnish the use of said balloon to said John Wise and said Washington H. Donaldson for the purpose of the making of an aerial voyage therein by the parties of the second and third parts from the city of New York to some point on the eastern side of the Atlantic Ocean upon the conditions following:

First. That the said John Wise and the said W. H. Donaldson shall personally superintend and direct the construction of the balloon according to the utmost of their skill and judgment, and that in all matters connected with the construction of such balloon they shall be subject to the general direction of The Graphic Company.

Second. That the said John Wise and the said W. H. Donaldson shall not make nor participate in any other balloon enterprise, exhibition, or ascension while this agreement is in existence.

Third. That on the completion of the said balloon the said John Wise and the said W. H. Donaldson shall, on a day and from a starting point to be selected by The Graphic Company, make a public ascension in such balloon, accompanied by such other persons as may be designated by The Graphic Company; and making such ascension, that they shall, directly and without any delay or evasion, seek the elevation of the eastern air current, there to remain until land shall have been made on the eastern side of the Atlantic Ocean.

Fourth. That the said John Wise and said W. H. Donaldson shall then land said balloon as safely and expeditiously as possible, and immediately thereafter communicate the intelligence of their arrival, with full particulars of the voyage, by the most speedy means available, to the *Daily Graphic*.

(Signed) JAMES H. GOODSELL, C. M. GOODSELL,
Managers of The Graphic Company.
JOHN WISE. WASHINGTON H. DONALDSON.

The foregoing preliminaries having been duly settled, the work of construction was begun on the very next day, June 28th, and will be pushed forward rapidly to completion. The editor of the *Graphic* says: "Although it is impossible to fix definitely the day of departure, yet we are confident that everything will be in readiness before August 20 next. We have lent our aid to the undertaking in the interest of science and business, and the progress of mankind. The balloon will not be exhibited to the curious to make a sensation, but, as soon as it is finished, will take its flight. We have reason to believe that the public will not be disappointed or dissatisfied either with the method of the undertaking or the manner of its performance.

"It is needless for us to enlarge upon the benefits which will result from the success of this enterprise. They may be easily imagined, if they are not obvious at once. The discomforts, the risks, the cost, and the perils of the ordinary ocean voyage are familiar enough. The path across the ocean has been paved with human bones. Millions of treasure have gone down beyond recovery. To demonstrate the practicability of aerial navigation is to revolutionize the business and communication of the world. To demonstrate its impracticability, even, would be a positive gain; but once sail to Europe through the air in sixty hours, once acquire practical mastery of the methods of navigating the air and the difficulties of the route, and there is no telling what grand results may follow."

Of all newspaper dodges to attract interest and induce large sales, this "Balloon to Europe" affair beats all. The pictorial representations of the progress of manufacturing the great machine, its inflation, trial, and final departure, will be fruitful themes for the artist's pencil, and the voyage, if successful, will supply an extensive series of *Graphic* illustrations, of "Life in the Clouds," exceeding in interest everything of the kind before produced. The steam presses of our enterprising cotemporary will have to be several times duplicated and run night and day for many weeks in order to supply the public demand.

The balloon is now being made in the lofts of the Domestic Sewing Machine Company, corner Broadway and 14th street.

In a letter to the *Graphic*, Mr. Wise says:

"The balloon proper will be a spheroid of 100 feet transverse, and 110 perpendicular and diameter. The supplemental balloon will be a spheroid of 36 feet diameter. These, with allowance for expansion of gas, will give us a lifting power of 15,900 pounds, and a net carrying power of 9,500 pounds, and of disposable ballast, 7,500 pounds. Our floats will not lose by exosmose of gas over 15 pounds per hour, and that will enable us to keep afloat 20 days. But allowing a liberal margin for the free escape of gas in the higher and rarefied regions of the atmosphere, we may still calculate safely for a ten days' buoyant power; and, if deemed necessary, we can dispose of the boat and gallery, and thus restore a buoyant force of 1,200 pounds, which would serve us for several days more; so that, under the most adverse circumstances, we can hardly fail to reach the European shore.

"We shall carry a boat more for the purpose of providing for a contingency that may possibly arise, from any damage to the main balloon, but one that we have little cause to apprehend. The boat will be stored with water and provisions to serve for thirty days. Our kind friends are thus assured that we are not foolhardy, seeing that we shall provide against all and any contingencies that are likely to possibly arise.

"Our main reliance is on the great eastward drift of the trade wind. We do not pretend that, in this first experimental voyage, we shall be able to make a given point on land, but we have an eye to the Gulf Stream, the great warm river in the ocean, which forms above it, in the ocean of air, a corresponding aerial river that will float us to the coast of Ireland."

The editors of the *Graphic* announce that the balloon will have passenger room for eight or ten persons, and the choice few who wish to take part in the expedition may now call at the captain's office, 41 Park Place, and purchase their tickets.

We recommend those who are tired of life, who have made their wills, who have no one dependent upon them and whose friends would be glad to be rid of them, to prepare carpet bags and go. The chances of their return to earth in a condition suitable for further usefulness, we regard as extremely slim. When Mr. Wise made his great voyage from St. Louis, he had twelve hundred miles of land to pass over, and descended before reaching the sea. By starting from New York, this long stretch of overland travel will be saved, and in a very short time after cutting the rope he will be wafted out over the trackless deep, provided he seeks and gains the high easterly current aforesaid.

The balloon which he proposes will, we believe, be the largest ever made. That of M. Giffard, used in London in 1869 for elevating passengers at Ashburnham Park, by means of rope and reel, was 93 feet in diameter, and held 425,000 cubic feet of hydrogen gas. It was made of three thicknesses of linen, cemented with rubber and varnished with shellac. Cost $10,000. It was capable of lifting 25 persons besides the cable by which the balloon was drawn down after every ascent, steam power being used. The cable weighed 4,350 lbs., and was 2,150 feet in length.

THE GREAT BALLOON VOYAGE OF 1859.

We will now give a history of the great voyage made by Mr. Wise, in 1859, from Missouri to New York, as published in our paper at that time:

[From the SCIENTIFIC AMERICAN of July 16, 1859.]

"The veteran aeronaut, Mr. John Wise, has long entertained the idea that a successful balloon voyage across the

(Conclusion on page 41.)