GREAT BALLOONS.

The construction of the great *Graphic* balloon in this city, in which Professor Wise is soon to attempt the passage of the Atlantic ocean, lends new interest to the general subject of aerial navigation.

One of the most successful efforts in this direction was that of M. de Lôme, made last year in France. We present herewith an engraving of his aerial ship, from the London *Graphic*. We also give some explanatory diagrams and references, with a full account of the voyage, taken from *Science Record* for 1873:

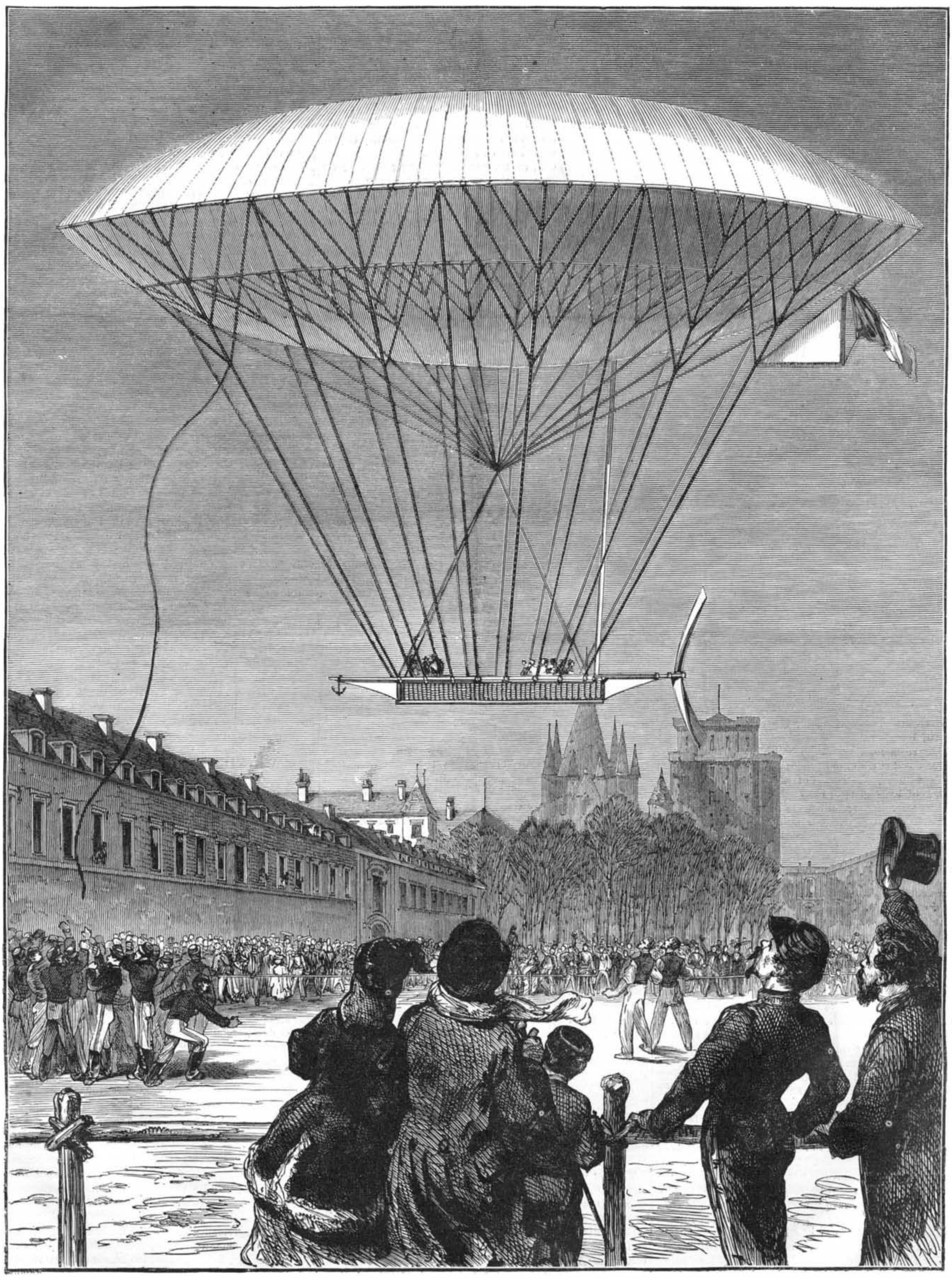
SUCCESSFUL VOYAGE OF AN AERIAL SHIP.

In continuing the record of what has been done, at home and abroad, to subjugate to man the dominions of the air, we must give attention to the most perfect of aerial machines yet constructed—the aerostat of M. Dupuy de Lôme.

Hydrogen gas was employed, and was obtained by the action of sulphuric acid and water on iron turnings, the gas being afterward washed and dried. The balloon consists of white silk taffeta, lined with india rubber, and again with nanzouk; and to the nanzouk lining, a varnish composition is applied.

That the plane of movement shall be directly under the control of the aeronaut requires that much less resistance should be presented to the air than is the case with the ordinary balloon, and careful calculation led to the following dimensions: Length, 118 feet 6 inches; diameter at center, 48 feet 8 inches; the area of section through the center being 1,862 square feet, and the volume 121,983 cubic feet. M. de Lôme, in his original paper, shows that to obtain a speed of about 5 miles per hour it is necessary to maintain a motive power equivalent to 217 foot pounds per second (about $\frac{2}{5}$ of one horse power), this motive power being preferably obtained from manual labor utilized in rotating a shaft to which is attached a two-bladed screw. By calculation, values were obtained, giving as a result that, for a speed of 5 miles per hour, the labor of four men in turning the winch is necessary, and 8 men for a speed of $6\frac{1}{2}$ miles an hour.

M. Dupuy de Lôme has found that a balloon to be successfully navigated must always be maintained at an equal degree of inflation, in order that the resistance to which the



M. DUPUY DE LOME'S GREAT AERIAL SHIP

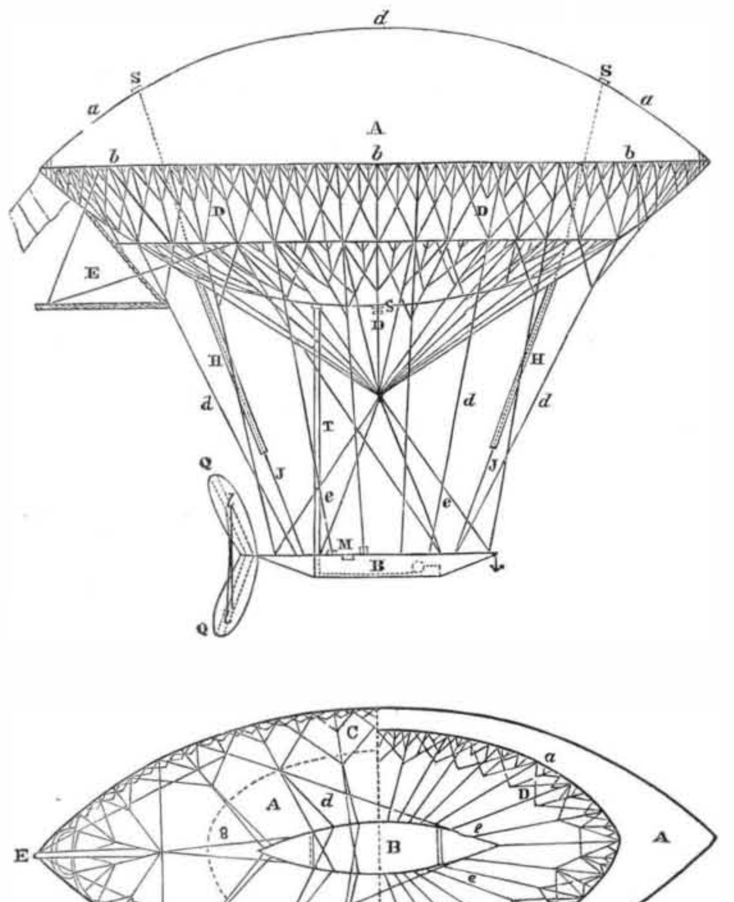
balloon is exposed in its passage through the air should remain constant, and capable at any moment of being defined. The balloon, at starting, being inflated fully with hydrogen, the constant degree of inflation is preserved by means of the hanging tubes, H H. These tubes have the ends open, and are pendant about 25 feet below the balloon. As the gas expands it forces itself down these tubes, while its own pressure in the tube reacts upon the body of gas in the balloon, preserving such an excess of interior pressure as prevents the shape of the outer covering being altered by the wind. Still further to maintain a constant surface there is provided a small internal balloon (termed a *ballonnet*), which, as the gas escapes, through diminution of pressure from the primary balloon, can be filled with air. As the gas expands in the larger balloon it would be forced out of the pendant tubes, were it not that a valve, opening at a low pressure, is attached to the ballonnet. The ultimate proportions of the aerostat, as given by M. Dupuy de Lôme, are:

Eight from top of balloon to keel of car, 95½ feet.

Distance between screw shaft and major axis of balloon, 67·1 feet.

Distance of major axis from the center of gravity of complete machine (without ballast), 51 feet.

The rudder is a triangular sail of 161½ square feet area, manipulated by cords from the car.



A, the balloon; B, the car, with D, the net work; *a a*, taffetas covering; *b b*, collar attaching the upper netting to the covering of balloon; *d d*, silken ropes suspending the car; *e e*, balance ropes for the car; 8, small internal balloon, with line of intersection with the balloon; E, gaff sail, or rudder; H, pendant tubes, the length of which regulates hight of the column of hydrogen; J, the cords regulating the valves, S; T, tube for filling small balloon with air; M, crank for working the screw, Q; *l*, stays, strengthening the screw.

We come now to the description of the journey actually undertaken in this machine, premising that instances of so complete a fulfilment of calculation are very rarely occurrent.

The ascent took place from the Fort Neuf of Vincennes. The crew consisted of 14 men, with baggage and provisions weighing 1·13 tuns. There were on board MM. Dupuy de Lôme, Zédé (*Ingénieur de la Marine*), Yon, and Dartois, aeronauts. The instruments weighed 1·75 tuns, and there were 0·27 tun of packages to be carried to the destination of the balloon. The total weight, with 0·59 tun of available ballast, amounted to 3·74 tuns, and the balloon, when thus ballasted, had an ascensional force sufficient to keep it in equilibrium close to the ground. In the first ascent 3 cwts. of ballast were thrown out, the balloon rising from the earth on February 2, 1872, at 1 o'clock. From 1 o'clock to about a quarter past but little more was done than to admire the graceful evolutions of the machine, and the readiness with which it answered to both helm and screw. At 1 hour 15 minutes observations were commenced, and showed the car to be 1,837 feet above the departure station, and moving in a northeasterly direction with a speed of 39 feet per second. The course was then altered to the southeast, at an angle of 83° with the former direction. The number of men working the screw, at 25 revolutions per minute, was eight, the aerostat moving with regard to the earth at a speed of 52·5 feet per second. Afterward this speed increased, with 27·5 revolutions of the screw per minute, to 55·8 feet per second. The speeds given by the form of anemometer employed, as due to the balloon, or rather to the screw, were 7·7 feet to 9·3 feet. The descent was commenced at 2 hours 35 minutes, and was effected at the destination, Mondecourt, near Noyon, without any shock or the slightest accident. We should now consider the results that have been attained in the experiments with the aerostat. They are: The maintenance of a constant exterior surface by means of the ballonnet; freedom from rocking motion, even while two or three persons are walking in the car; and a perfect control, the head of the aerostat being shifted to or kept in any direction, with a maximum force of 60 kilos from the manual labor of the eight men.

These are the mechanical improvements that have been achieved; but the most important result is that an impetus will be given to the study of aerial navigation, now that the science has found a theory seldom paralleled in its application. The remark of one of our greatest men: "Impossible; I don't know the word:" has indeed been practically shown to be an admitted principle by M. de Lôme.

M. de Lôme further proposes to remove seven of the eight men employed to work the screw, and substitute an engine of eight horse power, with one man as engineer. The ballast would then consist of the fuel and water, while the aerostat could be impelled at the rate of 14 miles per hour, at a much larger angle with the plane of direction of the wind. There has thus now been opened to us a new path in the science of aerostation, and it is difficult to limit the imagination to those new wonders we may expect within even a few years.

THE GREAT BALLOON NOW IN PROCESS OF CONSTRUCTION IN THIS CITY.

The following interesting particulars concerning the new balloon of Professor Wise are given in the *Daily Graphic:*

The main balloon is to be made of unbleached cotton, of which 4,316 yards have been purchased. The greatest strength is required at the crown, and this part of the airship will have three thicknesses of cloth. The exterior will be coated with a varnish made of linseed oil, beeswax, and benzine. The balloon is to be 110 feet high, and 100 feet in diameter. Gas capacity, 600,000 cubic feet. It will, however, start with only 400,000 cubic feet, as the gas will expand and fill the balloon as the latter rises in the air. When inflated the extreme hight of the apparatus, from the crown to the heel of the boat which will hang below, will be 160 feet.

There will be 14,000 yards (eight miles) of stitching. This is now being done by twelve seamstresses at the establishment of the Domestic Sewing Machine Company, corner of Broadway and Fourteenth street.

The thread used is silk and cotton, the top spool being silk. The valve of the balloon will be three feet in diameter and made of Spanish cedar, with a rubber-coated clapper closing on a brass plate. The valve fixtures and top of the balloon are the essential parts of the apparatus, and are being constructed with special care to guard against any accident of derangement.

The network will be composed of three-strand tarred rope, known as "marlin." The width of the net will be 212 meshes, and its breaking strength will be 58,300 pounds. Five hundred pounds of "marlin" will be used. From the netting 53 ropes, ⅝ inch in diameter, of Manilla, will connect with the concentrating rings. These ropes will each be 90 feet in length, or 4,770 feet in the aggregate. The concentrating rings will be three in number, to guard against breakage, and will be each fourteen inches in diameter, each ring being of wood, iron bound. These rings will sustain the car, life boat, and trailing rope, and will bear the strain when the anchor is thrown out in landing. From the concentrating rings, twenty-four Manilla 1 inch ropes, each 22 feet long, or requiring 528 feet in all, will depend and form the frames for an octagonal shaped car. They will be kept in place by light hoops made of ash. The lower ropes will be connected with network, and over the network at the bottom of the car a light pine floor will be laid loosely, so that it can be thrown out if required. The car will be covered with duck, of which fifty yards will be needed. Attached to the side of the car will be a light iron windlass, from which the boat and trail rope can be raised and lowered as may be desired. From a pulley attached to the concentrating rings a heavy Manilla rope will fall down through the car, and thence to a sling, attached to which will be the life boat. This boat will be of the most approved and careful construction. It will have watertight compartments, sliding keel, and will be so made that it will be self-righting. The boat will be provided with a complete outfit of oars and sails, and to it will be lashed instruments, guns, lines, etc., and provisions for thirty days, all in watertight cases.

The trial rope, by which the aeronaut can maintain any desired altitude without resorting to ballast, will be of Manilla rope, 1¼ inches thick, and 1,000 feet long.

The car will be fully provided with instruments, provisions, etc., independently of the boat. It will be so constructed that it can be taken apart piecemeal and disposed of as ballast. It will carry about 5,000 pounds of ballast, which will consist of bags of sand, each carefully weighed and marked. Among the instruments to be carried in the car, there will be a galvanic battery, with an alarm, two barometers, two chronometer watches, a compound thermometer, a wet and dry bulb thermometer, a hygrometer, componer, quadrant, chart, parachutes with fire balls attached, and so arranged as to explode when striking the water, so as to indicate the direction traversed; marine glasses, two vacuum tubes, a lime stove, etc. A number of carrier pigeons will be taken along, and dispatched, at intervals on the route, with intelligence of the progress of the expedition.

The lifting power of illuminating gas is about 36 pounds to the 1,000 feet, so that the balloon will have a lifting capacity of 11,600 pounds. The pressure will be 1½ pounds to the square inch.

The weight may be summed up as follows:

	Pounds.
Balloon	4,000
Net and ropes	800
Car	100
Boat	1,000
Dray rope	600
Anchor and grapnels	300
Sundries	300
	7,100

Then 4,500 pounds will be allowed for passengers and ballast.

Frightful Death of La Mountain, the Celebrated Aeronaut.

The particulars of the frightful fall and death of Professor La Mountain, while making a balloon ascension at Ionia, Mich., on the 4th of July last, are thus described by a correspondent of the Detroit *Post:*

"Among the many advertised attractions of the celebration of the Fourth by our citizens was that of the ascension of Professor La Mountain, of Brooklyn, Mich., in his mammoth air ship. Several thousand spectators thronged the public square for hours before the appointed time. A heavy squall of wind necessarily delayed the ascension for two or three hours, but at the end of that time the air became calm. Under direction of the Professor the balloon was got into position, and its inflation with hot air was commenced. The canvas soon filled, and loomed up nearly 75 feet high. The basket was a willow one of a size sufficient to hold one person comfortably. It was attached to the balloon by six or eight long ropes, which were fastened at the top to a round piece of wood some two or three feet in diameter. The ropes were in no manner fastened together between the top and the basket. As each piece was 100 feet long it seemed, even to inexperienced eyes, that there should have been some webbing or net work, at least over the bag or bulge of the canvas. The fear was generally expressed that some accident might occur by the canvas slipping through between the ropes. It was also noticed that the ropes were unevenly distributed—three or four being in a comparative cluster, leaving the other strands far apart. Nothing was said of the matter, as the Professor, who gave the whole structure a thorough look before taking his seat in the car, made no comment on the fact, and it was thought that his experience was sufficient for the occasion. Everything being in readiness, the words "let her go" were given, and the air ship darted up with great rapidity, while the aeronaut waved his hat to the uneasy multitude, who almost breathlessly watched his flight. Immediately upon leaving the ground the mouth of the canvas began to flap around with great violence. When fully a half mile from the earth and when the whole structure looked no larger than a hogshead, the balloon slipped between the ropes and was instantly inverted. The car and its occupant dropped like a shot; and when the ropes were pulled taut, the round piece of wood was torn from the canvas. With the most terrific velocity the unfortunate man descended, clinging to the basket. That he was conscious was evident from his struggles. With all the intensity of a life with but one chance, he strove to raise the basket above him, evidently hoping to use it as a parachute. He succeeded in his object; but when 100 feet high, he loosed his hold, folded his hands and arms before his face, and, feet first, struck the ground with a dull heavy thud. Then ensued a panic and uproar in the crowd, which is indescribable. Women fainted, men wept, and to add to the confusion the canvas came flying over the crowd like a huge bird. Some one cried out to get out of its way, as it would fall with crushing force. The cry was taken up and a general rush was made for safety, in which many were more or less injured.

La Mountain was crushed into a literal pulp. Not a sign of motion or life was visible when he was reached. Medical examination disclosed the fact that hardly a whole bone was left. Many were ground and splintered to powder. His jaws fell upon his arms, and were pulverized. The blood spurted from his mouth and ears. Where he struck there was an indenture, made in hard gravel ground, five or six inches deep. The corpse was laid out and placed on the public square, where it was viewed by thousands.

The Grand Rapids, Mich., *Eagle* says: "There was but little wind at the time, and the balloon arose directly upward, remaining right over the Court House square, whence it started, appearing of course, to diminish in size, till it was judged, by that appearance and the rate of its upward movement, to be 3,000 feet high. The shouts had ceased, and 10,000 upturned faces watched the diminishing object intently, when the basket was seen to separate from the sack, which hung and wavered about in one spot for half a moment or so, while the basket and man were shooting downward with the velocity of a cannon shot!

As the vast throng of witnesses comprehended the frightfully tragic spectacle, a thrill of intense horror spread through them, as from among them issued one wide spread suppressed groan of agony, for all seemed too horror stricken to shriek. Of course there was no such length of time in the downward flying of the devoted man as the reader has occupied in reading these last few lines describing it. From the instant of the disaster to the balloon till he struck the ground, the time was not probably more than fifteen seconds, as measured off on the watch dial by the second hand. At a hight of five or six hundred feet from the earth, the unfortunate man got separated from the basket—in fact it appeared as if he leaped from it intentionally. This certainly made no difference as to the fatality of the fall. The concussion must have killed him just as quickly had he struck the earth with the basket beneath him. Wonderful as it may seem, from the time he sprang from the basket his position in the air remained erect, feet down, till he struck, notwithstanding the greater weight of the head and body, which causes most human bodies to turn and fall head first. It is possible he had acquired a faculty of controlling his position in the air by athletic force. Perhaps, in the hurried thoughts of despair, he fancied he might, by striking feet down, be spared from death. But the indescribable swiftness of his descent must have knocked the breath out of him, even had he struck on a newly made hay stack. Many people declare that they saw such movements of his limbs and even expressions in his face as showed him to be alive and conscious until he struck. But this is considered by the greater number to have been entirely improbable. His shooting downward through space with lightning-like swiftness deprived him of all breath and sense of life, undoubtedly, while part way down. Indeed, it is hardly possible that he intentionally jumped from the basket. It is more likely that he fell from it when he had no longer any power to hold on to it. With terrific violence he crashed upon the earth, feet down, his legs being driven up into his body, and all but his head instantly mashed into a sickening, quivering mass of spouting blood, protruding bones, and dropping flesh. His feet struck into the earth several inches. He struck a few feet from the jail wall, only about eight rods from the very spot where he went up. Down came the basket right after him, and his hat came wavering down. What became of the sack of the balloon is not known."

La Mountain's name is familiar to the readers of the SCIENTIFIC AMERICAN. He was the hero of many a remarkable balloon ascension, and had great confidence in his abilities to navigate the air. But it is evident that he was careless, in the present instance, in respect to the mechanical details of his air ship, and the loss of his life is the sad result. La Mountain was one of the party who accompanied Professor Wise in his famous aerial flight from Missouri to New York in 1859. On that occasion, La Mountain narrowly escaped drowning in Lake Erie.

Action of Water on Lead.

The most general results of Sir Robert Christison's inquiries are: 1. That the purest waters act the most powerfully on lead, corroding it, and forming a carbonate of peculiar and uniform composition. 2. That all salts impede this action, and many prevent it altogether, some of them when in extremely minute proportions. 3. That the proportion of each salt required to prevent action is nearly in the inverse ratio of the solubility of the compound which its acid forms with the oxide of lead.

The corrosive action of water upon lead has often been confounded with other causes of corrosion, and the water has borne the blame. Thus the true action has been confounded with the corrosive action of potent agents accidentally coming in contact with the metal in the presence of water, as, for example, when a lead pipe has been led through fresh mortar, which is frequently or permanently kept moist, or when lumps of fresh mortar have been allowed to fall upon the bottom of a lead cistern.

The true or simple action of water has not unfrequently been confounded also with the effects of galvanic action. Thus, if a lead pipe or cistern be soldered with pewter solder and not with lead, erosion takes place near the line of junction of the solder with the lead. The presence of bars of other metals crossing lead, or bits of them lying on it, will also develop the same action; and some facts seem to point to the same property being possessed in a minor degree by some stony and earthy substances. This observation may explain the local erosion sometimes observed in cisterns containing hard water; since, if galvanic action be excited, it will be increased by the fact of saline water existing more largely in these waters than in soft or comparatively pure water.

Lastly, some observers have contradicted former statements, because under certain circumstances, which led them to anticipate no action, they nevertheless found lead in water, but only in extremely minute and unimportant proportion. The test for lead, hydrosulphuric acid, when employed in the way now usually practiced, is so delicate as to detect that metal when dissolved in ten million parts of water, or even more. Facts, however, warrant the conclusion that the impregnation must amount to at least ten times this quantity before water can act injuriously on man, however long it may be used.

Tin as a Filling for the Teeth.

Dr. E. W. Foster, in *Dental Cosmos*, says: Tin possesses many considerations of fitness for stopping carious teeth not held by gold. Its freedom from being suddenly affected by thermal changes, its plasticity and ease of adaptability to all the irregularities of the cavity, its permanency or stickiness in the cavity, its comparatively low specific gravity, and other favorable features, are some of the prominent facts connected with this really fine metal, that make it no mean competitor with gold in the daily and important question of filling and preserving the teeth. The prejudice of most operators is generally, we well know, against this foil, and from grounds we think not entirely reasonable.

We have occasion to use it much in our practice, sometimes for permanent fillings, and sometimes to precede gold in the soft vascular teeth of children and youth. As to the extreme permanency of tin when removed from the attrition of mastication, it will be difficult to determine. Yet we have seen tin fillings between thirty and forty years of age, still serviceable and in good condition.

The low specific gravity of tin, and its non-irritating nature, resembling in the latter trait, though in a less degree, the same remarkable quality possessed by lead, enable it to rest with comparative non-disturbance even in the midst of vital presences.

For this reason lead had long ago been used for filling teeth in many countries of Europe. In France especially it was the material *par excellence* for such purposes; and it may not be uninteresting to remark, that the very word in the French language used to signify the term "filling teeth," is "*plomber*," a word of historical significance in this connection, being derived from the name and the fact of lead being used as a stopping for teeth, even so far back as the formation of that language.

Though tin is easier of manipulation than gold, the same care, to the same end, should govern its introduction into the cavity, its condensation and finish afterwards. If the cavity is large, and nerve nearly exposed, the use of polish-powder (oxide of tin) moistened with water or glycerin, and applied to the walls of the cavity before the introduction of the tin, will produce agreeable and substantial results.

Cornell University.

The attention of our readers is called to the commencement of the above well known institution published in our "Business and Personal" column. The next scholastic year begins on September 8, so that ample time is afforded between that date and the present, for those desirous of availing themselves of the advantage of the various courses, to make all necessary preparations. Young mechanics, engineers and students in the various professions and trades will find no institution in the country better adapted to give them a sound, practical as well as theoretical, basis for their future callings than Cornell. Five hundred free scholarships are in existence, and the college is liberally endowed with every requisite for thorough and systematic instruction.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 20 to June 26, 1873, inclusive.

BRAIDER.—E. H. Alexander, New York city.
EXTINGUISHING FIRES.—J. W. Stanton, Brooklyn, N. Y.
GAS.—J. H. B. M. Randolph *et al.*, Detroit, Mich.
PICKER MOTION.—T. C. Morton, Waterbury, Conn.
PRESERVING MEAT, ETC.—A. T. Jones, Clinton, Wis., *et al.*
PRESERVING WOOD.—C. Brown (of Albemarle, Va.), London, Eng.
PRINTING OIL CLOTH, ETC.—W. H. Townsend, New York city.
SEWING MACHINE.—Lev Griswold, New York city.
STEAM BOILER.—J. Griffith (of New York city), London, Eng.
TREADLE.—S. K. Herrick, Boston, Mass.
TUNNELLING.—D. C. Haskins, Vallejo, Cal.

Recent American and Foreign Patents.

Improved Relisher and Wedge Cutter.

Wesley J. Hoskins and Amos D. Rowe, Essex, N. Y.—This invention consists of a combination of instrumentalities whereby the relish of a door rail may be cut, and the part to be removed may first be cut into wedges and then removed by a succession of operations, all of which are performed with one machine. A gang of three saws cuts three parallel slits on the swinging frame which is connected to a tilting table. Over the saws are mounted the two saws for cutting the diagonal slots on an arbor. In front of these the stationary cutters are arranged for cutting out the relish. In the first place, the rail is put on the table and moved along one of the guides, properly adjusted therefor against the saws, till the shoulder of the rabbet comes against a stop by which the saws cut a slit; then the table is tilted upward by a handle, without moving the rail from its position on the table, to other saws which make the diagonal cuts; from the saws the work is moved up to the cutters above; then the treadle is forced up and the wedges are cut off, leaving the relish, and making the wedges complete.

Improved Corn Harvester.

James H. Spears, Kennedy Wells, and Robert Wells, Piper City, Ill.—This invention has for its object to furnish an improved machine for detaching the ears from the stalks, removing the husks from the ears, and depositing the husked ears in a wagon. To a cross bar are attached the ends of the shanks of the three guides or gatherers. Rollers are arranged parallel with each other, in pairs, and upon the opposite sides of the shank of the central guide. These rollers have corrugations upon their lower or forward ends, the corrugations of the rollers of each pair running in opposite directions, and extending longitudinally along the upper or rear part of the said rollers. To the rear journals of the rollers of each pair are attached small gear wheels, meshing into each other, so that the rollers of each pair may be revolved together with equal velocity and in opposite directions. The journals of the inner rollers are extended to the rearward, and connect by gearing with a shaft on which is a roller. An endless carrier passes around a roller pivoted in a slot in the lower part of the shank of the central guide and around the roller attached to the shaft, and by which the said carrier is driven. The carrier receives the ears of corn from the rollers, carries them up and discharges them into the inclined spout, down which they slide to other rollers which are provided with short teeth arranged spirally, which tear off the husks from the ears, and at the same time carry said ears along and discharge them upon the elevator, which passes around rollers pivoted to the upper and lower ends of the elevator frame and discharges the husked ears into a hinged spout, down which they slide into a wagon.

Improved Medical Compound and Medicated Food.

Jean M. O. Tamin, of New York city.—This invention consists in extracting from vegetable substances those most nourishing ingredients which are combined with phosphorus, and in subsequently adding them to the substances to be eaten or imbibed as articles of food or medicines. Thus, for example, it is proposed to withdraw from vegetables, such as peas or beans, the ingredients above referred to, discarding the indigestible, or at least with difficulty digestible, residue of such vegetables, and to add the matter extracted to chocolate or other suitable article of food. A certain quantity of peas, for instance, is powdered and then treated with water. The mixture is filtered, and so much of the moisture is evaporated as to leave the remainder of a more or less viscid consistency. Gastric juice or finely cut pieces of a calf's stomach are next added. Finally, the mixture is dried at a moderate heat. The substances with which the phosphorus is thus mixed it is proposed to call "phosphorine."

Improved Washing Machine.

James W. Hannah, Sticklerville, Mo.—This invention has for its object to furnish an improved washing machine. The body of the machine is made semicylindrical in form, having vertical wooden ends and curved zinc bottom and sides. In the middle part of the ends of the box, leading downward from their upper edges, are formed vertical slots to receive the journals of the rubber, the ends of which enter grooves in the vertical bars or standards attached to the outer sides of said ends. To the inner surface of the bottom and sides of the box are attached round cleats. The end plates of the rubber are made semicircular in form and are connected and held in their proper positions by the cross rounds. To the rounds, at equal and short distances apart, are secured the concave edges of segments of ring plates. To the end plates and shaft are attached levers, the upper ends of which are connected by a round which serves as a handle in operating the rubber. By this construction the plates, being vertical, pass easily through the water and without carrying the water with them, which makes the labor of operating the machine very slight, and, at the same time, the scalloped edges of said plates, operating upon the clothes, clean them in a very short time.

Improved Animal Trap.

John Gould, Clinton, Pa.—This invention has for its object to furnish an improved animal trap, which shall be so constructed that the entrance of the animal will reset the trap for the next animal. By suitable construction, when the trap is set, as the animal enters the box and steps upon a platform, he tilts said platform, which draws back a catch lever and allows a wheel to be revolved by a spring until a pin, upon the other side of the wheel, strikes a stop spring. This movement closes the doors and leaves the animal shut up in the box. The animal then sees light entering through another box, and, trying to reach it, he raises a gate, steps upon and operates the trip platform, and passes into a third box whence he cannot escape. This movement withdraws the catch lever and allows the wheel to revolve until the next pin upon its other side strikes against the other stop spring, opening the doors and again setting the trap.

Improved Knapsack.

George H. Palmer, first Lieutenant 16th U. S. Infantry, Beloit, Wis.—In this invention the frame is made of small, tough, flexible pieces of wood, butted together at the end and secured at the corners by strong duck, canvas, or other heavy cloth, in which the sticks are bound at the edges. Between the sticks are strong thick pieces of leather fastened to the cloth and turned around the corners. They are to hold the sticks apart the width of the cloth pieces, and to afford sufficient strength for holding the covering and the straps, which are attached to them. About half an inch from the end the wood pieces are tied together by strong leather strings. The cloth pieces of each corner are connected together by straps which prevent them from sliding up on the rods, and bind the frame strongly together at the corners. The cover, of flexible material, is shaped so as to envelope all sides except one, and, having flaps, is fastened on by metal loops with a toggle piece, the said loop being inserted through the canvas and leather corner pieces; and the flaps are provided with means of buckling together when folded down. The lower loop straps also unite with the straps, the said straps passing through the metal loops and meeting and buckling together at the middle of the bottom of the knapsack. The loops are connected to the knapsack by the metal loops, that they can be readily shifted as may be required for changing the knapsack sides about. The shoulder straps are connected to the back plate by rivets, which are suitably arranged to allow the straps to turn freely as required in separating and adjusting them on the wearer, also for shifting them about to different positions for ease in sustaining the load. The knapsack frame is covered with linen or cotton duck, having on one side a waterproof flap of vulcanized rubber cloth. It may be reversed on the back by simply hooking it from the back pad, turning it, and changing the supporting straps to the opposite side. By this means the canvas back may be turned outward in hot weather, and the waterproof flap outward in rainy weather. The knapsack may be worn at almost any place desired on the back.

Improved Friction Attachment for Securing Pulleys to Shafts.

Henry Cox, Peterborough, Canada.—The invention consists in the improvement of friction attachments for pulley shafts. A shaft carries a loose pulley in the hub of which is formed a mortise, at the sides of which are formed one or more lugs to receive a pin by which an eccentric disk is pivoted to said hub. By this construction, when the pulley is turned in one direction it will run freely, but when turned in the other direction the eccentric will take hold of the shaft and carry it with the said pulley in its revolution. This secures the pulley on the shaft or prevents its retrograde motion.

Improvement in the Manufacture of Zinc White.

Nathan Bartlett, of Bayonne City, assignor to himself and Samuel C. West, Elizabeth, N. J.—The furnace has three chambers, an upper, middle, and lower one. The fire is built at one end and delivers the lighter vapor into the upper chamber and the heavier into the middle chamber, the latter vapor passing out at the chimney, while the former, after traversing the length of the furnace, descends in two passages to the lower chamber, where, after having twice traversed the whole length, it enters the discharge chimney. This improvement in the arrangement of the furnace consists in making the middle chamber funnel-shaped, or approximately so, by which to concentrate the heat, as before stated, and thus work out the oxide from the ore much cleaner than it has ever been done before, and thus increase the percentage of gain. In carrying out this improved mode of working the furnace the chamber is in four imaginary sections. When fully heated and charged a batch of the residuum at the opening and the three other batches are shifted along one stage, and a fresh batch applied, thus working the ore along intermittingly as the reduction proceeds, and at the same time supplying the fresh ore and removing the refuse without cooling the furnace down or losing the time now lost by discharging at the mouth of the furnace and recharging again, the doors remaining open the while so that much heat is lost. For introducing the oxygen to combine with the gases evolved from the coal in the furnace, also the vapors of the ore, and thus to insure more perfect combustion, two blast pipes discharge into the chamber, so that the air, which is forced in by any suitable blower, unites with the gases as they emerge from the passages and burns intensely.

Improved Horse Power.

Joseph Milbourn, Millport, Ohio.—The object of this invention is to improve and render more useful the horse powers which are used for thrashing grain, and other purposes; and it consists in adjustable extension levers, in combination with the old or ordinary levers, and in stay rods which connect the ends of the extension levers, and in draft rods attached to the stay rods. There are but two draft rods, but there may be a draft rod for each lever, if desired. By this arrangement the draft is applied to the ends of the extension levers, which results in a great saving of power.

Improved Washing Machine.

Nathan F. Reed, North Wolcott, Vt.—This invention has for its object to furnish an improved washing machine. A set of rollers, the journals of which revolve in bars of such a size that the rollers work clear of the bottom of the box, form a roller bottom to said box. A second set of rollers, the journals of which revolve in bars which are made shorter than the bars above mentioned, are connected by boards, thus forming a roller platform or rubbing board. To the sides of the middle part of the platform are secured staples upon which hook notches are formed in the lower ends of bars which are pivoted to levers. By this construction, by moving the upper ends of the levers back and forth, the roller platform will be moved back and forth, rubbing the clothes between it and the roller bottom, washing them quickly and thoroughly. By suitable means the roller platform may be held down upon the clothes with any desired pressure.

Improved Implement.

Henry B. Whitehead, Holly Springs, Miss.—This invention relates to an improved tool for use as pliers or as a hand vice; and consists in an arrangement of jaws having perpendicular toothed shanks, and transversely slotted handles provided with teeth on their pivot ends for engaging with the jaw shanks, whereby a parallel motion of the jaws is produced. By tightening a thumb screw the jaws may be set and used as a hand vise. The handles when used as calipers and dividers, and opened to the desired angle, are thereby held in position. When the handles are thrown out as far as the frame will allow, the jaws may be moved one or two teeth, and can then be used to gripe larger bodies than in the former state.