

### THE CAPTIVE BALLOON—APPARATUS FOR TESTING THE STRENGTH OF MATERIALS.

For over a month, the Captive Balloon has been operating with such precision, and so safely, as to justly excite the admiration of those who have it in charge, as well as of those who take part in its ascensions. These results have been attained by M. Giffard only by the extreme care which he has taken to thoroughly test the strength of the various materials which were used in its construction. Fig. 1 represents the apparatus which was employed to ascertain the tearing resistance of the stuff of which the body of the balloon is made. A strip of the material, two inches in width, is fastened by means of the vises, V and V', between the clamps, m and m'. By turning the crank, M, the clamp, m, is caused to separate further and further from the clamp, m', and the fabric stretches up to the point where it breaks. A hand, moving around a semicircular dial, represented at the left of the engraving (Fig. 1), gives the amount of strain in kilogrammes. Underneath, at B, may be seen (represented one fifth natural size) a piece of the stuff thus broken. A strip like this, two inches wide, requires an effort of 420 lbs. to tear it. The material of the balloon stretches about one tenth before it breaks. The balloon, therefore, would be able to increase more than one quarter in volume before the material of which it is composed gave way to the pressure.

The apparatus just described for testing the resistance of the fabric was not entirely unknown before; but the machinery for ascertaining the strength of the cable (a matter of no less importance) is entirely new, and M. Giffard's own invention. This apparatus, represented in Fig. 2, is composed of a solid frame of wood, upon which is placed the hydraulic press which is to determine the rupture of the portion of the cable submitted to trial.

At the bottom of the engraving, to the left, is seen the double pump which forces the water up to the hydraulic press. Under the piston of this press are suspended, by means of a crosspin, two cranks, which are provided at their lower ends with a second crosspin, around which is fastened one of the extremities of the piece of cable to be tested. The lower end of this piece of cable is attached to a third crosspin, fixed to the lower part of the framework by means of a stout band.

At E is represented an accumulator, which, at the moment the cable parts, prevents any shock to the manometer that will be described further on. The tube which leads the water to the accumulator is connected at A, and the one that leads to the manometer is fitted at the point, E. The pipe, B, figured against the right hand standard of the frame, serves to allow the escape of air from the press the moment it begins operation.

The manometer for measuring the amount of pressure exerted is represented at C. It is entirely new, and is one of the most interesting devices of the whole system. This apparatus is formed of a flattened tube wound spirally a number of times, and its proportions are such that

it may be made to indicate a pressure as high as 300 atmospheres. It causes the index hand to move around the whole circumference of the dial, without any interference and without any multiplication of movement. The apparatus is at once exceedingly correct and very powerful. By means of it M. Giffard has ascertained that, to break the small end of the cable, it needed a pressure equivalent to a weight of more than 61,000 lbs., and for the large end more than 79,000 lbs. When we reflect that the Captive Balloon never

exercises a traction of more than 17,000 lbs. on the cable, and that while in operation the latter is submitted to no friction, we will readily perceive that nothing can detach the captive monster from its place of anchorage.

Admitting the possibility of such an occurrence, let us see what would happen. The balloon would simply rise rapidly in the air, and the lower automatic valve would immediately open under the pressure of the gas. During the first minute the balloon would lose 80,000 lbs. of ascensional force; it would lose a little less during the second minute, and so on during the subsequent minutes. Under such conditions, owing to the working of the automatic valve alone, the balloon would not be able to rise to a greater altitude than 8,000 feet. We are supposing in this case that the balloon was permitted to rise freely of its own accord; but such a circumstance would never take place in reality, since MM. Eugene and Jules Godard and Camille Dartois are always in the car, and the balloon is never allowed to make an ascension without them. Should the cable break these skilled aeronauts would bring the balloon down to *terre firma* again without the least accident.

But to return to M. Giffard's apparatus for cable testing: This invention is not only of interest in connection with balloon construction, for it is destined to render great service in the art of rope making, which has hitherto been greatly in need of just so accurate a system. It is also to be used, before long, in some other experiments, which are to be made at the factory of Messrs. Flaud & Cohendet, where it was constructed.

#### Engineering Inventions.

An improved Portable Railway has been patented by Francisco Amat, of Havana, Cuba. This invention consists of a track section whose rails project at one end and partly over the wider cross tie of the adjoining section, said cross tie having locking plates close to the rails, that bear on the end tie and against the rails of the first section. The locking plates have a slight upward curve at the end, and are also curved or rounded off at that side adjoining the rails.

Mr. Stephen Barnes, of New Haven, Conn., has patented an improved Gate for Railroad Crossings, that closes either the road at both sides of the railroad track or the track, admitting of the crossing of vehicles or not, according as the gate is set in either direction, the gate being held in either position reliably, and arranged to signal to the approaching train or to the vehicles the actual position of the gate.

Mr. Silas Hewitt, of Seneca Falls, N. Y., has patented an improved Car Brake, that exerts a double frictional action by contact with the wheels and rails, so as to be more powerful and effective than the single brakes which have heretofore been applied either to the wheels or to the rails.

Mr. William M. Stehley, of King William Court House, Va., has patented an improvement in Elastic Armor for Ships, which consists in alternating steel or iron plates and rubber cushions and springs for supporting the metal plates against the impact of projectiles.

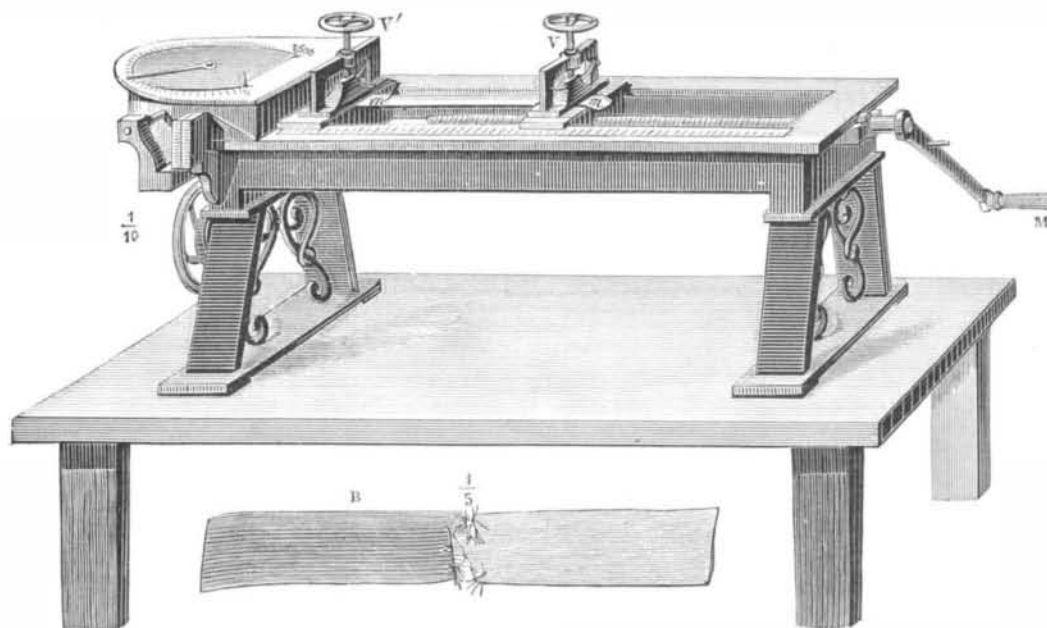


Fig. 1.—APPARATUS FOR TESTING THE FABRIC OF THE CAPTIVE BALLOON.

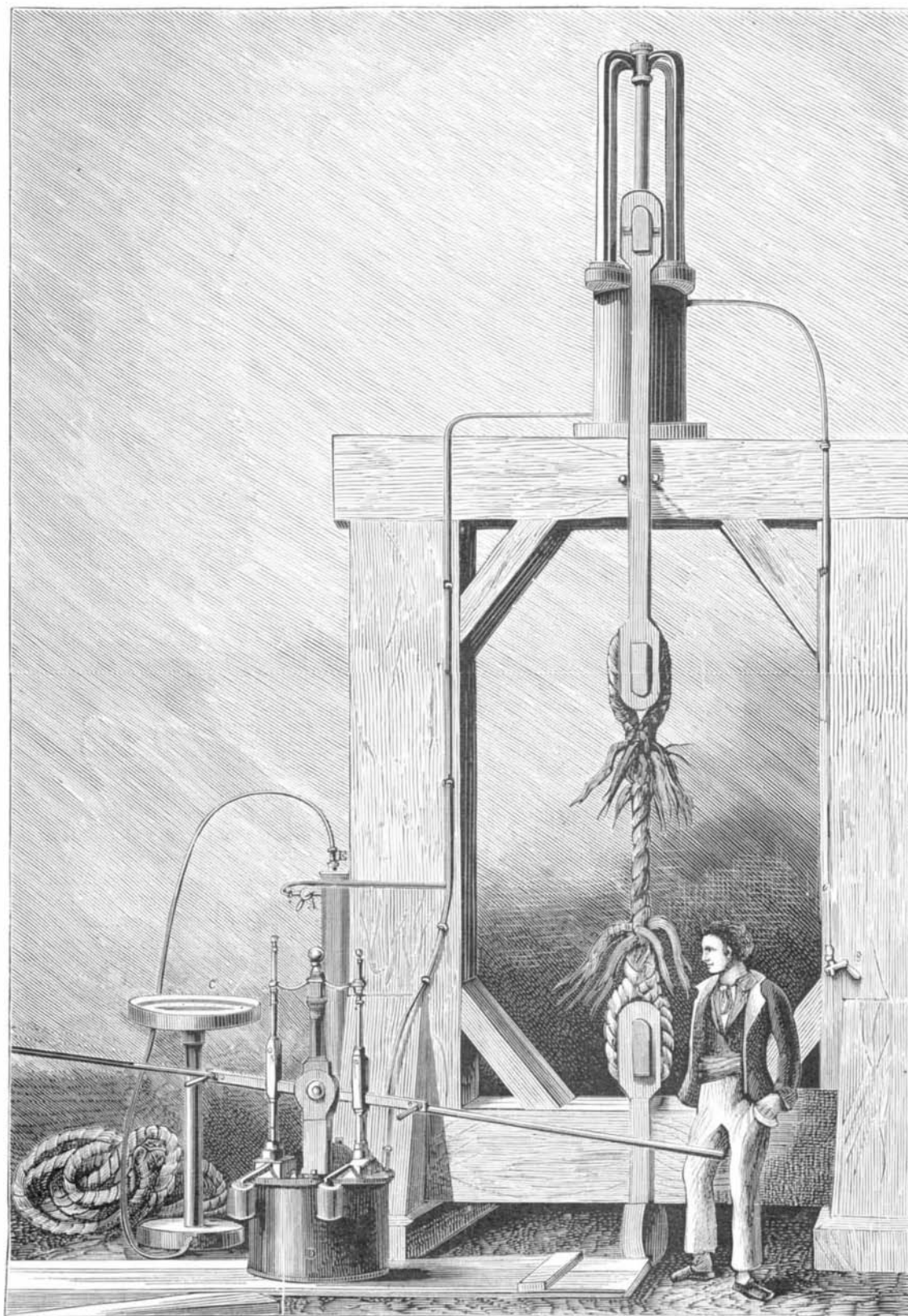


Fig. 2.—GIFFARD'S APPARATUS FOR TESTING STRENGTH OF CABLES.

An improved Locomotive has been patented by Mr. Jacob J. Anthony, of Sharon Springs, N. Y. It consists in a hollow frame which forms the water tank, and at the same time supports the cylinders and valve gear, and is itself supported by the axles of the drive wheels. The invention possesses many other novel features which cannot be properly described without an engraving.

Mr. Nathaniel F. Gilman, of Rochester, Minn., has patented an improved Railway Car Truck. The object of this invention is to provide a safe and economical railway system. It consists in a track formed of I-beams set on edge, joined at their ends, and supported by suitable cross ties or sleepers. The inventor provides a truck of peculiar construction adapted to the I-beams.

Mr. Abraham L. Akins, of Greensburg, Pa., has devised an improved Treadle Motion for sewing machines, circular saws, lathes, and other light machinery, in which the reciprocating motion of a treadle is changed in connection with a spiral spring and intermediate oscillating parts into continuous rotary motion.

**Improvement in the Leclanche Battery.**

At a recent meeting of the French Academy, M. DuMoncel exhibited, on the part of M. Léclanché, a new model of the well known battery of the latter, designed to furnish a more constant current (as well as being more durable) than the form at present in use. In this new model the carbon electrode of the positive pole, instead of being immersed in a mixture of peroxide of manganese and carbon (from which it often becomes isolated when the battery is operated much), is completely detached; and, for the mixture, there are substituted two prisms of these materials, held in place against the two faces of the electrode by means of rubber bands. The simple contact of a fragment of this mixture is sufficient to quickly and powerfully depolarize a carbon plate; and this effect results from the local current developed in the contact of these two substances, which current causes the hydrogen from the carbon to be immediately absorbed by the peroxide. In order that their local current be better established, the prisms are hollowed out on the side of contact, and the depression filled with a layer of carbon, thus increasing their conducting power. By this means the negative electrodes may serve for an indefinite period (which is an impossibility in the form of battery in use at present), and when the prisms are used up new ones have only to be substituted. Moreover, in this model, the mixture can be more strongly pressed, and the resistance of the element remains uniform. This system, also, may easily be rendered portable for the use of physicians.

**ANCIENT STAND FOR YULE LOG.**

The days when

"A Christmas gambol oft would cheer  
A poor man's heart through half the year"

are gone; but a few mementos remain to remind us of that happy period when holidays were looked forward to through weeks of pleasurable anticipation, and the remembrance of such a day lingered in the mind until the approach of another.

Anciently, on Christmas, a glowing fire was made of great logs, the principal of which was termed the yule log, or Christmas block, which might be burned till Candlemas Eve, to resist the severity of the weather. As ancient customs and the articles which are the necessary accompaniment of such customs are coming into vogue after having completed a cycle, we present our readers with an engraving of a richly wrought stand for supporting the yule log, which was in use in Venice in 1577.

**Vital Resistance.**

In summing up the results of a long series of observations on the effect of sunlight on bacteria and other organisms commonly associated with putrefaction and decay, Arthur Downes and T. P. Blunt remark that there is a lingering belief in the minds of many that matter which is endowed with life can, by its "vital resistance," more endure and survive the effect of injurious influences. This belief receives no support from their experiments. On the contrary, they have met with results which are best explained by the consideration that bioplasm is matter of the utmost complexity and instability of constitution, ever changing and most unstable when the life forces are at their full.

**The Largest Ship Ever Made.**

It is said that the steamship Great Eastern has been purchased by a company who intend to use her as a cattle boat to ply between Texas and London. She is now being fitted out at Milford Haven, and is to have new engines and boilers, manufactured by the Clyde Iron Works, at a cost of \$500,000. Re-

frigerators will be built in her for the purpose of carrying fresh beef. It is estimated that she will carry 2,200 head of cattle and 3,600 head of sheep.

**A CABINET.**

Drawing room furniture, although it may be of a lighter and perhaps more ornamental description than the more



CABINET FROM "ART IN THE HOUSE."

solemn fittings of the dining room, must follow the same general rules: it should be well constructed, suitable to its purpose, and thoroughly good. American walnut is a good wood for the purpose. It should be oil finished, so that it may be rubbed down from time to time and made as good, if not better, than new. Among the larger pieces of furniture for the drawing room may be a cabinet such as is represented in the accompanying engraving. It is of walnut ornamented with lighter and darker woods. The recesses and shelves have mirror backgrounds, which reflect the ornaments and give a brilliant effect to the whole.

Such a piece of furniture as this takes up the principal place in the room, and the rest of the wall space may be utilized for hanging book and china shelves, and smaller cabinets.

**Military Boots.**

The French military authorities have condemned the shoe and gaiter and favor the adoption of a boot which is formed of two pieces of leather, reaches some way above the ankle, and opens on the outside of the leg from the top to below the ankle bone. This opening is covered by a piece of soft leather, and closed by three short leather strings fastened to the boot on one side and three buttons. The pressure upon the instep and the tightness of the upper part round the leg can be regulated at pleasure; during any temporary halt, a man can throw the boot open and allow the air to circulate around and cool his feet; it can be put on and fastened without trouble in the dark; it effectually keeps out wet and dust, and the bottoms of the trousers can be worn either inside or outside the boot.

**New Mechanical Inventions.**

Mr. Simon S. Zahm, of Huntington, Ind., has patented an improved Churning Apparatus, which is simple, convenient, easily operated, and effective, bringing the butter in a very short time, and with a comparatively small amount of labor.

An improved Machine for Skiving Boot and Shoe Counters has been patented by Mr. Seth D. Tripp, of Lynn, Mass. The object of this invention is to furnish a machine which will feed the counters to one knife for skiving one edge, and then carry the counters forward to a second knife, which skives the other edge, delivering the counter in a finished condition; also, to provide for the rapid sharpening of the knives without removing them from the machine. It has a feeding device, which will feed the counters automatically, one by one, at the proper speed.

An improved Gas Light Extinguisher has been patented by Messrs. Philipp Brand and Edward J. King, of Jacksonville, Ill. This device is to be applied to gas burners and their supply pipes, and is so constructed that the light may be extinguished by varying the gas pressure at the gas works or at other points, as may be desired. It may be adjusted to burn gas under high or low pressure, as required.

Mr. Thoro F. Greenleaf, of Westborough, Mass., has devised an improved Flour Dressing Machine, which has a casing of suitable form divided by transverse partitions into as many compartments as there are different kinds of flour to be bolted. The casing contains wheels composed of wire brushes and perforated wings or floats arranged in alternation, one of these wheels being placed in each compartment in the casing, and they are all mounted on the same and operated by the same driving mechanism.

Mr. James Hutton, of Denver, Col., has patented an improved Felly Joint. This invention relates to means for expanding the fellyes of a wheel, and it is applicable to either iron or wooden fellyes, and to fellyes that are either sawed or bent.

Mr. William L. Orran, of Morris Gap, Tenn., has patented an improved Endless Chain Water Wheel, which is so constructed that the water may exert the full power of its weight for the longest possible time.

Mr. John Brant, of Providence, R. I., has patented an Apparatus for the Manufacture of Seamless Balls, which will enable seamless balls of any desired size to be made rapidly and accurately.

Messrs. Philip Van Tassel and Martin Paup, of Port Madison, Washington Ter., have patented an improved Steam Pump, which is so constructed that the valve may be operated, without any gear or other attachment, by the movement of the main piston, to change the position of the valve and reverse the motion of the main piston.

Mr. John H. Blain, of Round Rock, Texas, has patented an improved Horse Power. The object of this invention is to combine the principles of the lever and endless-tread horse powers in one machine, and utilize the weight of the horse or other animal; also, to construct a cheap and compact power which will be available for any purpose on a farm or other place where power is needed.

An improvement in Carving Machines has been patented by Mathew Rice, of Augusta, Ga. This device may be used in connection with lathes and other machines for carving, dovetailing, moulding, blind-slat mortising, and other descriptions of wood working.

An improved Wire Stretcher has been patented by Mr. Isaac G. Ericson, of Colorado Springs, Col. This invention consists of two levers pivoted a short distance apart to a bar or carrier near the center of the levers. The lev-



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