

THE DYNAMOMETER OF THE GREAT CAPTIVE BALLOON AT THE PARIS EXHIBITION.

Mr. Henry Giffard's great balloon at the Paris Exhibition possesses many peculiar and interesting points. The general construction of the balloon, its valves, and many of its appurtenances have been described in a former number.

The dynamometer which unites the balloon to the cable is suspended in the center of the space surrounded by the annular gallery of the car. It is formed of two steel cylinders, united by light steel bow springs. Four vertical dials indicate by means of hands the amount of traction in kilogrammes to which the dynamometer is subjected. The aerial voyagers may at any time know the excess of ascensional power of the balloon by inspecting either of the dials.

New Engineering Inventions.

Mr. E. A. Hayes, of New York city, has patented an improved Covering for Steam Boilers. This covering is of felt or other fabric applied to the exterior surfaces of steam boilers and various parts of steam engines for the purpose of protecting them from cold and preventing condensation of steam. The principal object of the invention is to provide means for using the covering again after it has been removed from the boiler.

An improved Turbine Wheel and Gate-operating Mechanism has been patented by Messrs. Uriah S. Sheffer and William H. Sheffer, of York, Pa. This invention consists in constructing the wheel with a conical upper plate, a conical lower plate, and radial partitions forming buckets converging downwardly and toward the center of the wheel, the said partitions being extended downwardly to form curved buckets at the point of discharge. This invention also consists in a novel arrangement of mechanism for operating the gates.

Messrs. Robert Deeley and John Turl, of New York city, have patented an improved Portable Railway, which is designed especially for use upon sugar plantations for hauling the cane from the field to the mill. It may be used for various other purposes where a temporary track is required.

An improved Rock Washer for Oil Wells has been patented by Messrs. Frank Jeannerat and Lewis E. Simons, of Edenburg, Pa. The object of this invention is to provide a means of keeping open the apertures in the well tubing through which oil issues for the purpose of washing the rock and preventing the accumulation of paraffine. It consists in a spring carrying a pin, which projects through the aperture in the well tubing, and in a ball or enlargement on the valve rod, which engages the spring and causes the pin to make an outward movement for each stroke of the valve rod.

Messrs. William H. Wilder and Charles W. Conant, of Gardner, Mass., have patented an improved Car Brake, which is so constructed as to enable the brake to be applied with much more force than ordinarily constructed brakes.

Mr. Maximilian Jacker, of Marquette, Mich., has patented an improved Hoisting Machine, which consists in a single differential friction brake, applied to the winding drum, in connection with gearing, in such a manner that the starting, stopping, and reversing of the drum are accomplished by manipulation of the one brake, and this is done without interfering with the operation of any other winding drum which may be operated from the same main shaft.

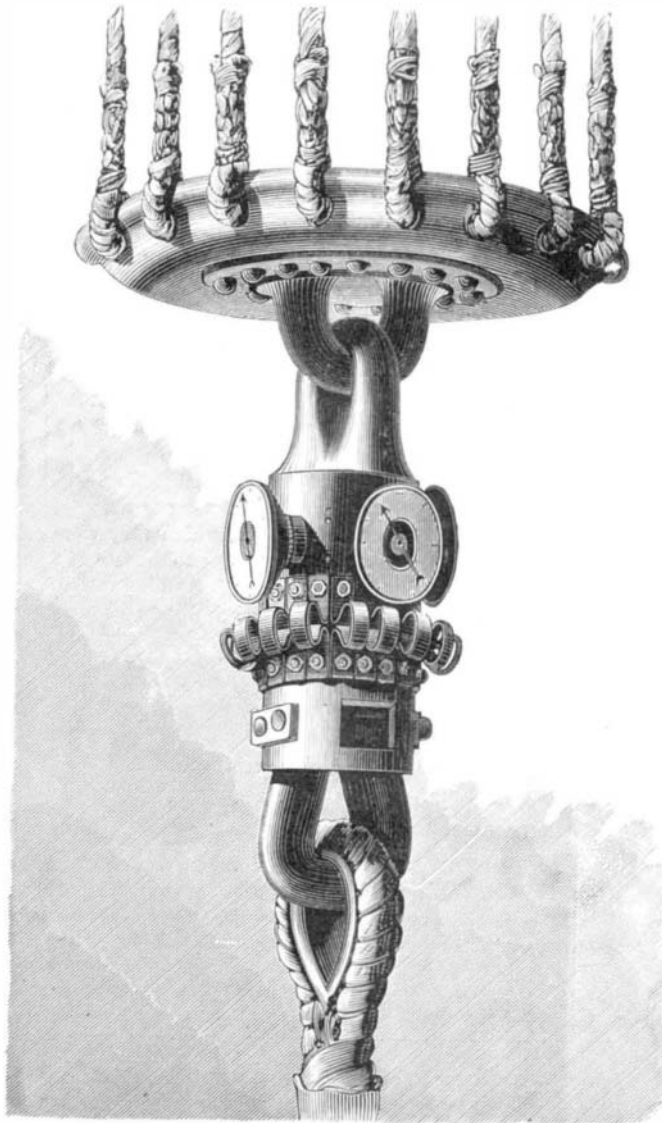
Mr. John B. Deeds, of Terre Haute, Ind., is the inventor of an improved Machine for Starting or Moving Railroad Cars upon the track. It is so constructed that it may be conveniently operated by a hand lever to move one car apart from another without the necessity of going in between them, and it will allow of a full throw or movement of the hand lever, even while the cars are close together.

Mr. Richard T. Pascall, of New York city, has devised an improved Steam Trap, which consists in a casing containing a spherical corrugated sheet metal float, and having a strainer for preventing the entrance of dirt, and provided with a balanced discharge valve. It has a device for lifting the float independently of the action of the water, and also a guard placed above the float, to carry the water that enters the trap to the side of the casing.

Mr. Louis Leypoldt, of New York city, has patented an improved Railroad Rail for elevated and surface railroads, by which the annoying

noise caused by the contact of wheels and rails may be avoided or deadened.

Mr. John J. Tonkin, of Richmond, Va., has patented an improved Gauge Cock for determining the water level in steam boilers. It consists in constructing the axial portion of the cock in such form that it shall fulfill itself the func-



DYNAMOMETER OF THE CAPTIVE BALLOON AT THE PARIS EXHIBITION.

tion of a valve by longitudinal movement, so that, in trying the water level, all that is necessary is to grasp the handle of the tube and force it longitudinally in, and then turn the tube axially until its right angular arm dips into the water, the pressure of the steam within serving to force back the tube and seat its valve upon the valve seat.

Johnston's string binder was shown at the Royal Agricultural Society's Show, at Bristol, which has just closed, and one of his machines is at the Exhibition, as are also the others named above as working with wire. While the heavy troops are thus getting into line, there is also a scattering fire among

SHEAF BINDING.

The war between wire and twine for the binding of sheaves has fairly commenced. Wire is more convenient, and so far the most successful machines have used it. Wood, McCormick, and Osborne are fairly before the public in the United States, England, and France, with their automatic binders.

Johnston's string binder was shown at the Royal Agricultural Society's Show, at Bristol, which has just closed, and one of his machines is at the Exhibition, as are also the others named above as working with wire. While the heavy troops are thus getting into line, there is also a scattering fire among the pickets, and in the French section are various attempts to obviate the use of the bunch of straw taken from the sheaf to form a band. One man proposes to use the bark peeled from osiers, two or three twisted together; these are sold very cheap. Another has cheap hempen strings cut to length and sold in bundles of one thousand each.

It is estimated that the annual crop of France is about 4,000,000,000 sheaves of grain, and that 50 straw bands contain one franc's worth of grain, the whole representing 80,000,000 francs, most of which is lost by shelling out on to the ground or mildewing under the band. Add to this the loss of time in making and applying, and the injury to the grain in the size of the band, which causes dampness to the sheaf. The figures seem formidable, and the *automatique* band is presented to solve the difficulty.

The mode of using it is evident from the engraving on the next page; the wooden block being held in one hand, one knee of the operator is placed upon the sheaf to compress it, while the other hand draws the cord through the ring. The expansion of the sheaf binds the cord between the ring and the block, and makes a perfectly tight fastening. The cord and block are treated with tar, and are smoked to render them indestructible by humidity and noxious to insects, rats, and lizards. The price is 70 francs (\$14) per 1,000, 5 feet long.

Another candidate in the same field offers his sheaf bands with

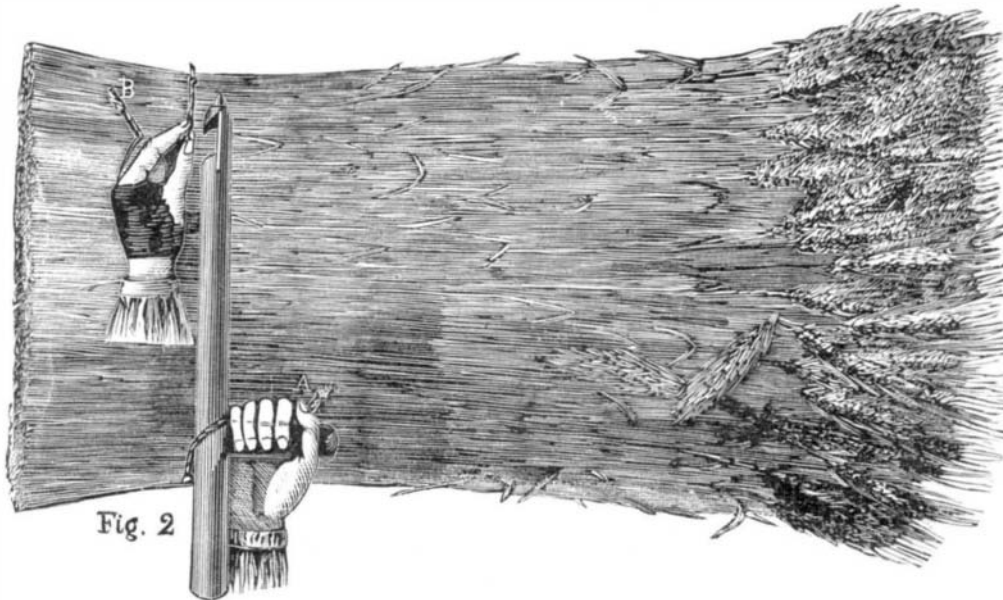
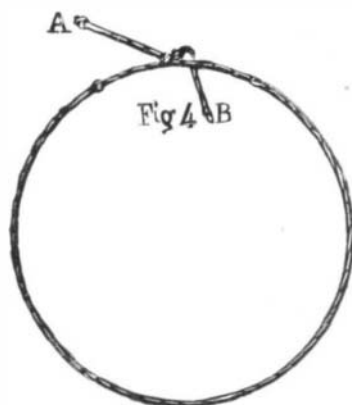
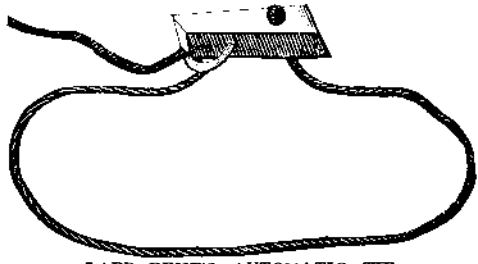


Fig. 2



TOULOUSAIN'S SHEAF BINDER.

a statement that it saves in the neighborhood of 80 per cent of the labor involved, and more than 200 per cent of the cost of the ordinary bands (*plus de 200% sur le prix*, etc.). It is surely worth examination, for this is actually money in the pocket. The band is composed of two cords knotted together, forming loops. The point of the tool (Fig. 3) is introduced through a loop at or near one end, and is thrust as far as the handle permits. The band being placed around the sheaf, the point of the tool is thrust through such one of



LAPPARENT'S AUTOMATIC TIE.

the other loops as will give the tightness to the band, and the handle end of the tool is then carried over, describing an arc upon the point which is in the sheaf; the loop slips down from the handle to the point end, and the loop caught in the notch is then drawn through the loop on the loop, and the latter is withdrawn, allowing the knot drawn through to catch in the loop, where it is held by the expansion of the sheaf. They are five feet long, and the price is, according to size, from \$5.32 to \$7.60 per 1,000. *Violà tout!*

EDWARD H. KNIGHT.

GANG PLOW TRIALS.—PARIS EXHIBITION.

The following report of the dynamometric trials of the best American and French gang plows was received too late for insertion with the detailed account of the competition printed in the SCIENTIFIC AMERICAN last week. Our correspondent observes that no table of equal fullness and value has ever before been published in this country.

Dynamometric Trials of Gang Plows at Petit-Bourg (Seine et Oise), France, August 6th, 1878.

Reported for the SCIENTIFIC AMERICAN, by Dr. Edward H. Knight, U. S. Commissioner, etc.

NAMES OF EXHIBITORS.	TRIALS. (1)	Surface Measure by Dynamometer.		Length of trace. (2)	Mean ordinate. (3)	Corresponding effort.	Mean depth of furrow.	Mean width of furrow slice of the gang plow.	Section of land turned.	Power necessary to displace one cubic cube of earth. (4)	Mean of two trials.	Length of furrow.	Time of travel.	Weight of Plow.
		Square Meters.	Milli-meters.											
Meixmoron de Dombasle, Nancy (Meurthe et Moselle), France.	1. Going.	115,160	2 430	49 39	497 31	151 1	678 1	0 102664	4814 1	4899 2	160	4 8	247	
	2. Return'g.	112,735	2 365	47 67	500 25	161 3	626 0	0 100974	4856 2	160	4 12			
Deere & Company, Moline, Illinois, United States.	1. Going.	120,870	2 512	48 12	504 97	163 0	695 6	0 113283	4453 7	4566 9	160	4 12	260	
	2. Return'g.	125,970	2 377	52 995	556 13	167 3	709 0	0 118616	4680 0	160	4 22			

(1) The ground was slightly inclined.
 (2) The base line on the paper ribbon of the dynamometer.
 (3) Mean distance between the base and profile lines on paper ribbon.
 (4) Kilogrammeter, the French dynamic unit. The power required to lift 1 kilogramme to a height of one meter. One *cheval-vapeur* (horse power) is the power required to lift 75 kilos. a distance of 1 meter (i. e. 75 kilogrammeters) in a second. 1 kilogramme=2.2046 pounds avoirdupois. 1 meter=39.37079 inches.

President White on the Paris Exhibition.

In a private letter to a friend in Brooklyn, President White, of Cornell University, speaks of American success at Paris in the following terms:

"The Exhibition is really a vast success from every point of view save the financial. You will be glad to learn that our Americans are carrying off much more than their share of the great awards. Only yesterday, in sitting on the Jury of Appeals, I was greatly interested in seeing how, in one department after another, our people have made their mark. In regard to several exhibits, while the presidents of the class juries presented their reports, they went into exclamations of surprise over the recent revelations of American energy and industry. One of them especially declared that if America went on as she at present is going, in regard to the paper manufacture, she would soon have control of the European markets, instancing more particularly the new applications of this industry in the United States. I only wish we could have had one of those paper boats present, such as that in which our Cornell boys beat Harvard the other day. That would have completed the tableau.

"Perhaps the most striking thing has been the taking of the Great Prize for artistic gold and silver work by Tiffany. Splendid as the Exhibition was in this respect, Tiffany stood above all his rivals. In agricultural implements and in machinery of a certain class we lead everything. But this does not surprise me so much as to find that in various points where we did not expect much there are important recompenses for skill and ability. With all the ingenuity which the French have given to surgical instruments and instruments of precision, I was especially glad to see the United States stand at the side of France in such recognition."

Running the Fast Train.

The train leaving this city at 7:35 in the morning for New York over the Pennsylvania Railroad is among the fastest in the world. Indeed, a portion of the distance is made at a rate scarcely obtained by any other road in Europe or America. The distance between West Philadelphia and Jersey City is 89 miles, accomplished in one hour and 54 minutes,

with a single stop, while the return is six minutes less, including two stops. This gives a rate, in going, of nearly 50 miles, and in returning of slightly more than 50 miles an hour, surpassing that of the celebrated Queen's mail between London and Holyhead, where the run of 264 miles occupies seven hours. At half past seven o'clock Friday morning, when a *Times* man, by permission, boarded the engine at the West Philadelphia depot the steam gauge marked 120 pounds and "still rising." Precisely five minutes later the bell clinked over the engineer's head, and almost simultaneously he gave a slight clutch of the lever and the train of four cars was off. It stopped at Germantown Junction 13 minutes later. As soon as the engine got clear of the suburbs she shrieked and bounded away at greater speed. About 20 minutes after it wound its way through Bristol, and in still less time the iron bridge over the Delaware was sighted and Trenton was bisected at the same moderate speed which had been adhered to through Philadelphia. But it was necessary to do better in order to reach Jersey City, nearly 60 miles away, at the appointed time. Trenton was scarcely passed when the engineer touched up his steel. Between the first two mile posts noted, the distance was passed in 63 seconds; the next in a little less, and a third in precisely 60. Hurrah! The train was spinning along at the rate of a mile a minute. And yet everything proceeded with so much smoothness that it was impossible to appreciate the amazing swiftness. There was no unusual jolting, and in the cars the passengers were smoking, dozing or reading, just as though it was an ordinary train in which they were riding. Just beyond Princeton the speed rose to the rate of a mile in 58 seconds and continued it without diminution, except a slight "slowing up" at Monmouth Junction, until New Brunswick was in view. As soon as the town was left behind the engine was at it again, and in the neighborhood of Menlo Park the speed became prodigious, as if the locomotive was snorting defiance to the wonderful Edison in his laboratory under the hill.

day the passengers began stepping off just a minute and a half before the train was due. Of the 29 trips from West Philadelphia to New York, 25 were made on time connection. The train has been missed only twice. Once was on account of the accident mentioned, and the other was a twelve minute detention caused by an excursion train getting in the way. The other delays were just two minutes apiece, occasioned by the draw in the river. The return trip fails oftener, it being difficult to get away from Jersey City at the exact moment, while the run is harder, including more up grade.

The train generally consists of four or five cars, including a palace one, and averages about 300 passengers a day. It is under the charge of Louis Silance, an experienced conductor, while the two engines, which alternately do the work, are run by the veterans Edward Osmond, who has been on the road 21 years and has handled a locomotive 16 years, and Frank Peacock, equally skilled and careful. The register shows that many a mile has been made in 48 seconds, which is at the rate of 75 miles an hour. Going eastward the train makes one and in returning two stops. The driving wheels of the engine are only five feet in diameter, but this will probably be increased to five and a half feet. —*Philadelphia Times*.

The Population of Europe.

Correcting Behm and Wagner's tables of 1878, for the changes just made in Turkey, the population of the several states of Europe is now as follows, the total being in round numbers 312,400,000:

Germany, 1875.....	42,727,360	Iceland, 1876.....	71,300
Austro-Hungary, 1876..	37,350,000	Spain (without Canaries), 1871.....	16,526,511
Liechtenstei. n., 1876..	8,664	Andorra.....	12,000
Switzerland, 1876.....	2,759,854	Gibraltar, 1873.....	25,143
Netherlands, 1876.....	3,865,456	Portugal (with Azores), 1875.....	4,319,284
Luxembourg, 1875.....	205,158	Italy, 1876.....	27,769,475
European Russia, 1872..	72,392,770	European Turkey.....	8,359,000
Finland, 1875.....	1,912,647	Roumania, 1878.....	5,149,000
Sweden, 1876.....	4,429,713	Servia, 1878.....	1,642,000
Norway, 1875.....	1,807,555	Montenegro.....	210,000
Denmark, 1876.....	1,903,000	Greece, 1878.....	2,200,000
Belgium, 1876.....	5,336,185	Malta, 1878.....	145,000
France, 1876.....	36,905,788	Faroes, 1876.....	10,600
Great Britain, 1873.....	34,242,966		

The cession of Bosnia to Austria increases the population of the Austro-Hungarian empire something over 1,000,000. If Turkey is further reduced by the populations of the practically independent principalities of Bulgaria (1,773,000 inhabitants) and Eastern Roumelia (746,000), there will remain to that empire considerably less than five millions, about two and a half millions being Mohammedans.

The Shoe and Leather Trade.

The testimony of actual workmen before the Congressional Labor Committee is invariably full of interest and encouragement. Markedly of this nature was that of Mr. J. H. Walker, a manufacturer of boots and shoes at Worcester, Mass., and of leather at Chicago—a typical American working man, who has won success by diligence and thrift. He said:

"I employ 497 men, and do a business of about \$2,000,000 a year. I began life working at the bench, and have built up my own business, and made all the money I possess. The boot and shoe business is considered next in importance to that of agriculture in the United States. I have before me the statistics of the shipment of cases of boots, shoes, and rubbers from Boston. In 1872 the shipments were 1,452,000 cases; in 1874 there was a decrease of 115,000 cases; in 1875, an increase of 59,000 over 1874; in 1876, an increase of 72,000 over 1875; in 1877, an increase of 237,000 over 1876; in 1878, thus far, a decrease of 156,400 from the same period last year, which is partly owing to the facts that the large sales of rubbers in New York have not been made, and that jobbers are not carrying large stocks, but are buying from time to time. The volume of business has increased since 1874, but there have been small profits, and the business has been carried on rather for the benefit of the workmen than of the capitalists. Machinery is used in our business, but in a less degree than in the manufacture of cotton and woolen goods. Wages in 1840 were \$1 a day for thirteen hours' work; in 1860 they had doubled, and in 1865 were nearly \$4; now wages have fallen to about \$2, the same as in 1860, with ten hours' work a day. The effect of the introduction of machinery upon the trade has been to improve the shoes, and to increase the working capacity of a laborer about 15 per cent. The effect upon the workmen has been to improve them intellectually. The question to-day is the kind of work and the wages to be paid rather than the want of work. If the people of Massachusetts were driven to it, the soil of that State would amply support its entire population; it has ceased to be an agricultural State because manufacturing has become more profitable than tilling the soil."

Mr. Hewitt—Is there any difficulty in men rising from the rank of employé to that of employer? A. "In 1840 there were in Worcester four firms of shoe manufacturers, consisting of seven persons. Of these only one died in comfortable circumstances. In 1850 there were sixteen firms, consisting of eighteen men; only two of these retired with capital, four have failed, and only two are engaged in the business now. In 1860 there were twenty-one firms, consisting of twenty-nine men; two have gone out of the business with capital, twelve have failed, and only five are now manufacturers. To-day there are twenty-one firms, consisting of forty men; of these only five are the sons of manufacturers, and only one has not been a worker for wages. There never was a time when it was more easy for a journey-