An Electric Mountain Railway.

This has recently been opened to the public at the Burgenstock, near Lucerne. Under the superintendence of M. Abt, the rails describe one grand curve formed upon an angle of 112 degrees, and, by an arrangement of the Abt system, the journey is made as steadily and smoothly as upon any of the straight funicular lines previously constructed. The Burgenstock being almost perpendicular, it would have been impossible to construct a railway upon the old plan. From the shore of the Lake of Lucerne to the Burgenstock is 1,330 feet, and it is 2,860 feet above the level of the sea. The total length of the line is 938 meters, and it commences with a gradient of 32 per cent, which is increased to 58 per cent after the first 400 meters, and this is maintained for the rest of the journey. A single pair of rails is used throughout, with the exception of a few yards at half distance to permit the two cars to pass. Through the opposition of the Swiss government, each car is at the present time only allowed to run the half distance, and they insist upon the passengers changing, in order, as they say, to avoid collision or accident. The motive power, electricity, is generated by two dynamos, each of 25 horse power, which are worked by a water wheel of nominally 125 horse power, erected upon the river Aar at its mouth at Buochs, three miles away. The electric current is conducted by means of insulated copper wires. The loss in transmission is estimated at 25 per cent.

Export Museums in Germany.

The Germans still seem to find their export museums very useful, if one may judge by the increasing number of such institutions, and the care with which they are being developed. These museums are now in existence at Stuttgart, Berlin, Munich, Cologne, Frankfort, and other places in Germany. With regard to that at Frankfort, British Consul-General Oppenheimer has recently reported at some length. He states that these export museums are looked upon with growing interest, inasmuch as they "greatly contribute to extend German intercourse with foreign countries."

The Frankfort Export Museum is said to serve as the means of informing the manufacturers and merchants of the district as to the articles most current abroad, giving them the prices realized, stating the mode of packing most in favor, the quantities sold, the local charges, the period for which credit is asked and given, and so forth. An import museum forms an essential part of the Frankfort institution, its object being to make manufacturers and merchants acquainted with the raw materials which may be made useful for various technical and industrial purposes. All possible information is given as to these materials. An information office constitutes another part of the Frankfort Museum. It contains statistics of all kinds, technical and commercial periodicals, reports, particulars of customs tariffs, and so on.

Information, samples, etc., are constantly received by all these museums from the German consulates all over the world. At Frankfort there are also export sample rooms, where there are exhibited samples, designs, show cards, price lists, etc., giving exact prices, weights, measures, and all other necessary details in German, English, and French.

Thus the Germans appear to cultivate these institutions with care. They do so, it is stated, because they find in them a means of more economical, more permanent, and more effective representation than exhibitions, which involve heavy expenses. In taking this view the Germans are probably right, seeing that the majority of exhibitions are now of no use whatever save as a very expensive means of advertising to the general public. That impression is spreading in this country, but up to the present it cannot be said that there is anything like a general movement in the direction of export museums or sample rooms. Such museums are, perhaps, better fitted for a rising industrial nation like Germany than for Great Britain, yet we should probably be wise not to neglect an idea which appears to be found so useful by those who are undoubtedly our most earnest and most serious commercial competitors.—*The Ironmonger.*

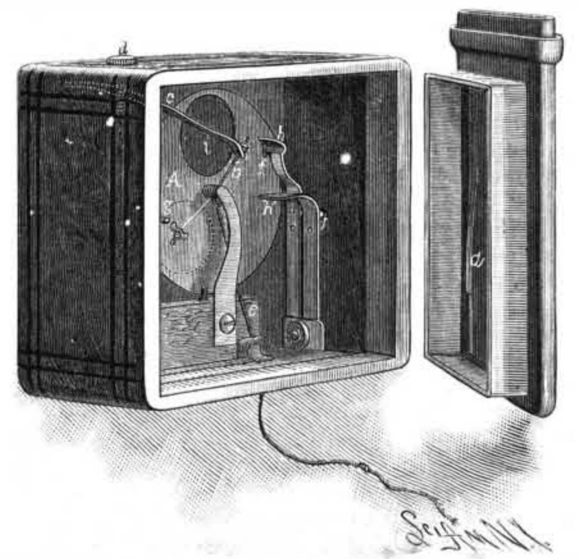
An American Parachutist in England.

On the evening of September 1 Professor Baldwin, the daring American aeronaut, for the tenth time successfully performed his feat of dropping from a balloon at the Alexandra Palace, London, in the presence of many thousands of spectators, among whom were Major Templer, of the Military Ballooning Department, Chatham; Mr. Lefevre, president of the Balloon Society of Great Britain; and others interested scientifically in the question of aerial navigation. The ascent with the balloon was made by Professor Baldwin from the North Park, and he dropped away from the balloon with his patent parachute at an altitude of about 1,200 feet, and safely descended just outside the palace fence on the Wood-green side. The balloon fell at Wood-green. Afterward there was a large gathering of visitors in the central hall of the palace to witness the presentation of a gold medal to Mr. Baldwin by the Balloon Society.

A POCKET CAMERA.

BY GEO. M. HOPKINS.

No equipment for a tour or a summer's vacation is now complete without a photographic outfit for making instantaneous memoranda of scenes and objects met with upon the road, on the river or lake, or in the picturesque nooks of mountain and valley. The principal trouble with photography in these days is not with the plates and chemicals, as of old, but with the more or less cumbersome camera and accessories, which



INTERIOR OF POCKET CAMERA.

must be ever present with the artist, making him an object of curiosity wherever he may go.

If large pictures are desired, a large camera and tripod of corresponding size will, of course, be required. To these must be added a complement of plate holders if a number of pictures are to be made in a short time. Some of the recently devised cameras are very portable, and in every way desirable. The writer adds to the list an instrument which differs in some respects from others. The principal feature is the plate-changing device, which is quite simple and admits of the use of flexible bags for holding the plates before and after exposure. The bags—which hold one plate each—are made of the stout black paper known in the trade as leatherette. Each bag has a very thin covering of leather, such as is used by bookbinders on very light work, and around the mouth of the bag is glued a band of thin, tough pasteboard. The bags are made over a wooden form. A dozen filled bags occupy very little more room than the plates in the original package. The light is excluded, and the plates are held in the bags by folding over the top, as shown in the engraving. Each bag is provided with a rubber band extending around it lengthwise, to prevent it from unfolding.

A POCKET CAMERA.

In the present case, the plate holder proper is made of brass and fitted to the camera box, from which it is never removed, except in case of some disarrangement of the interior parts of the camera. The holder consists of a flat sheath, made of suitable size to readily admit the plate, and provided with an opening in the front side, of the size of the field of the lens. This opening is surrounded by a flange which fits light-tight into the camera box.

Two light bowed springs, *a*, are soldered to the back of the sheath, and tend to press the plate forward to bring the film into the focal plane.

The end of the sheath, which projects upward above the top of the camera box, is of suitable size to be received in the stiffened ends of the bags, and a channel is formed around the end of the sheath near its upper end by soldering an angled strip of brass around the mouth of the sheath, as shown in Fig. 1. Into this channel the stiffened end of the bag is inserted before it is unfolded. The channel is blackened, so that when the end of the bag is inserted in it, no light can enter. Now, by straightening the bag and shaking the camera, the plate contained by the bag will be made to fall into the holder. The bag can now be folded against the back of the holder and held there by one of the elastic bands extending over the top and under the bottom of the box. The removal of the plate from the camera is simply the reverse of what has just been described; that is, the bag is unfolded, and the camera being inverted, the plate is dropped into the bag, when the bag is again folded and removed from the holder.

The shutter of this little camera is both simple and effective. It admits of instantaneous and time exposures, and can readily be adjusted to any required speed without opening the camera box.

The shutter consists of a light metallic disk, A, provided with a central boss arranged to turn on a stud projecting from a plate secured to the inner surface of the front of the box. A stout but fine cord, *b*, is attached by one end to a small loop soldered to the fa e of the shutter and wound once around the boss of the shutter; the remaining end passes through a hole in the end of the spring, *c*. A screw, *d*, passes through the top of the camera, through a slot in the spring, *c*, the nut being fitted to the slot of the spring and provided with shoulders which support the spring. By turning the screw, *d*, the spring may be made to turn the shutter with more or less rapidity, as may be required. A cord, *e*, inserted in an eye on the boss of the shutter and wound in a direction opposite that of the cord, *b*, passes out through a hole in the box and serves to set the shutter.

The shutter is provided with two small studs, *f g*, the stud, *f*, being arranged near the periphery of the disk, in position to be engaged by the spring catch, *h*, when the shutter is drawn around by the cord, *e*, preparatory to making an instantaneous exposure. The stud, *g*, is placed in such a position relative to the catch, *h'*, that its engagement with the catch will hold the shutter open, or with its opening, *i*, coincident with the opening of the tube, as indicated in dotted lines.

The catch, *h'*, is provided with a wire arm, *j*, which extends behind the catch, *h*, in such a way as to allow the catch, *h'*, to move a short distance before releasing the catch, *h*. Each catch is provided with a stud which projects through the camera box and presses against the leather covering, forming two small convex projections, *l*, *m*. When an instantaneous exposure is desired, the shutter is released by pressing the projection, *l*. When a time exposure is to be made, the button, *m*, is pressed. This operation first throws the catch, *h'*, into the path of the stud, *g*, thus releasing the stud, *f*, allowing the shutter to turn until the stud, *g*, strikes the catch, *h*. This will arrest the shutter in an open position. When the catch, *h'*, is released, the shutter closes. For time exposures the camera box may be placed on any convenient support.

For instantaneous exposures, the camera may be held in the hand. One desiring to make a camera of this kind, and having the proper facilities, could substitute a toothed sector and pinion for the shutter boss and the cords used in operating it.

The camera lens is of the spherical, wide angle kind, with a fixed focus for all distances from five feet upward.

The camera box is 2 inches deep and 3½ inches square, outside measurement. The camera was designed especially as a tourist's companion for taking lantern views, and it has served its purpose very well indeed.

Hydrogen for Balloons.

While experiments are being made in England to solve the problem of the manufacture of balloon hydrogen by electrolysis, *Iron* informs us that Messrs. Majert and Richter have devised, had constructed, and successfully experimented with, at Berlin, an apparatus that does away with the inconveniences of former processes. The hydrogen is obtained by heating a mixture of slaked lime and powdered zinc, the carriage of which on a campaign is rendered easy by inclosing it in tin cartridges. The water of the slaked lime is decomposed by the zinc, and, as a result, there is obtained a pure gas, free from arseniated hydrogen, which is so dangerous to man, and from sulphuric acid, which is so injurious to the balloon. The apparatus for producing the gas is heated by any combustible whatever. It is in the form of a small locomotive, and is easily drawn by four horses. In front, there is a seat for two men, which can be removed in a minute and be replaced by a chimney. The fire is started, and in six minutes the cartridges are red hot. As soon as this temperature is reached, the cartridges are introduced into the retort, and five minutes afterward the production of hydrogen goes on normally. With 120 cartridges, about 890 cubic feet per hour are obtained. A military balloon of ordinary dimensions can, therefore, be inflated in three hours.—*La Nature.*

The Number of the Stars.

The total number of stars that one can see, says Prof. E. S. Holden, in the August number of the *Century*, will depend very largely upon the clearness of the sky and the keenness of the sight. In the whole celestial sphere, there are about six thousand stars visible to an ordinarily good eye. Of these, however, we can never see more than a fraction at any one time, because a half of the sphere is always below the horizon. If we could see a star in the horizon as easily as in the zenith, a half of the whole number, or 3,000, would be visible on any clear night. But stars near the horizon are seen through so great a thickness of atmosphere as greatly to obscure their light, and only the brightest ones can there be seen. As a result of this observation, it is not likely that more than 2,000 stars can ever be taken in at a single view by any ordinary eye. About 2,000 other stars are so near the south pole that they never rise in our latitudes. Hence, out of 6,000 supposed to be visible, 4,000 only ever come within the range of our vision, unless we make a journey toward the equator.

As telescopic power is increased, we still find stars of fainter and fainter light; but the number cannot go on increasing forever in the same ratio as with the brighter magnitudes, because, if it did, the whole sky would be a blaze of starlight. If telescopes with powers far exceeding our present ones were made, they would no doubt show new stars of twentieth, twenty first, etc., magnitudes; but it is highly probable that the number of such successive orders of stars would not increase in the same ratio as is observed in the eighth, ninth, and tenth magnitudes, for example.

The enormous labor of estimating the number of stars of such classes will long prevent the accumulation of statistics on this question; but this much is certain, that in special regions of the sky that have been searchingly examined by various telescopes of successively increasing apertures, the number of new stars found is by no means in proportion to the increased instrumental power. If this is found to be true elsewhere, the conclusion may be that, after all, the stellar system can be experimentally shown to be of finite extent, and to contain only a finite number of stars.

In the whole sky, an eye of average power will, as above stated, see about 6,000 stars. With a telescope, this number is greatly increased, and the most powerful instrument of modern times will show 60,000,000. Of this number, not one out of 100 has ever been catalogued at all.

In all, 314,926 stars, from the first to the ninth and one-half magnitudes, are contained in the northern sky, or about 600,000 in both hemispheres. All of these can be seen with a three-inch object glass.

Labrador.

Mr. R. F. Holme recently read to the Royal Geographical Society an interesting account of a journey to the interior of Labrador. Although the coast is utterly bare and treeless, a luxurious forest growth commences at a distance inland of about twelve miles, and clothes the whole of the country except the barrens or moors, which are the home of the caribou. Mr. Holme has ascended all the rivers that flow into Hamilton Inlet as far as navigable in a boat. One of the most important of these is the Kenamou, used as one of the routes from the south. By far the largest river of this district is the Grand, which is the name given to the channel connecting Lake Petchikapou with Goose Bay, at the head of Hamilton Inlet. Grand River is really only a portion of a continuous waterway of rivers and lakes connecting Goose Bay with Ungava Bay. Lake Wiminikapou is situated about 150 miles from the mouth of Grand River, and thirty miles above that long and narrow lake are the Grand Falls, the height of which is not known, but which may prove to be among the most stupendous in the world. The elevation of the Labrador table land is given by Professor Hind at 2,240 feet, and at least 2,000 feet of this are in the thirty miles between the head of these falls and the lake below.

Lake Petchikapou, one of the largest of the interior lakes of Eastern Labrador, is connected with the ocean not only by Grand River, but by Nascopee River and Grand Lake. The Indians of the interior of Labrador are all of the Cree nation, and are perhaps the most unadulterated Indians to be found on the continent. A. G. Guillemard, in a note to the May number of the *Proc. Roy. Geog. Soc.*, suggests that possibly the Grand Falls of Grand River (Labrador) might be reached more readily by following up the Moisie River from the Gulf of St. Lawrence and skirting Lake Aswanipi. He also says: "The fall from a height at all approaching 2,000 feet of a river 500 yards in width, a short distance higher up, would form one of the wonders of the world, and would surely have been described by Mr. Maclean after returning from his visit in 1839. Mr. Guillemard mentions among waterfalls combining great volume of water and great height, the Garsoppa Falls, in Western Hindostan, 300 yards wide and 830 feet high, and the Kaieteur Fall of the Potaro River, in British Guiana, 123 yards wide and 741 feet in vertical height.

Horse Railways.

Two distinct methods are recognized among street car men in the handling of their stable equipments. In one the stock of horses is kept as low as possible, they are worked hard, making 14 or 15 miles a day, and the depreciation is very heavy. In the other the stable equipment is increased, the horses are kept in excellent condition, their average daily duty is reduced to 10 or 12 miles, and the depreciation is lessened.

Assuming the cost of a horse as $150, and the cost of feeding and caring for him as $180 per annum, it would seem that any accurate knowledge of the average life of horses under different day's duty would soon determine the proper amount of the latter.

All railway returns do not, strange as it may seem, give accurate information on which such estimates of cost can be made, but from such facts as are given we may deduce the following: Taking the returns for 1887 for the five largest roads in Massachusetts, we find that they show 6,909 horses and 1,410 cars, that the mileage made was 12,834,665, and the passengers carried, 76,187,842.

Dividing the average daily mileage by the number of horses, and multiplying the number of horses in a team, we find only 10·26 miles as the average daily duty for all teams, sick or well. Horses which are on duty make from 12 to 14 miles.

On the West End road of Boston, which is now the largest street railway combination in the world, having about 212 miles of track and over 8,000 horses, 10 per cent of the horses are counted as being off duty from illness, sprains, shoeing, or other causes, and the balance of the horses average about 12 miles a day. A car day is estimated at 10 to 11 hours, and from 45 to 50 miles, and eight horses are allowed as the active force.

The rule given me by one of the officials of this company, as a fair one to determine a stable equipment, is to divide the total daily mileage by the miles made in a car day and multiply it by nine, adding what is necessary for hill horses. Hence, if 50 miles is a car day duty, a daily run of 1,600 miles would require a stable equipment of 288 horses besides those for hill work.

On the Fourth Avenue line, in New York, the stable equipment is determined as follows: A car day is 11 hours, and eight horses make about five trips, aggregating about 50 miles. To this number is added 10 per cent for illness, sprains, etc., and 10 per cent for emergencies. On this road is illustrated the influence of an important factor in horse car work—that is, the position of the stables. Horses from the upper stable are limited to 11 miles, or otherwise they would have to make 22 miles, while horses from the lower stable have to make about 13½ miles, or considerably more.

The average cost of motive power per car day throughout the United States, that is, for from 10 to 11 hours and trips aggregating from 45 to 50 miles, is about $4. This counts only those horses on actual duty on the road. The cost of motive power per car day for equal mileage in Richmond (Richmond Union Passenger Railway, equipped by the Sprague Electric Motor Company) is less than $2 on the heaviest sort of grade work. The total operating expenses of a horse railway average for the five largest roads in Massachusetts 25·15 cents, and for all the roads in Massachusetts 24·7 cents per car mile, and the ratio of operating expenses to gross receipts is, for all the roads, 86 per cent

The cost per day per horse, based upon the returns of four of the largest roads in New York, is 54 cents, and the cost per car mile from 9½ to 10½ cents per car mile.

In addition to the regular depreciation, there is ever present danger of an epidemic in hot weather.

Since the cost of the motive power alone—that is, the cost of harness and stable equipments, horse shoeing, renewals, provender, hostlers, etc.—is 40 per cent of the total operating expenses, it will at once be seen how vitally important any material saving in the cost of motive power becomes. If, as we claim, the cost of motive power in an electrical system is one-half or less than that in a horse system, the percentage of gross receipts available for interest and dividends is more than doubled.

Furthermore, when we remember that the average running time for horses is only five to six miles per hour, we have another reason which constitutes an unwarrantable objection to the use of horses for rapid transit.—*Frank J. Sprague.*

The Treatment of Sleeplessness.

Recipes for sleeplessness continue to present themselves. A correspondent of the *Lancet* has found the following to be an effectual remedy in his own case: After taking a deep inspiration he holds his breath till discomfort is felt, then repeats the process a second and a third time. As a rule, this is enough to procure sleep. A slight degree of asphyxia is thus relied on as a soporific agent, but the theoretical correctness of this method is somewhat open to question. Certainly there is proof to show that the daily expenditure of oxygen is most active during the waking period, and that nightly sleep appears to coincide with a period of deficient tissue oxygenation. It is at least as probable, however, that other influences are associated with the production and timely recurrence of sleep besides that just referred to. This plan, moreover, however effectual and beneficial in the case of its author, is not without its disadvantages. The tendency of deficient oxygenation is to increase blood pressure and to slow the heart's action. With a normal organ, as an occasional occurrence, this might not be of much consequence. If, however, the impeded heart should also be enfeebled by disease, the experiment might be repeated once too often. Another combatant in the struggle with insomnia lays down a series of rules, for the most part very sensible, to which he pins his faith. Considering that the chief causes of sleeplessness are worry and the want of a due amount of exercise and fresh air, he advises his fellow sufferers to observe the ordinary rules of hygiene relating to such matters, to take food and drink in moderation, and to avoid of an evening the use of tea, coffee, and tobacco. In dealing with severe nervous irritation from mental or physical work, he has found a daily rest an almost essential prelude to sleep at night. Thus, he treats of sleeplessness rather as a tendency requiring constitutional remedies than a symptom of mere brain excitation. There is much to be said for his theory and means of treatment.—*Therapeutic Gazette.*

Division of Labor.

A new idea has been developed in Germany, in the shape of the manufacture of mortar, to be sold at retail to small builders and private individuals. The business requires very little capital, and the mortar, which is mixed by machinery, and of excellent quality, finds a ready sale, something like two million barrels having been disposed of last year in Berlin alone. It is rapidly becoming usual for city builders here, as elsewhere, instead of maintaining large yards, at enormous rents, for the storage of materials, to keep only an office, contracting for their bricks, lime, cement, doors, lumber, glass, and so on, to be delivered at the building where they are to be used. This involves the manufacture of mortar on the ground, under unfavorable circumstances, and at an unnecessary expense; and a provision by which, on dropping a card into a box or speaking a word through a telephone, a suitable quantity of first-rate mortar for any purpose, ready for use, could be delivered at an hour's notice where required, seems likely to be very useful.—*The Architect.*

While, in the course of time, adds the *Review and Record* (Brooklyn), architects will become divided into men who devote themselves wholly to designing churches, or office buildings, or factories, or residences, no one man attempting to cover the entire field, similar subdivisions will be made in the building trade. We shall have firms supplying mortar only, or cement; others that lay bricks, or certain kinds of stone, or make foundations, or construct roofs; no one man undertaking to do everything himself. And, by the way, the principle does not end with the architect and the builder, but is applicable as well to the trade of the decorator, plumber, plasterer, etc.

Alum Baking Powders.

Mr. C. V. Petraeus, in an article on baking powders in the *Pharmaceutical Record,* states that burnt alum is the most perfect acid element that can be used in baking powders, and for several reasons, viz.: 1. When exposed to the air, it does not become moist. 2. When mixed with bicarbonate of soda, and starch or flour, burnt alum evolves no gas at ordinary temperatures, therefore an alum baking powder does not deteriorate in the package like a cream of tartar powder—its keeping quality is far above the latter. 3. Though burnt alum does not dissolve in water, during the baking process it sets free the gas from bicarbonate of soda slowly, and with greater regularity than cream of tartar, and therefore does much better and more effective work. He shows further that 80 grains of burnt alum decompose as much bicarbonate (84 grains) as 188 grains of cream of tartar, and while the dry residue in the latter case weighs 210 grains, in the case of the alum it is 110 grains (71 grains sulphate of soda, 22 grains sulphate of ammonia, and 17 grains alumina). The use of alum in baking powder must not be confounded with its use for "improving" bad flour. In the one case the alum remains in the bread as alum, just as it was put into the flour; but when mixed with bicarbonate of soda, as in baking powders, it is entirely decomposed, and there remains in the bread only a few grains of insoluble alumina, which is quite as harmless as would be a few grains of white clay or any other inert material. For these and other reasons Mr. Petraeus considers that alum baking powders are the best, not only because a given quantity will raise more bread than the same quantity of cream of tartar baking powder, but because of the small quantity and innocent character of the residue they leave in the bread. A suitable formula for alum baking powder, based on the figures given above, would be as follows:

Burnt alum, in fine powder	8 oz.
Bicarbonate of soda	8 " ℥iij.
Rice flour	1 lb.

—*Chem. and Drug.*