trough-shaped buckets, each holding about 2 cwt., and suspended from the line by a light iron frame, at the upper end of which is a pair of grooved wheels running on the line of rods. A train is made up of ten of these skips, which are in electrical connection with each other and with an electrical motor, which is placed in the middle of the train, having five skips in front of and five behind it; the dynamo machine used as the motor is of Reckenzaun's design. At a point about midway of the length of the line is the engine house, in which is a steam engine for driving the dynamo machines. From these latter the current is led to the line, and thus to the electrical motor which moves the train. The use to which the line is put is to carry clay from a pit to the Glynde railway siding, whence it is delivered into trucks and transported by rail to the works of the New Haven Cement Company. At the charging end of the telpher line, the skips are loaded each with about 2 cwt. of clay, the train thus carrying 1 ton. A laborer, by touching a key, starts the train, which travels at a speed of from four to five miles an hour along the overhead line to the Glynde station. Arrived there, another laborer upsets each skip as it passes over a railway truck, into which the clay is thus loaded. This upsetting, however, will eventually be performed automatically by means of a lever on each skip, which will come in contact with a projecting arm as it passes over the truck.

The laborer at the discharging end of the line has full control over the train, and can stop, start, and reverse it at will, as can also the man at the other or loading end. There are two trains at Glynde, but only one is at present used, that being found sufficient to deliver 150 tons of clay per week at the station. The trains need no attention when running, as they are governed to run at the same speed both on rising and falling gradients. An automatic block system is provided, so that as many as twenty trains can be run on the line without the possibility of collision. The telpherage line at Glynde being the first erected is still capable of improvement in detail, but it successfully demonstrates Jenkin's proposals for working the equivalent of a wire rope railway by electricity instead of by the teledynamic system of Hirn and others, although time is necessary to prove its comparative practical utility and efficiency. Our engraving is from the London *Graphic*. A more detailed description of this system, with several engravings, will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 420.

CLAY'S IMPROVED SPLIT LINK.

ONE and three-fifths seconds after the gong struck was the time achieved by one of the steam fire engine companies in harnessing up and starting, at the recent horse show in New York.

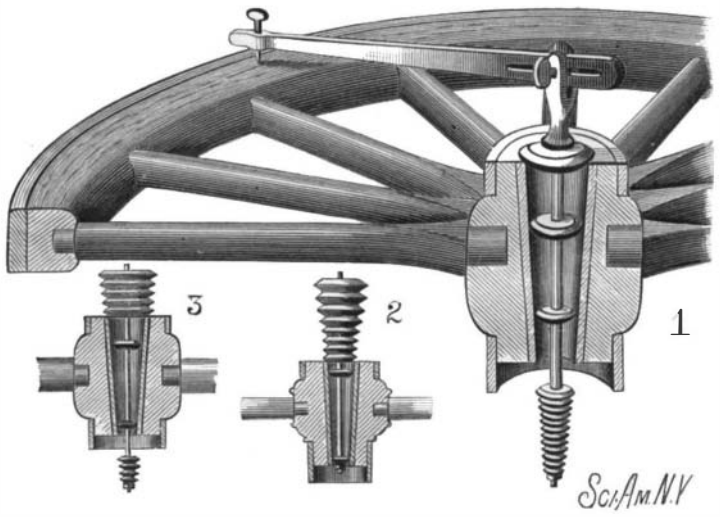
HUB-BOXING GAUGE.

By means of this gauge the wheelwright is enabled to quickly and accurately center the box in the wheel. Upon a rod provided near its upper end with a fixed collar, and at its lower end with a nut, are rings, which are made successively smaller in diameter toward the lower end. The top of the rod is held by a set screw to the slotted end of a gauge arm; the slot allows the rod to be set nearer to or farther from the marker at the other end of the arm, to suit wheels of different diameters. The form of the gauge rings or collars is clearly shown in the cut. To use the gauge, the rod with the rings is passed into the hub-box, when two or more of the rings will bind against the tapering inner wall of the box, to form a true bearing for the rod at the exact center of the box; the gauge arm is then set so that the marker will stand at about the joint of the felly with the tire. The rod and arm may be together turned around the wheel, so that the indicator will show at the periphery whether the box stands precisely at the center or not.

By providing the rod with a sufficient number of rings, one gauge may be used for almost auy ordinary size of wheel.

Fig. 1 shows the gauge applied to a large size box, Fig. 3 to a medium, and Fig. 2 to a small box.

This invention has been patented by Mr. William J. Matern, of Bloomington, Illinois.



MATERN'S READY HUB-BOXING GAUGE.

Water is Fattening.

It has been observed that water is fattening, that those who drink large quantities of water have a tendency to fullness and rotundity. That there is considerable truth in this observation the *Medical and Surgical Reporter* fully substantiates. That excessive imbibition of very cold (iced) water (especially when one is very warm) is not to be commended, yet we have reason to believe that the *unlimited* use of *pure spring water*, at its natural temperature, is not only very conducive to health, but has an actual tendency to favor a fullness and roundness of body. Whether this is the result of a better action on the part of the digestive, assimilative, and depurative functions, owing to the internal cleanliness or flushing of the human sewers produced by large quantities of water, or whether water has some specific action in producing this fullness, we do not know, neither does it signify, since observation confirms as a fact that the free use of water does have this effect.

British Shipbuilding.

Recurring to the subject of depression in the shipping trade, the London *Times* says that in 1884 the result was more unsatisfactory than at any year previously. The tonnage of iron vessels built in 1884 at Tyne, Wear, West Hartlepool, the Tees, Blyth, and Whitby included, amounted to 297,000, or less than one-half the total of 1883. It is added that elsewhere the falling off is equally pronounced. At this time not one-half the building berths at the northern shipyards are employed. Thousands of workmen have been thrown out of work at the shipyards and iron and steel works, and "a correspondent thinks" that the approaching winter will witness a still further depression and distress.

IMPROVED SPLIT LINK.

The link is composed of two parts hinged together. Each part is made of half-round iron, and is formed with an opening and enlargement. The enlargements are so located in relation to the openings as to close the latter, and form a complete and continuous link when the parts are closed, as shown in the lower figure. A cut-away place in each half forms, when the parts are closed, a recess, so that a nail or other small object may be easily inserted between the parts of the link, for forcing it open in case it should not work easily at the hinge. In one form of link, the ends at the openings are oppositely beveled to fit the beveled ends of the enlargements, so that tight joints will be formed when the link is closed; in this form, corresponding projections, formed on the parts, are fashioned into the hinge. In the form shown in the engraving, the hinge is formed in the material composing the body of the link, and the ends of the openings are cut at an opposite, to fit the diagonal ends of the projections, so that the latter prevent lateral movement of the parts upon each, thereby preventing strain upon the hinge. With the form of construction the little fins of metal which always form at the inner edges of the link, in the use and wear thereof, in no way interfere with the opening of the link, as such fins do with links that open and close edgewise with the parts sliding upon each other.

Further information concerning this invention can be had from the patentee, Mr. Wm. H. Clay, of Paris, Kentucky.

BUTTONHOLE CUTTER.

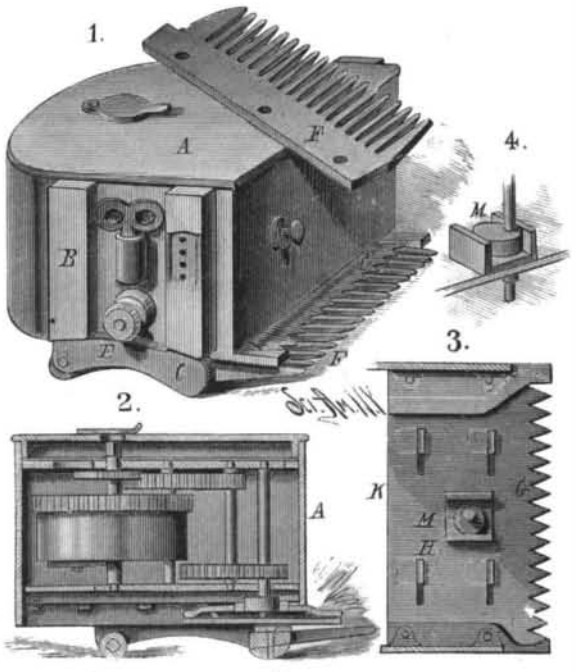
The buttonhole scissors shown in the cut are so constructed that they can be adjusted very easily for buttonholes of a certain size. Each blade is formed with a notch or recess, which constitute the cutting parts. One blade is provided, adjacent to the diagonal edge (each blade has a diagonal edge formed on the rear part of the blade proper) of the other, with a button having a pin mounted to turn in the blade and a handle wing. The button is eccentric in relation to its pivot, and its rim is made polygonal. When the button is in its normal position, its long, straight side comes in contact with the diagonal edge of the other blade. It will be seen that by properly adjusting the button, the cutting edges of the blades may be made to overlap more or less, and buttonholes of different sizes may be cut.

This invention has been patented by Mr. C. A. Roder. Particulars can be had by addressing Messrs. Herman Boker & Co., of 101 and 103 Duane Street, New York city.

RODER'S BUTTONHOLE CUTTER.

HAIR CUTTING MACHINE.

We illustrate a hair cutting machine, patented by Mr. Vladimir S. Bekofsky, of Jenchuan, Corea, which is operated by clockwork, and after winding needs no attention from the operator, other than to be passed over the hair to be cut. Fig. 1 shows a perspective view of the machine, with an extra comb lying on top of the case, Fig. 2 a cross sectional elevation, Fig. 3 a top view of the upper cutting plate, and Fig. 4 a perspective view of the eccentric driving mechanism. A metal box, A, has two upright guides, B, on each end, in which legs projecting from the crosspiece, C, slide up and down. These legs are provided with a series of apertures, as shown by the break in one of the guides, for receiving pins projecting through the box, from the free ends of an interior spring, operated by the push button, E. A comb, F, is secured to the front of the crosspiece, C. Two knife blades are shown immediately above the comb, the upper one of which, G, is provided with longitudinal slots to receive the prongs, H, on the lower plate, K. On the upper plate there are two upwardly projecting lugs, between which an eccentric disk, M, is located, which is mounted on an upright shaft actuated directly from the clockwork. The plate, G, is convex, as shown in cross section, so that only its front teeth and rear edge are in contact with the under plate. Immediately above the push button, E, there is a pocket for holding a key for winding up the clockwork. When the machine is not in use, the mechanism is prevented from operating by a brake lever connected with a push button on the front of the metal box. In operation the button is pressed inward to relieve the clock fan and permit it to rotate. If the hair is to be cut very short, the comb is adjusted as shown, but when it is desired to leave a greater length of hair, the comb is adjusted further from the cutting plates by lowering the crosspieces, C. The machine will be found a great convenience, and will effect a considerable saving of time.



BEKOFSKY'S HAIR CUTTING MACHINE.

Process for Printing Photographs on the Lithographic Press.

BY HERMAN REINBOLD.

The art of printing photographs and other half-tint subjects on a type press has been brought to great perfection, and many of the best process workers are experimenting in this field, with more or less success. The writer, who has given a description of a process of this kind in one of the latest numbers of the *Lithographer and Printer*, and which was well received by the press, has lately made experiments with a process for printing photographs on the lithographic press.

The photo-mechanical processes, known as lichtdruck, phototype, artotype, heliotype, etc., and whose originator was Albert of Munich, have all given more or less good results, though it takes years and years of experience, a good knowledge of chemistry and photography, and even then accidents occur so often, the manipulations are so many, and the process is so slow, that at least here in this country it could not be made a paying business as yet. In Germany lichtdruck is more generally used, and most of the work is printed on the steam press, of a construction expressly made for that purpose.

The principle upon which the photo-mechanical processes is based is that of the action of the light on chrome-gelatine, which, after being exposed to the light, attains properties like those of the lithographic stone. The trouble of these processes is, and always will be, the difficulty of making the gelatine film stick to the glass or metal or stone; and the softness of the film makes it very subject to accidents.

After a number of impressions the film is hurt by the pressure, the prints get flat, the ink is taken up unevenly, afterward the gelatine gets holes and bubbles, and the washing, which has to be done very often, finally spoils it entirely. Therefore with the greatest care only a limited number of good impressions can be taken from one plate.

All efforts to do away with the gelatine have proved to be unsuccessful; and though various substitutes have been mentioned, none of them was satisfactory. The lithographic stone has not a fine enough grain to print a photograph directly on it, as it is done in photo-lithography, and therefore the gelatine is used exclusively either on glass or metal, generally copper.

The writer has made many experiments with gelatine, and his aim was to do away entirely with it, and finally he succeeded in this. The following lines give an exact description of it. It is well known that the process of photography is an electric one, the light having the effect upon the bromide and iodide silver combinations to produce an electric current, which decomposes the silver salts, thereby precipitating the silver as a black, fine powder. Of course, the stronger the light has acted, the more of the salt is decomposed, and thereby the photographic effect is produced. Now, the electric nature of the photographic process can be successfully used for half tone printing in lithography.

A perfectly level zinc plate is polished with fine pumicestone powder and water, until no more scratches are visible. This plate is then amalgamated with mercury by laying it into a pan containing the metal for a few minutes, during which time it is rubbed over with a soft camel's hair brush. When taken out, the little drops of quicksilver adhering to the surface are removed and the amalgamation is quite even, which can be readily seen, as the zinc must look like a mirror; the plate should be kept free from dust before used. In order to prohibit the mercury to dissolve or amalgamate the back side of the plate, it may be covered with asphaltum or varnish.

The plate is now ready to be coated with the sensitive collodion. It is coated in the dark rooms like a negative glass plate with positive or so-called chloride of silver collodion, and dried.

After this it is exposed under a negative from one to four minutes, according to the strength of the negative and the light; but it should never be exposed to full sunlight. Of course it takes some experience to get the right time of exposure, and for the beginning a Vogel photometer may be used with advantage.

In the dark room the picture is developed in the same manner as a glass negative, and cut with hyposulphite of soda and washed. Dry in a heat of about 120 degrees. It will be readily understood that the silver precipitated by the action of the light will form an amalgam with the mercury, while at the other places the mercury will remain intact.

A mixture of two parts of alcohol and one part of ether will dissolve the film, leaving the metals combined.

Zinc has the property to be saponified in the presence of an acid and an alkali, thus prohibiting grease or resin to stick to it. This property has already been used in lithography, and in Europe a great many firms use zinc instead of lithographic stones, both on account of its cheapness and ease of handling it. But the salts used now to bring about saponification are not strong enough; and where the grain is very fine, the plates and prints get soon blurred.

This is due mostly to the resin and acid which the ink contains, and which of course neutralize the alkali. Lately a salt has been discovered by which this difficulty is entirely overcome, and which makes enough zinc soap alkaline to print an almost unlimited number of prints from the same plate without the least difficulty. This chemical is aluminum palmitate ($C_{16}H_{28}O_4 + AlO_3$). One three-thousandth part of it added to benzine is enough to saponify this liquid into a solid body, which will not take any grease or ink.

A bath is made of 90 per cent alcohol and 10 per cent palmitate of aluminum. After having the zinc plate put into a 5 per cent sulphuric acid fluid for a moment, and have it dried, flow the plate with the above bath. When the alcohol is evaporated and the plate washed once more to remove the alumina, the plate is ready to be printed from. No etching fluid or gum is necessary, but it should be washed and wetted just like the stone. If the plate should show a tendency to blur after a number of prints, put it into very weak acid, and afterward in the bath weakened with 25 per cent alcohol. If this does not make it better, the plate was over or under exposed, or the zinc was not clean.

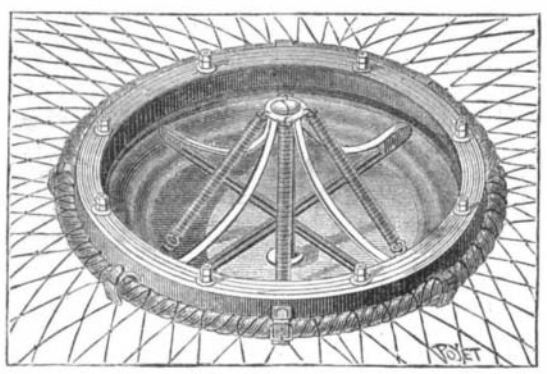


Fig. 2.—UPPER VALVE.

The plate in its appearance is quite level; the light parts are grained, while on the high parts it looks as if polished. The grain obtained in this way is so fine that, it can hardly be seen with the naked eye, and if printed with a photograph tint ink, will make prints equal to the best lichtdruck. Any number of prints can be taken from one plate. The plates cannot be saved, as the action of the oxygen in the air destroys the properties of the chemical combination in a few weeks. Therefore the plates should be used immediately after made. The success depends largely on the negative, like all processes where photographs are used for reproduction.

CAPTIVE BALLOONS FOR ARMY USE.

Some of the military powers of Europe, desirous of an aerostatic plant, and after more or less successful experiments, have been obliged to have recourse to France, that is to say, to the true country of balloons, for the construction of their apparatus. Mr. Gabriel Yon, an old companion of Henri Giffard in his steam balloon experiment of 1855, and the constructor of the Dupuy de Lome screw balloon, as well as of a large number of postal balloons during the siege of Paris, has studied and brought out a system of transportable, captive balloons, for which he has successively received large orders from the Italian and Russian governments. In this the former has priority, and the first captive balloon of Mr. Yon's make, provided with his hydrogen gas apparatus and windlass for ascents and descents, was experimented with at Rome by him and the officers of the Italian army. At these experiments, which took place last July, the Italian Minister of War was also present. The success was complete, and, owing to the results obtained, the Russian Government ordered from Mr. Yon two sets of the apparatus. One of these was recently tested at the Flaud Works, in the vicinity of the Champ de Mars.

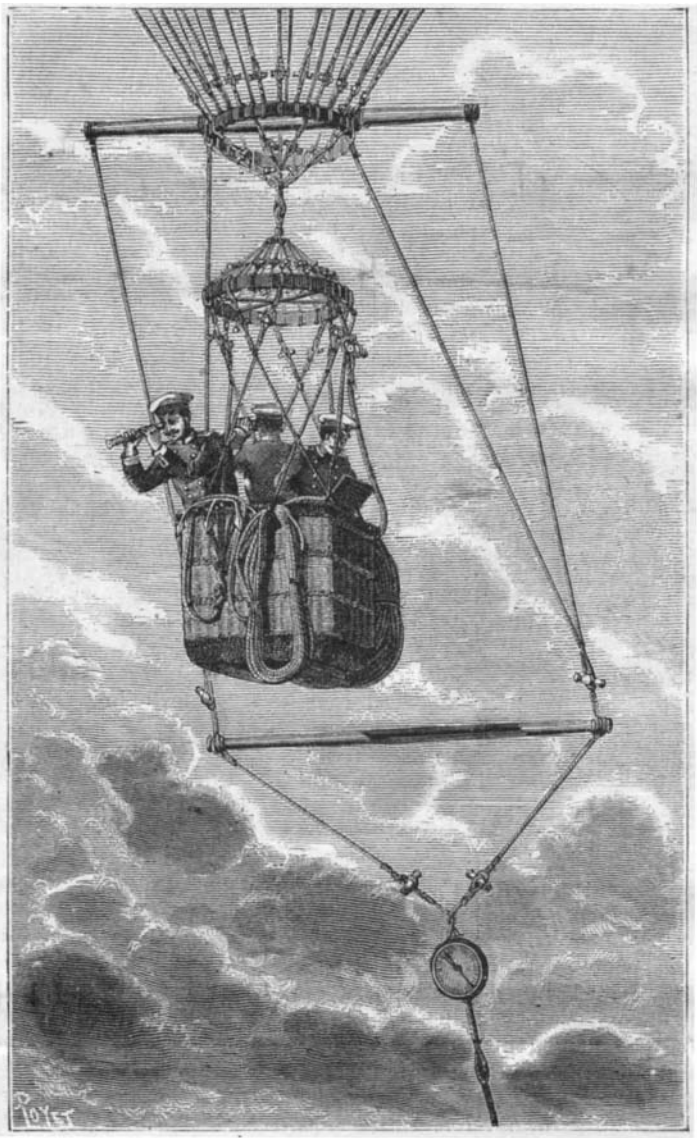


Fig. 1.—CAR OF A MILITARY BALLOON.

As we were present, we shall describe these new and interesting aerostatic apparatus. We shall study in succession the three distinct and independent parts of which they consist, viz.: (1) the balloon, (2) the gas apparatus for inflating it, and (3) the windlass for maneuvering the ascension cable.

The balloon is of Chinese silk, and is of 19,425 cubic feet capacity. The netting is made of Naples hemp. The fabric of the balloon is rendered impermeable by ordinary balloon varnish, having boiled linseed oil as a base. The netting and cordage are covered with a preparation having catechu for a base, in order to preserve them against the action of dampness. The upper and lower valves are of wood and metal combined, and their tightness is perfect, the joint being formed under spring traction, through the pressure of metallic bars upon a band of elastic rubber. The upper valve is seen from above, in Fig. 2, where the four traction springs are clearly shown.

The suspension of the car is very happily carried out. Its connection with the netting occurs at a central point, that allows the balloon to assume all the inclinations possible without moving the car from a vertical position, such a condition being indispensable for the success of the observation. The car, as shown in Fig. 1, is freely balanced between two suspension trapezes that are well combined.

A dynamometer, which connects the ascension cable with the entire affair, permits of measuring the ascensional power at the moment of starting, and of knowing at each moment of the ascent the traction that the balloon is exerting upon the cable. This latter is 1,600 feet in length, and around it is wound an insulated copper wire that permits the officers below to be in permanent telephonic communication with the observers in the car.

The devices for arresting motion, such as the brake-rope and anchor, which are for use in cases of free ascent, are very strong and efficient.

The balloon is inflated by means of a continuously operating hydrogen gas generator. The apparatus in which water is decomposed by iron and sulphuric acid is mounted upon a four-wheeled carriage, which may be easily drawn by two horses (Fig. 3). It consists of a boiler plate generator, lined with lead to prevent the action of the acid upon it, and surmounted by a cylinder for the reception of the iron filings. The whole is hermetically closed by a cap and bolts. The requisite water and acid are distributed automatically, in proper proportions, by pumps actuated by a small steam engine. The steam is led by a large rubber tube, which connects with a boiler that we shall presently speak of.

On making its exit from the generator, the gas passes into a purifier, wherein it bubbles up through water which is continuously renewed by a special pump actuated by the connecting rod of the motor. After this, it traverses two driers, which contain caustic soda and calcium chloride. The two driers are shown to the left in Fig. 3. To one of them is seen adapted the movable pipe, D, of varnished canvas, which leads to the balloon.

The residuum of the reaction, consisting of a solution of iron sulphate, flows to the exterior of the generator through a pipe, A, adapted to a siphon. The pipe, B, permits the water in the purifier to flow out in the same way. The pipe, C, beneath the carriage runs to an external reservoir of water. On a campaign, the feed pump takes its water from a spring, pond, river, or other source.

The weight of the gas apparatus, mounted upon its carriage, is 6,300 pounds, and the production of hydro-