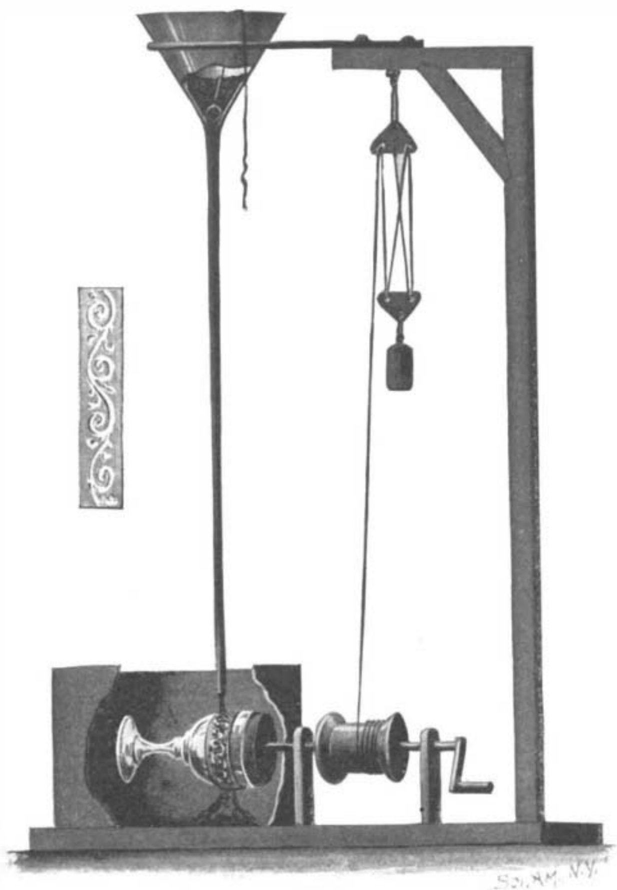
HOME-MADE DEVICE FOR DECORATING GLASS.

One of the Scientific American staff has devised a very simple and inexpensive apparatus for cutting initials, monograms and ornamental borders or bands on glass articles, such as tumblers, bottles, hand mirrors, etc., with emery powder.

When a letter or the like is to be cut in the glass, the glass may be held stationary by any suitable means and then all that is necessary is about three pounds of medium-grade emery and a funnel having a tube from four to five feet long and one-fourth of an inch in diameter. The initial is cut through a paper stencil, which is fastened to the glass with mucilage, or held in place by rubber bands. The emery, falling through the tube and striking on the exposed glass, will cut it quite rapidly, and three or four runnings of the emery will form the cut sufficiently deep. It may be stated that the stencil should be a trifle larger than the desired cut in the glass.

To cut an ornamental band on a goblet, tumbler or bottle, the work should be rotated slowly about two inches below the funnel tube. The turning, of course, may be done by hand; but this will be somewhat tiresome, and thus tend to lessen one's interest in the work. A boy with a little skill can rig up an old clockwork to do the turning, or the device illustrated here may be constructed from material found about the house. It consists of a suitably-mounted spindle, having a block of wood or a large cork on one end to fit snugly in the tumbler so as to support it, and also secured on the spindle is a drum, conveniently a large spool, from which a cord extends to connection with a fixed double pulley and a movable double pulley to which the actuating weight is attached. If it is not convenient to procure pulleys, plates of metal, or even of wood, may be pierced with holes, through which the cord may pass, as shown in the cut; but, obviously, pulleys are preferable because of the smaller friction and wear on the cord, which last may be a small fish line. When it is desired to inspect the progress of the work, the flow of emery may be cut off by a small cork attached to a string. When the string is loosened the weight of the emery will force the cork into the upper end of the funnel tube. The spindle should be provided with a crank for convenience in rewinding the cord, and during the rewinding the work of the emery may continue.



GRAVITY METHOD OF ENGRAVING GLASS WITH SAND.

A NEW VARIABLE SPEED TRANSMISSION.

The special device which accomplishes the changes of speed plays a very important part in mechanics in general and particularly in a gasoline automobile. All the ingenuity of the various constructors has not as yet resulted in the complete and definite solution of the problem of a transmission where the modifications of speed are progressive, silent, and without shock. The necessity for an arrangement of this kind in a gasoline carriage results from the nature of the motor itself, which will operate satisfactorily only under certain conditions and within certain limits of speed and power. For instance, if the shaft of the motor be connected by an invariable transmission device to the driving axle of the carriage, and a proper speed reduction to run the vehicle on the level is used, the increased resistance to traction on a grade would stall the motor. It would be incapable of adapting itself to the changed conditions and would simply refuse to work. Notwithstanding the many inventions which this problem has called forth, it is still generally solved in most instances by putting under the control of the operator three or four different speeds. He passes from one to the other with sudden jerks and a disagreeable racket which tell well enough to what harmful shocks the mechanism must be submitted. Certain constructors just as often connect the two shafts through trains of gears, when they wish to obtain different speeds. This arrangement is difficult to operate, noisy, and heavy, while in order to modify certain of its defects as well as to avoid breaking off the teeth of the gears, friction clutches are often added, which increase the weight, size, and price of the apparatus. Other manufacturers have recourse to belt transmission, which is assuredly more pliable and quiet. But here again it is necessary to employ numerous pulleys and belts in order to obtain the different speeds. Parallel cones set inversely with a belt capable of being slid on them laterally, and thus of producing all possible speed variations, have also been thoroughly tried, but the adherence of a belt on a conical surface is always more or less defective. Numerous and eminent inventors, including such men as Edison, have attempted to find a practical solution of this problem. "As long as it applies to the transmission of small powers only," says M. Hirsch, "the problem is relatively easy." Among other devices attention should be called to the transmission by means of rollers that can be moved to variable distances from the center of a flat disk or from the point of a rotating cone. This principle has been used in numerous different forms, one of the most remarkable of which is that of the American constructor Sellers. Mention should also be made of MM. Bataille & Bloom's expansible pulleys, on which the round or V-shaped cord or belt runs on the circle of intersection of the sides of the pulley, which is varied in diameter by moving the sides together or apart. Analogous transmissions have been devised by Richard Simms, Gordon, Reeves, and others. These systems are inadequate for the transmission of any large amount of power, and when comparatively large powers are to be transmitted it is necessary to employ a wide flat belt running on a pulley adapted to it. The problem has therefore remained unsolved up to the present. Now, however, we are happy to state that the new form of pulley devised by M. Roger de Montais has at last furnished the ingenious and complete solution which has long been awaited.

The question may be asked as to what is necessary for the complete solving of this problem. The essential feature is that the two connected pulleys, which form the transmission at normal speed, be able to gradually change in diameter while the apparatus is in full operation, one contracting and the other expanding without the belt's slackening. This is precisely what occurs with M. de Montais' pulleys. The arrangement consists of two expansible pulleys with cylindrical rims which carry a wide, flat belt; and suitable levers for varying the same. The rim of each of the pulleys is made up of sections, and each section is supported by two rods forming a V and pivoted to the section at the apex of the latter. The center of each of the rods forming the V is connected by a short rod to a central holder fast on the shaft between the legs of the V, the whole forming a lozenge-shaped frame, as will be seen by a glance at Fig. 2. As these supporting frames are all equal, they expand and contract together. They are made of light rods cut from sheet steel, which, being somewhat elastic, will give a little.

The middle of the pulley is in three parts. The center part, as just stated, is fast on the shaft, while the two side holders slide along it, thus bringing together or forcing apart the ends of the V-shaped supporting arms, which results in expanding or contracting the pulley. When the latter is contracted to the fullest extent, all the sections of the rim are close together, thus forming one continuous surface. The sections are connected by a circular lazy tongs which serves to brace them. The pulley is driven by the central part or the hub, which is fast on the shaft and which transmits its movement of rotation through the pairs of small steel arms connected to it and to the V of every segment of the rim.

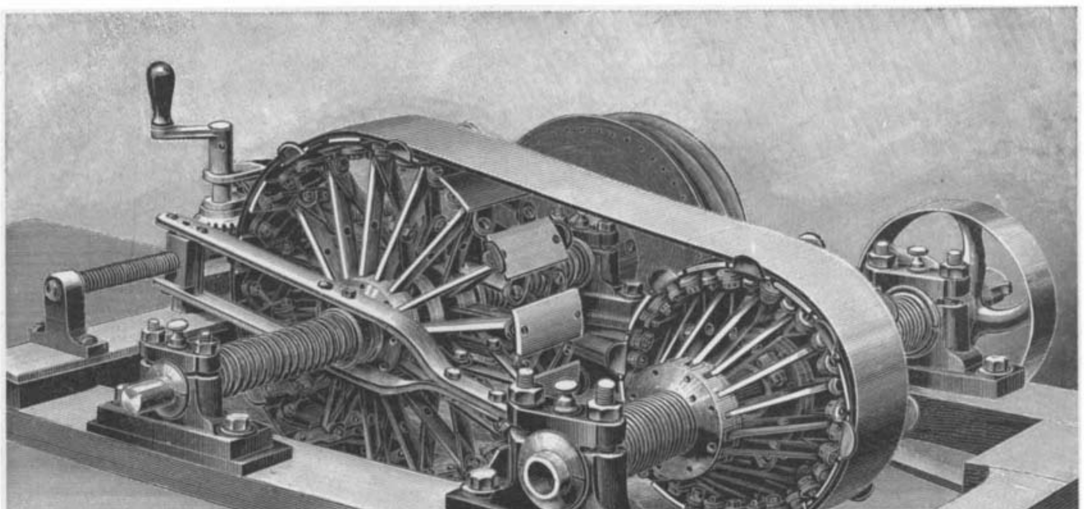


Fig. 1.—GENERAL VIEW OF THE ROGER DE MONTAIS TRANSMISSION.

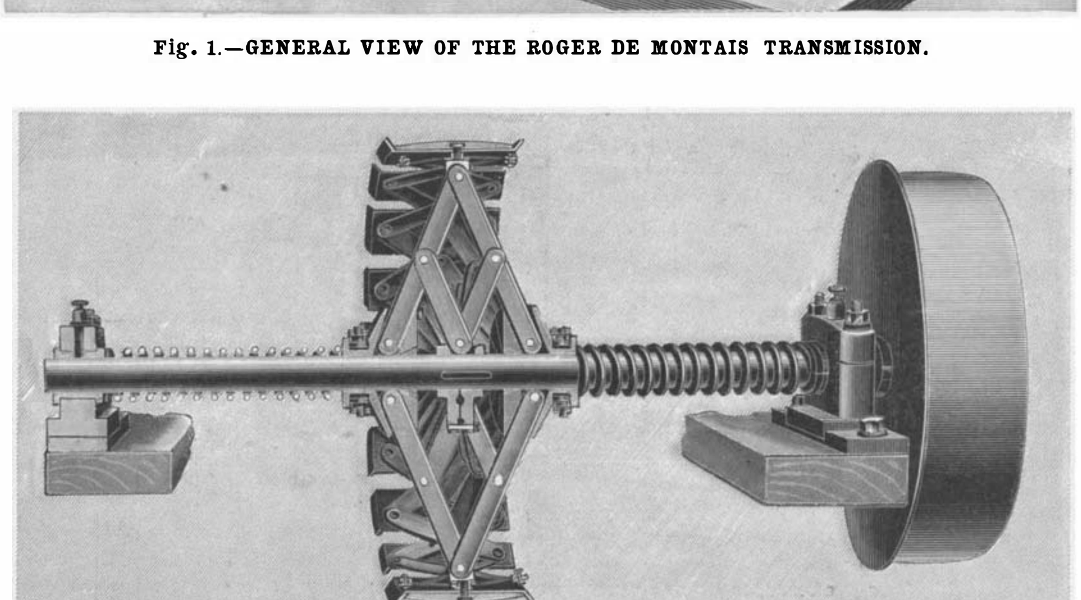


Fig. 2.—DETAILS OF THE TRANSMISSION.

The transmission is composed, as has already been shown, of two expansible pulleys connected by an endless belt, the tension of which tends to contract the pulleys and force aside the movable hubs. The inventor counteracts this tendency by means of springs coiled around the shaft and pressing inward the movable hubs. The springs bear against rings mounted on the shaft, and in such a manner as not to cause any undue friction. The pressure of these springs diminishes as they lengthen, but at the same time the diameter of the pulley increases as well as the opening of the V formed by the jointed supporting arms. The result is that, if the power and flexibility have been correctly calculated, the belt is always held quite taut. Protection is had, therefore, from accidental slipping of the belt, which is often so disastrous and difficult to evade in all ordinary belt transmissions. In fact, the antagonistic effort of the springs takes up automatically any shrinkage or stretching of the belt that may occur in service without, however, producing anything more than a very slight variation in the diameter of the pulleys.

Thus the two great disadvantages of belts—slipping and excess of tension—are done away with at a single stroke.

Another advantage of the apparatus is that it is only necessary to govern one pulley in order to obtain the different speed variations. If the diameter of this pulley is changed, by suitable mechanical means, since the belt is always of the same length, it necessarily produces the inverse modification of the other pulley up to the point where equilibrium is re-established between the tension of the belt for which the apparatus is set and the pressure of the springs.

The mechanism that causes the pulley to contract or expand consists of two levers—one on each side—fastened at one end to fixed pivots and having their centers attached to the movable ends of the hub. The other ends of the levers have holes suitably threaded to travel on endless screws which are cut on either end of the same transverse rod, one left-handed and the other right-handed. This shaft is revolved by turning the handle shown, to which it is connected by bevel gears; and since it is threaded in the inverse direction on its two halves, the two rods are forced apart or together, according to the direction in which the handle is turned, thus contracting or expanding the pulley. The transmission is thrown in or out of gear by a special lever acting on the other pulley and tending to contract it without affecting its mate, thus making the belt loose and allowing it to slip. This lever is not shown in the illustrations, but it engages the throat of one of the outside hubs in a ball thrust bearing.

The view of the transmission that we show was made from one which was given a series of rigorous tests at the end of which a very eulogistic report was made to the Society for the Encouragement of National Industry by the late M. Hirsch, professor of mechanics at the Conservatory of Arts and Trades. This apparatus furnished easily—without any slipping of the belt—all desirable speeds, at several different powers. The transmission was easy and silent; and rapid changes, when under full load, from the highest to the lowest speed and *vice versa*, were obtained with perfect control. A recent application of it to an automobile gave the most satisfactory results. This vehicle, which was exhibited at the Automobile Show, has at this writing been in operation several weeks without a breakdown or hitch of any sort.

That the apparatus is partially automatic in operation, renders it particularly useful in connection with lathes, drills, calenders, and many other machine tools which require transmissions without shock and noise. It is applicable, moreover, to the most diverse powers—to 400 horse power as easily as to 10. Because of its adaptability to such widely varying ranges of power and to so many different fields of usefulness, we thought it of sufficient interest to be made known.

For the above description we are indebted to La Nature.

Wireless Telegraphy Rivalry.

Almost daily the press of England and United States publishes an utterance that comes either from Marconi or Slaby. Marconi maintains that his German rival simply copied his method. The German professor indignantly denies it. But Marconi and Slaby are not the only figures in this little wireless telegraphy war. Dr. Braun, who is also an inventor of an ethereal telegraphic system, insists hotly, at regular intervals, that he is the man to whom the success of space communication is due. Siemens & Halske, who manufacture his apparatus, evidently believe so too, for they have brought an action against the Allgemeine Elektricitaets-Gesellschaft, the owners of the Slaby-Arco patents, and will also institute proceedings against the English Marconi Company. Up to the present time this little opera bouffe war has found its expression chiefly in a refusal of the rival companies to receive one another's messages when sent from stations or ships. Now it seems that the daily press is called upon to take up the matter, and then the courts will follow. If the strife is not soon settled, we may have a duplication of the long controversy that followed the introduction of the telephone.

According to the Centralblatt für Accumulatoren- und Elementenkunde, a German company is building electric tugboats with some success, these boats being employed for touring purposes regularly between Zehndenick and Berlin. The boats are 14 to 15 meters in length, 3.25 meters in width, and have a draught of 1.05 meters, and are able to tow barges of 150 tons at a higher rate than the steam tugs usually employed for this purpose. The chief advantage offered by these electrically propelled tugs is that their displacement is considerably less than that of steam tugs of equivalent drawing power, and they are, therefore, peculiarly suited for towing purposes in shallow and winding canals or rivers. The transport of goods by water is said to require only one-fifth of the drawing power required for transport by rail, so that this development of electrically-propelled tugboats is worthy of attention.

Electrical Notes.

That the Marconi system is apparently on the road to commercial success, would seem to be indicated by the formation of a huge company for the purpose of exploiting the invention. The Marconi Wireless Telegraphy Company of America, according to Marconi, was recently founded and capitalized at $6,150,000.

Marconi has finally decided on Table Head, 15 miles from Sydney, as the location for his Cape Breton station. He told the officials of the town that flashes from the trolley wire would interfere with his system, and asked if the town could not take some action in the matter. Forthwith a meeting of the Council was called. A resolution was passed that for a period of five years no trolley line was to be operated within a third of a mile of the station. Marconi says that the work of building the station will begin at once and will be completed within three months.

It is announced that the Marconi Wireless Telegraphy Company have undertaken to install the Marconi apparatus at certain places in the Congo Free State. The district particularly in view at the present time is that around the Upper Congo River, and the first installations will be made at Banana, the post of the north side of the Congo estuary and St. Paul de Loanda, in Portuguese West Africa. It is intended later to connect up Boma, the capital of the Congo State, with Banana in the same way. The apparatus for the first two places mentioned is now on its way to Congo Free State on board the Belgian liner "Albertville." It is said that the intended exploitation of wireless telegraphy in this part of Africa is the result of the success achieved in the experiments which have been going on between Frinton (near Walton-on-the-Naze), in Essex, and Withernsea with the Marconi system. The distance between these two stations is 158 miles, 85 over land and 73 over sea. Banana and St. Paul de Loanda in Africa are two similarly separated points, and are, therefore, expected to give equally satisfactory results with wireless communication.

George Westinghouse has stirred up what may prove to be a hornets' nest in pointing out certain dangers which, in his opinion, should be guarded against in the fitting of trains with electrical apparatus. Mr. Westinghouse says: "It is not very apparent how these dangers can be guarded against. A lifelong experience, however, in connection with safety appliances upon railroads has caused me to view the subject from quite a different standpoint from that usually taken, especially by inventors and promoters, and in some cases by manufacturers of electrical apparatus, who evidently dislike to emphasize the dangers attending the application of so much electrical machinery beneath the ordinary combustible cars now generally in use and the utilization of which has been contemplated in order to keep down the total cost of installation.

"I believe a further useful purpose will be served by particularizing some of the dangers to be guarded against in the fitting of trains with electrical apparatus:

"1. A great advantage of electric traction is the possibility of a much higher speed. This, however, while not extending the vision of the engineer in charge of the apparatus, will require a greater distance within which to stop the train.

"2. When many tons of electrical apparatus are distributed beneath several cars of a train, and of necessity more or less loosely supported, and between which and the rails and roadbed there is but a small clearance, it is evident that much greater precautions will have to be taken than is ordinarily the case with the running gear of the present steam cars, derangements in which have often been the cause of accident.

"3. Electrical apparatus supported beneath the car can develop, by means of a short circuit, heat energy sufficient to instantly ignite cars of wood construction, and this has occurred repeatedly, notwithstanding the presence of safety appliances, intended to guard against such occurrences.

"4. When a total wreck results from an accident, and experience has shown that accidents are inevitable, whatever the mode of propulsion, the débris scattered over the 'live' and other rails would render useless the ordinary circuit-controlling devices which may be located upon the cars. This emphasizes the importance of a non-combustible construction of cars."

Santos Dumont Arrives in America.

The steamship "Deutschland" brought with her on April 10 Alberto Santos-Dumont, who comes to America for the purpose of winning the large prize at the St. Louis Fair. After the St. Louis airship trials he will return to Europe for the purpose of competing for the Pearson prize in England. In July or August he will again come to this country, if a suitable prize be offered, in order to test a dirigible airship in New York city. Santos-Dumont brought with him a portion of the machinery of his new airship, the seventh which he has designed.

Automobile News.

Signor Zanardelli, the Italian Prime Minister, has issued orders prohibiting the Nice-Abazzia automobile race on Italian territory. French automobilists have held an indignation meeting in Turin. The race is definitely declared off.

The French Minister of the Navy has recently made tests of some gasoline launches for light artillery at the port of Lorient. Propelled by an Abeille motor, these boats have given excellent results, thanks to the auto-incandescent igniter, which does away with all danger of fire. Electric ignition was given up for this purpose, since the batteries had such a short life they could not be depended upon.

Mr. Frederick R. Simms has invented an armored automobile for war purposes, that is just now attracting considerable attention at Crystal Palace, London. Although specially designed for coast defense, the vehicle is said to be suitable for offensive work as well. Such is its power that it can drag guns into position and haul stores and men. The motor is of 16 horse power. The speed of the vehicle is 9 miles per hour. A carrying capacity of 12 tons is claimed. Fuel for 200 miles is carried in a tank. The armor of this curious fort on wheels consists of two automatic, quick-firing Maxims, and several thousand rounds of ammunition. A rope ladder and searchlights form part of the equipment.

The German War Office has offered three prizes of 10,000, 5,000 and 2,500 marks respectively for the best motor vehicles for military use. The machines must be ready for testing by February, 1903. Each automobile must be driven by alcohol; must be chiefly adapted for the transportation of military supplies and artillery; must not weigh less than 8 tons; and must have a tractive power of 16 tons on good roads. The vehicle must be able to travel on soft or rough ground and also through water 18 inches deep. A limit of 20 inches has been placed upon the width of the tires. Unfortunately the competition is open only to automobile makers of Germany; otherwise our own manufacturers might have a chance to show what they can do in the way of building alcohol machines.

An electric automobile ambulance was one of the features of an exposition which was lately held at Frankfort, in which life-saving and accident appliances were exhibited. The ambulance is very well arranged, and the stretcher carrying the wounded person may be placed inside and the vehicle closed. The city of Hanover has purchased this vehicle. The ambulance is arranged to open at the side and the stretcher is thus introduced: A pair of large doors open to the top and bottom; the lower door takes a horizontal position and is provided with rails by which the stretcher may be slid easily into the interior. The hollow portion of the inside is finished in polished wood so as to be easily disinfected. There is space in the interior for two assistants. The batteries are placed partly under the conductor's seat in front and partly in a box which rests on the rear axle. Two motors are used, and these drive the rear wheels by chain gearing. The motor and transmission devices are quite independent of the body of the ambulance, and are mounted on a specially designed truck in order to avoid all shocks or noise. The vehicle makes an average speed of 10 miles an hour. The battery weighs 1,300 pounds for a run of 20 miles without recharging.

Automobile clubs are now established all over the United Kingdom, mostly in affiliation with the Central Automobile Club of Great Britain and Ireland, which is now agitating for the removal of the restrictions placed on motor vehicles by the act of 1896, which removed earlier absurd regulations, such as that no mechanical vehicle should proceed along the public road at a speed of more than four miles an hour, and that each one must be preceded by a man with a red flag. Electrical World and Engineer says that in a long letter addressed to the press and signed by the presidents of the councils of the French, Swiss, Belgian and Austrian automobile clubs, and also by all the chief British automobilists, cogent reasons are put forward for an amendment of the act which prevents an automobile being worked at a speed of more than 12 miles an hour, even on a straight road free from traffic. The protest points out that the systematic prosecutions and heavy fines imposed for constant breaches of this law are damaging an industry whose importance can be inferred from the fact that in October last, probably the quietest month in the year, $227,205 left the country for France, Germany and the United States for the purchase of automobiles. English manufacturers are also protesting against these restrictions, which, they say, hamper the automobile manufacturing industry at the present time, owing to the prejudice against automobiles, the systematic prosecutions and the heavy fines imposed for breaches of the 12-mile-an-hour limit, thus damaging an industry which is encouraged in almost every country, so that a source of employment for thousands of men is checked, and English automobilists are still ordering, to a great extent, machines from abroad.