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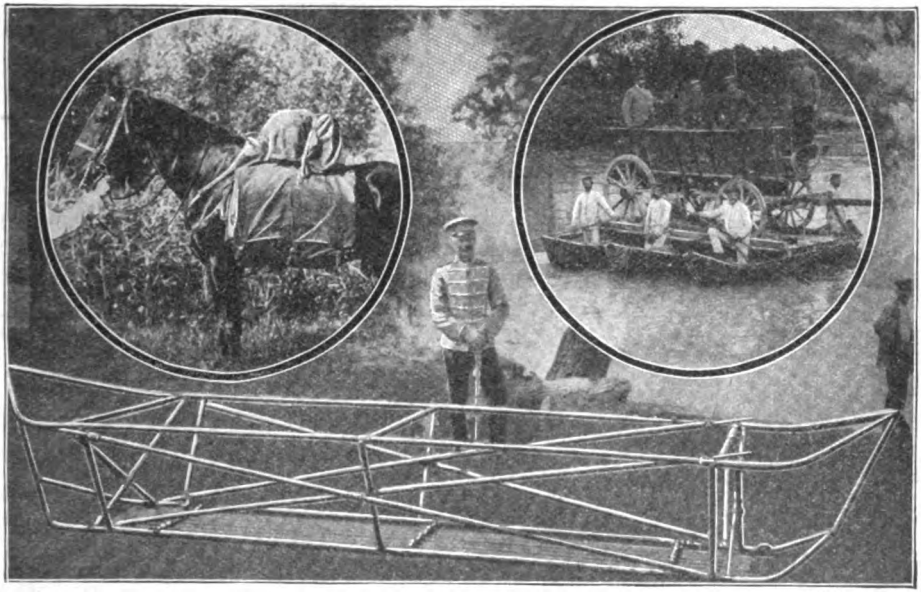


German Military Folding Boats

CANVAS FOLDING BOATS TO TRANSPORT ARMIES ACROSS RIVERS

Probably one of the most important and interesting inventions recently added to the equipment of the German army is a canvas folding boat, the skeleton of which is formed of cavalry lances. From 12 to 16 lances are necessary to make one boat, and three or four more are used as oars. The latter are made by fastening pieces of wood, covered with oilcloth, to the ends. The task of putting the boats together is so simple that six men can complete the feat in 4 minutes. A water-tight sailcloth is stretched on the lances and tied in place.

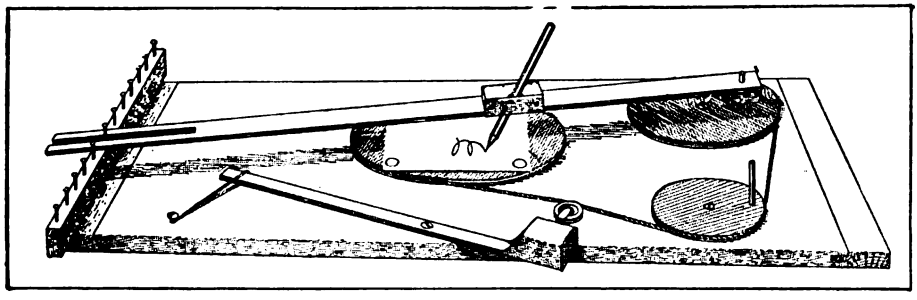
The lances are, of course, carried by the cavalry regiments in the German army, not as skeletons for boats, but as weapons of warfare. The canvas is folded into small, light bundles, and carried on the horses' backs behind the saddles. The boats have a wonderful capacity when their lightness is taken into consideration. Each will carry 16 soldiers with equipments, or 2 tons of anything compact enough to be placed in them. The possibilities of the boats seem to be endless. By placing two of them together and running boards across, horses and field guns can be

Amateur Mechanics

How to Make a Wondergraph

By P. E. Tuck

An exceedingly interesting machine is the so-called wondergraph. It is easy and cheap to make and will furnish both entertainment and instruction for young and old. It is a drawing machine and the variety of designs it will produce, all symmetrical and ornamental, and some wonderfully complicated, is almost without limit. Figure 1 represents diagramatically the machine shown in the sketch. This is the easiest to make and gives fully as great a variety of results as any one of them.

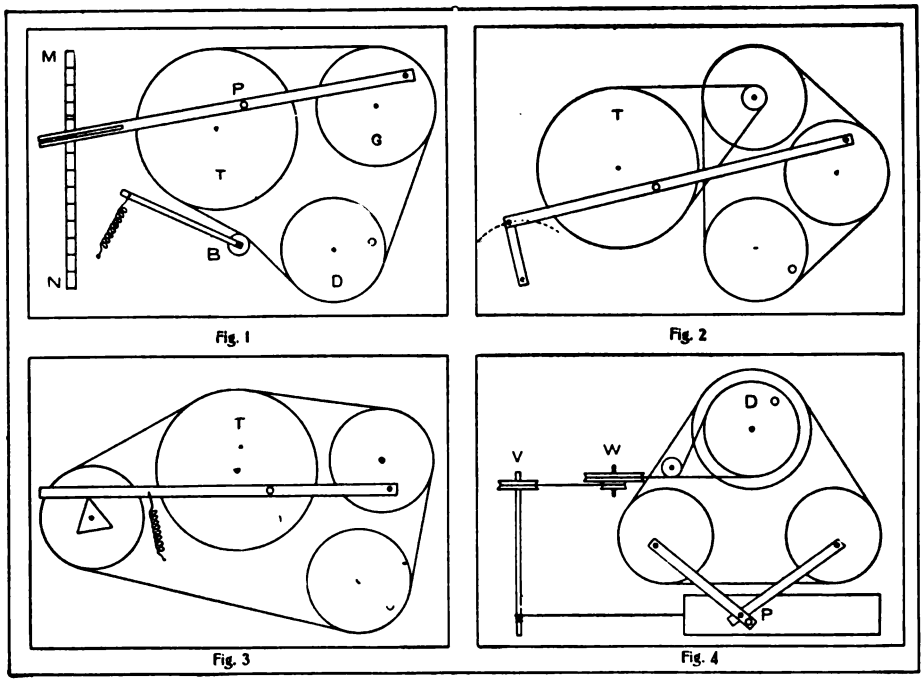


An Easily Made Wondergraph

To a piece of wide board or a discarded box bottom, three grooved circular discs are fastened with screws so as to revolve freely about the centers. They may be sawed from pieces of thin board or, better still, for about 15 cents three of the plaques so generally used in burnt wood work may be obtained. Use the largest one for the revolving table, T. G is the guide wheel and D the driver with attached handle. Secure a piece of a 36-in. ruler, which can be obtained from any furniture dealer, and nail a small block, about 1 in. thick, to one end and drill a hole through both the ruler and the block and by means of a wooden peg, pivot them to the face of the guide wheel. A fountain pen or pencil is placed at P and held securely by rubber bands in a grooved block attached to the ruler. A strip of wood, MN, is fastened to one end of the board. This strip is made just high enough to keep the ruler parallel with the face of the table, and a row of small nails are driven part way in its upper edge. Anyone of these nails may be used to hold the other end of the ruler in position as shown in the sketch. If the wheels are not true, a belt tightener, B, may be attached and held against the belt by a spring or rubber band.

After the apparatus is adjusted so it will run smoothly, fasten a piece of drawing paper to the table with a couple of thumb tacks, adjust the pen so that it rests lightly on the paper and turn the drive wheel. You will be surprised and delighted at the results. The accompanying designs were made with a very crude combination of pulleys and belts such as described.

The dimensions of the wondergraph may vary. The larger designs in the illustration were made on a table 8 in. in diameter which was driven by a guide wheel 6 in. in diameter. The size of the driver has no effect on the form or dimensions of the design, but a change in almost any other part of the machine has a marked effect on the results obtained. If the pen holder is made so that it may be fastened at various positions along the ruler, and the guide wheel have holes drilled through it at different distances from the center



Diagrams Showing Construction of Wondergraphs

to hold the peg attaching the ruler, these two adjustments, together with the one for changing the other end of the ruler by the rows of nails, will make a very great number of combinations possible. Even a slight change will greatly modify a figure or give an entirely new one. Designs may be changed by simply twisting the belt, thus reversing the direction of the table.

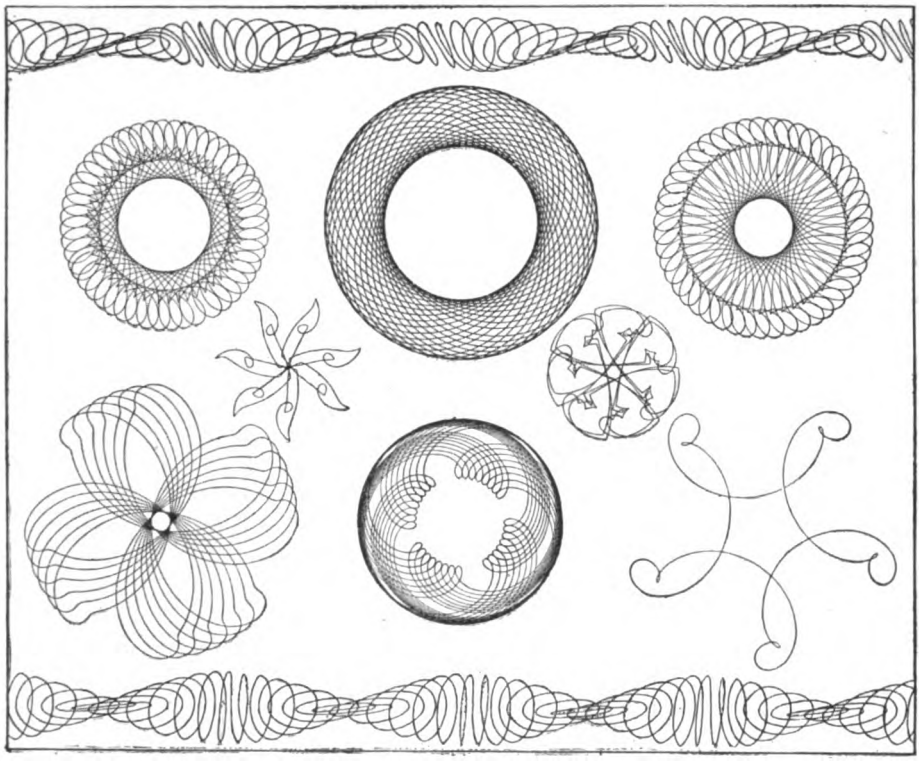
If an arm be fastened to the ruler at right angles to it, containing three or four grooves to hold the pen, still different figures will be obtained. A novel effect is made by fastening two pens to this arm at the same time, one filled with red ink and the other with black ink. The designs will be quite dissimilar and may be one traced over the other or one within the other according to the relative position of the pens.

Again change the size of the guide wheel and note the effect. If the diameter of the table is a multiple of that of the guide wheel, a complete figure of few lobes will result as shown by the one design in the lower right-hand corner of the illustration. With a very flexible belt tightener an elliptical guide wheel may be used. The axis may be taken at one of the foci or at the intersection of the axis of the ellipse.

The most complicated adjustment is to mount the table on the face of another disc, table and disc revolving in opposite directions. It will go through a long series of changes without completing any figure and then will repeat itself. The diameters may be made to vary from the fraction of an inch to as large a diameter as the size of the table permits. The designs given here were originally traced on drawing paper 6 in. square.

Remarkable and complex as are the curves produced in this manner, yet they are but the results obtained by combining simultaneously two simple motions as may be shown in the following manner: Hold the table stationary and the pen will trace an oval. But if the guide wheel is secured in a fixed position and the table is revolved a circle will be the result.

So much for the machine shown in



Specimen Scrolls Made on the Wondergraph

Fig. 1. The number of the modifications of this simple contrivance is limited only by the ingenuity of the maker. Fig. 2 speaks for itself. One end of the ruler is fastened in such a way as to have a to-and-fro motion over the arc of a circle and the speed of the table is geared down by the addition of another wheel with a small pulley attached. This will give many new designs. In Fig. 3 the end of the ruler is held by a rubber band against the edge of a thin triangular piece of wood which is attached to the face of the fourth wheel. By substituting other plain figures for the triangle, or outlining them with small finishing nails, many curious modifications such as are shown by the two smallest designs in the illustrations may be obtained. It is necessary, if symmetrical designs are to be made, that the fourth wheel and the guide wheel have the same diameter.

In Fig. 4, V and W are vertical wheels which may be successfully connected with the double horizontal drive wheel if the pulley between the two has a wide flange and is set at the proper angle. A long strip of paper is given a uniform rectilinear motion as the string attached to it is wound around the axle, V. The pen, P, has a motion compounded of two simultaneous motions at right angles to each other given by the two guide wheels. Designs such as shown as a border at the top and bottom of the illustration are obtained in this way. If the vertical wheels are disconnected and the paper fastened in place the well known Lissajou's curves are obtained. These curves may be traced by various methods, but this arrangement is about the simplest of them all. The design in this case will change as the ratio of the diameters of the two guide wheels are changed.

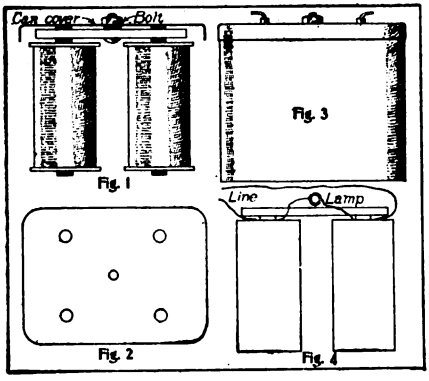
These are only a few of the many adjustments that are possible. Frequently some new device will give a figure which is apparently like one ob-

tained in some other way, yet, if you will watch the way in which the two are commenced and developed into the complete design you will find they are formed quite differently.

The average boy will take delight in making a wondergraph and in inventing the many improvements that are sure to suggest themselves to him. At all events it will not be time thrown away, for, simple as the contrivance is, it will arouse latent energies which may develop along more useful lines in maturer years.

How to Make a 110-Volt Transformer

Secure two magnets from a telephone bell, or a set of magnets wound for 2,000 ohms. Mount them on a bar of brass or steel as shown in Fig. 1. Get an empty cocoa can and clean it good to remove all particles of cocoa and punch five holes in the cover, as shown in Fig. 2. The middle hole is to be used to fasten the cover to the brass bar with a bolt. The other four holes are for the wire terminals. A piece of rubber tubing must be placed over the wire terminals before inserting them in the holes. Fill the can with crude oil, or with any kind of oil except kero-

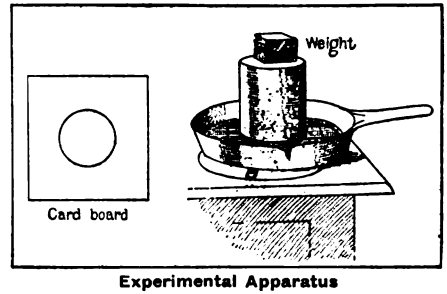


Parts of the Transformer

sene oil, and immerse the magnets in it by fitting the cover on tight (Fig. 3). The connections are made as shown in the diagram, Fig. 5. This device may be used on 110-volt current for electroplating and small battery lamps, provided the magnets are wound with wire no larger than No. 40.—Contributed by C. M. Rubsan, Muskogee, Okla.

Experiment with a Vacuum

Take any kitchen utensil used for frying purposes—an ordinary skillet, or spider, works best—having a smooth



Experimental Apparatus

inner bottom surface, and turn in water to the depth of ½ in. Cut a piece of cardboard circular to fit the bottom of the spider and make a hole in the center 4 in. in diameter. The hole will need to correspond to the size of the can used. It should be 1 in. less in diameter than that of the can. Place this cardboard in the bottom of the spider under the water. A 2-qt. syrup can or pail renders the best demonstration, although good results may be obtained from the use of an ordinary tomato can. The edge of the can must have no indentations, so it will fit perfectly tight all around on the cardboard. Place the can bottom side up and evenly over the hole in the cardboard. Put a sufficient weight on the can to prevent it moving on the cardboard, but not too heavy, say, 1 lb.

Place the spider with its adjusted contents upon a heated stove. Soon the inverted can will begin to agitate. When this agitation finally ceases remove the spider from the stove, being careful not to move the can, and if the quickest results are desired, apply snow, ice or cold water to the surface of the can until the sides begin to flatten.

The spider with its entire contents