

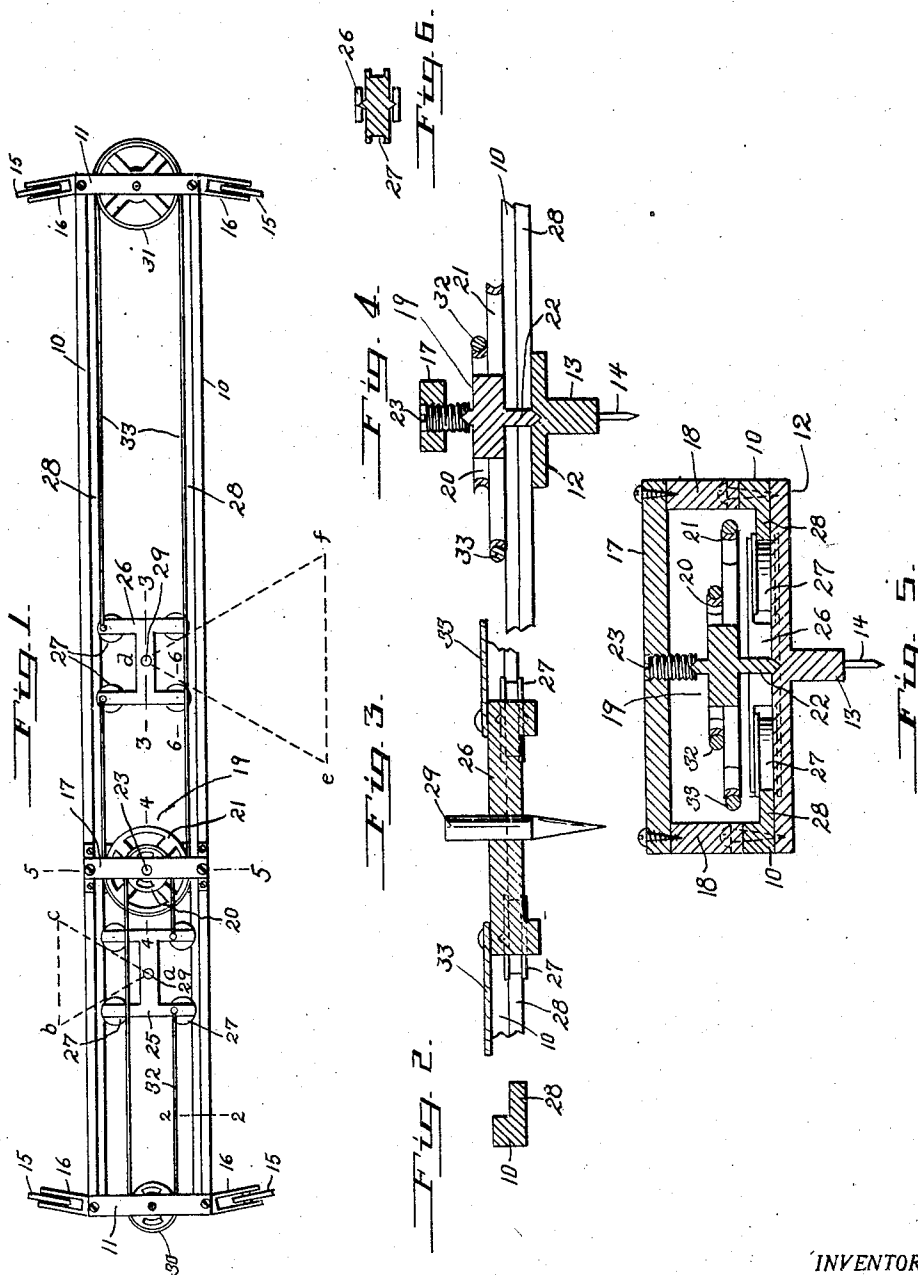
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PANTOGRAPH

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PANTOGRAPH.

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This invention relates to improvements in pantographs, and it has for its object the provision of a device of simple and sturdy construction; more particularly, it is sought to provide means for transmitting the movement of the tracing stylus to the reproducing stylus so that lost motion and slipping of the driving parts is reduced to a minimum. The means employed for the purpose is described in detail hereinafter, pointed out in the appended claims and illustrated in the accompanying drawings.

In the accompanying drawings, in which similar reference characters designate corresponding parts:

Figure 1 is a plan view of a pantograph embodying the invention.

Figures 2, 3, 4, 5 and 6 are, respectively, detail sectional views on the lines 2—2, 3—3, 4—4, 5—5 and 6—6 of Fig. 1.

Referring to the drawings in detail, the frame of the machine is of an elongated rectangular formation and comprises the longitudinal members 10 joined at their ends by the cross members 11 to form a rigid structure. Extending across the under side of the frame is the pivot member 12 positioned so that one-third of the length of the frame is on one side of said member and two-thirds is on the other side. Projecting from the under side of the pivot member is the lug 13 in which is mounted the pin 14 to be forced into the drawing board or other support when the device is operated. This pin, seated in the drawing board, forms the pivot about which the frame is turned. At the ends of the frame are mounted the rollers 15 journaled in the brackets 16 attached to the corners of the frame. These rollers travel on a plane including the lower end of the lug 13 and in practice this plane is formed by the surface of the drawing board on which the device is mounted. With the pin 14 journaled in the drawing board the frame can be freely oscillated about the pivot so formed, the rollers 15 riding on the board carrying the frame and maintaining it in its parallel relation to the board.

Extending across the upper part of the frame and parallel to the pivot member 12 is

the upper member 17 secured at its ends to the spacing blocks 18, secured in turn to the longitudinal members 10. These members, so connected, form a transverse frame in the longitudinal main frame. Mounted in the transverse frame is the pulley 19 having concentric rims 20 and 21 with the latter of twice the diameter of the former. The pulley is carried by the integral shaft 22 journaled at its lower end in the pivot member 12 and at its upper end in the set-screw 23 threaded in the upper member 17 of the transverse frame. By backing out the set-screw the pulley can be readily dismounted. The axis of the double-rimmed pulley is coincident with the vertical axis of the main frame.

Mounted in the main frame on opposite sides of the transverse frame are the carriages 25 and 26 of like construction. Each carriage comprises a frame of H-shape formation having grooved rollers 27 journaled in the extremity of each arm. Each carriage travels between the longitudinal members 10 of the main frame with the grooved rollers 27 engaging the tracks 28 extending along the inner faces of the longitudinal members. In each carriage is centrally located a stylus 29 frictionally held for vertical adjustment therein. The axes of the two styli and of the double-rimmed pulley are in the same vertical plane and these relative positions are maintained irrespective of the travel of the carriages in the main frame.

In the cross-pieces 11 at the opposite ends of the main frame are journaled the pulleys 30 and 31, respectively. Looped around the idler pulley 30 and the rim 20 of shorter diameter of the double pulley is the band 32 attached at its ends to opposite sides of the carriage 25. Likewise, a band 33 is looped around the idler pulley 31 and the rim 21 of greater diameter of the double pulley and its ends are attached to opposite sides of the carriage 26. The pulley 30 and the rim 20 are of the same diameter, as are the pulley 31 and the rim 21, to maintain their respective bands in longitudinal parallel relation to the main frame. Each band is under tension to provide frictional engagement between it and the pulley rim with which it is engaged,

so that the drive of one will be imparted to the other without relative slip. It is to be observed that the length of the guideway for the travel of the carriage 25, which is connected with the lesser pulley rim 20, is one-half the length of the guideway for the travel of the carriage 26, which is connected with the larger pulley rim 21. Also, the distance of the axial center of the double-rimmed pulley to the axial center of the carriage 26 is twice the distance between the axial center of the pulley and the axial center of the carriage 25, the axial centers of the carriages being indicated by their respective styli. Consequently, the proportionate travel of the two carriages on the supporting frame is the same as the proportional relation of the diameters of the two rims of the double pulley; that is, as one to two.

From the foregoing it is obvious that if the carriage 25 is moved in either direction on its guideway, there will be a corresponding movement of the carriage 26 on its guideway, but the latter will travel twice the distance travelled by the former. Also, the movement of the carriages will be in opposite directions; for an instance, if the carriage 25 is moved to the left, as shown in Fig. 1, the carriage 26 will move to the right. The proportional travel of the two carriages may be varied by substituting for the double pulley, other pulleys with rims of different proportionate relations. Such substitution is facilitated by the adjustable set-screw 23.

In the operation of the device, for an example, to reproduce the given triangle a, b, c , enlarged to twice the size, as at d, e, f , the paper with the given triangle displayed thereon is affixed to a drawing board in the usual manner. The pantograph is then mounted on the board by forcing the pin 14 into the same so that the wheels 15 ride thereon. It is positioned so that the given triangle is contained within the field of travel of the carriage 25 as the device is turned on its pivot formed by the pin 14 journaled in the board. The main frame is turned on its pivot and the carriage 25 is moved on its guideway to position the stylus 29 mounted in said carriage directly above the angle a of the given triangle. Then both styli 29 are forced downwardly into contact with the paper. For convenience, the stylus mounted in the carriage 25 may be designated as the tracing stylus and the one in the carriage 26 the reproducing stylus, the latter being a pencil or a pen; also the carriages 25 and 26 may be respectively designated as the tracing and reproducing carriage.

After the device has been initially positioned, the tracing stylus is moved along the line $a-b$. This movement of the tracing stylus causes the device to turn on its pivot 14 and the tracing carriage to move on the guideway, outwardly toward the left end of

the frame as shown in Fig. 1. As the tracing carriage 25 moves along the guideway the band or belt 32 is drawn the same distance around the pulley rim 20. Through the frictional engagement of the band with the pulley rim, the double pulley is rotated and the rim 21 draws the band 33 to propel the reproducing carriage 26 along the guideway. But the diameter of the rim 21 is twice that of the rim 20, so that the movement of the band 33 is twice that of the band 32; consequently, the reproducing carriage 26, driven by the band 33, travels twice the distance travelled by the tracing carriage 25. As the tracing stylus travels along the line $a-b$ of the given triangle, the reproducing stylus draws the line $d-f$ of the reproduction, the line $d-f$ being twice the length of the line $a-b$. Likewise, as the tracing stylus successively follows the lines $b-c$ and $c-a$ of the given triangle, the reproducing stylus successively forms the lines $f-e$ and $e-d$ to complete the enlarged reproduction of the given triangle. While the example given of the operation of the device is a simple one yet it is particularly adapted to the reproduction of complicated work, such as maps.

What I claim is:

1. In a pantograph, the combination of an elongated frame having a longitudinal guideway, means for pivoting the frame at an intermediate point, a carriage mounted in each end of the frame to travel in the guideway with the carriages on opposite sides of the pivotal point of the frame, a stylus mounted in each carriage, a double-rimmed pulley mounted on the frame with its axis aligned with the pivotal axis of the frame, the rims of the pulley having diameters in proportional relation to each other, and bands respectively connected with the opposite carriages and each band being looped around one of the rims of the double pulley so that the travel of one of the carriages is transmitted to the other carriage with the travel of the carriages in proportional relation.

2. In a pantograph, the combination of an elongated frame having a longitudinal guideway, means for pivoting the frame at an intermediate part, carriages mounted in the frame to travel in the guideway on opposite sides of the pivotal point of the frame, a stylus mounted in each carriage, a double-rimmed pulley mounted in the frame with its axis coincident with the pivot of the frame, and bands in opposite extension looped around the rims of the pulley and respectively connected with the opposite carriages so that when one of the carriages is moved on the guideway a proportional travel is transmitted to the other carriage.

3. In a pantograph, the combination of an elongated frame having a longitudinal guideway, idler pulleys mounted in the frame at

opposite ends of the guideway, means for pivoting the frame at an intermediate part, carriages mounted in the frame to travel in the guideway on opposite sides of the pivotal point of the frame, a stylus mounted in each carriage, a double rimmed pulley mounted in the frame with its axis coincident with the pivot of the frame, and bands in opposite ex- tension looped around the rims of the double-rimmed pulleys and the idler pulleys and 10 respectively connected with the opposite carriages so that when one of the carriages is moved on the guideway a proportional travel is transmitted to the other carriage.

In testimony whereof I affix my signature.

LAT RIDGWAY.