(No Model.) 2 Sheets—Sheet 1.

W. M. GILMORE.

INTERCHANGING WORD OR NUMBER CHART.

No. 474,732. Patented May 10, 1892.

Fig. 1.

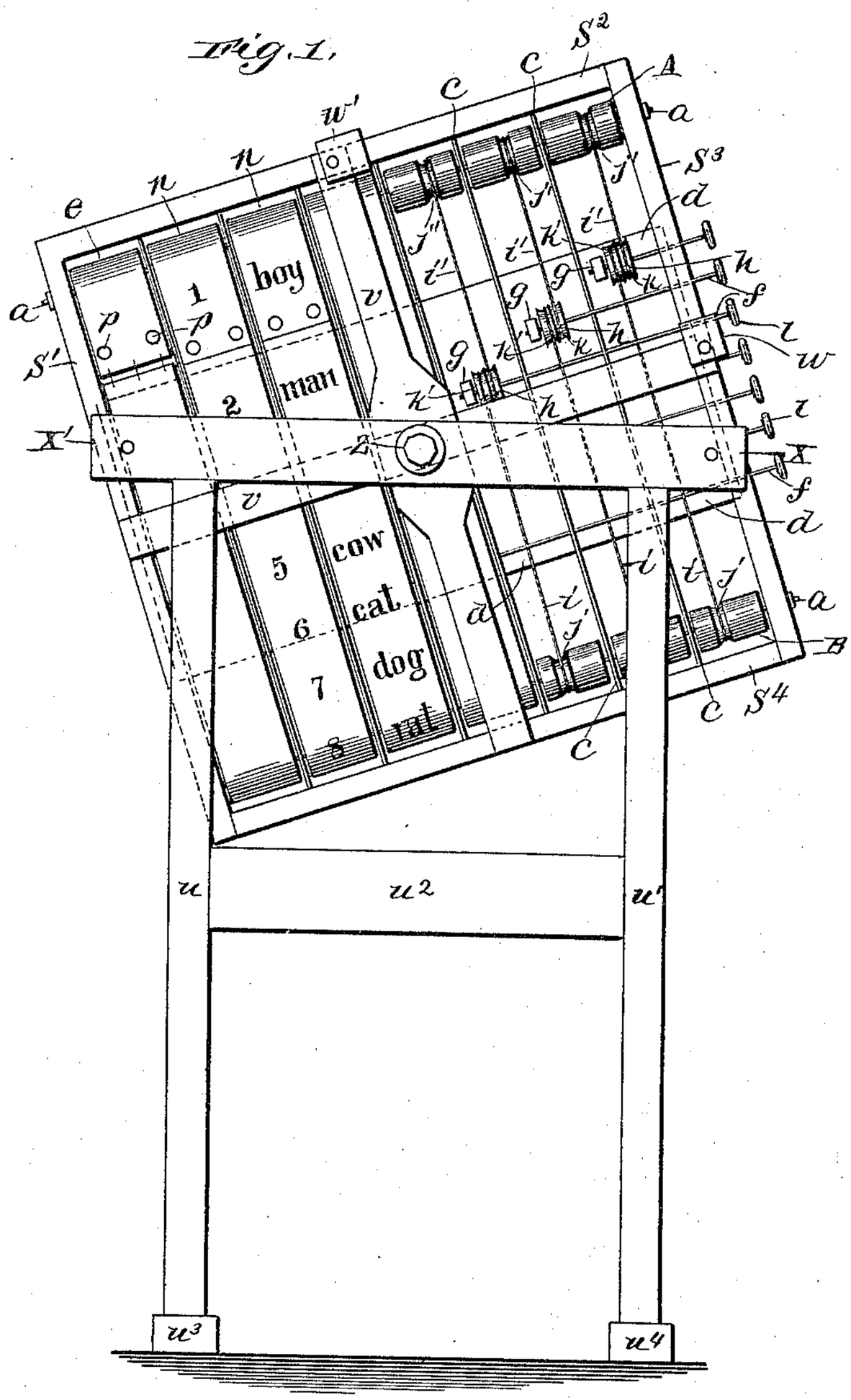
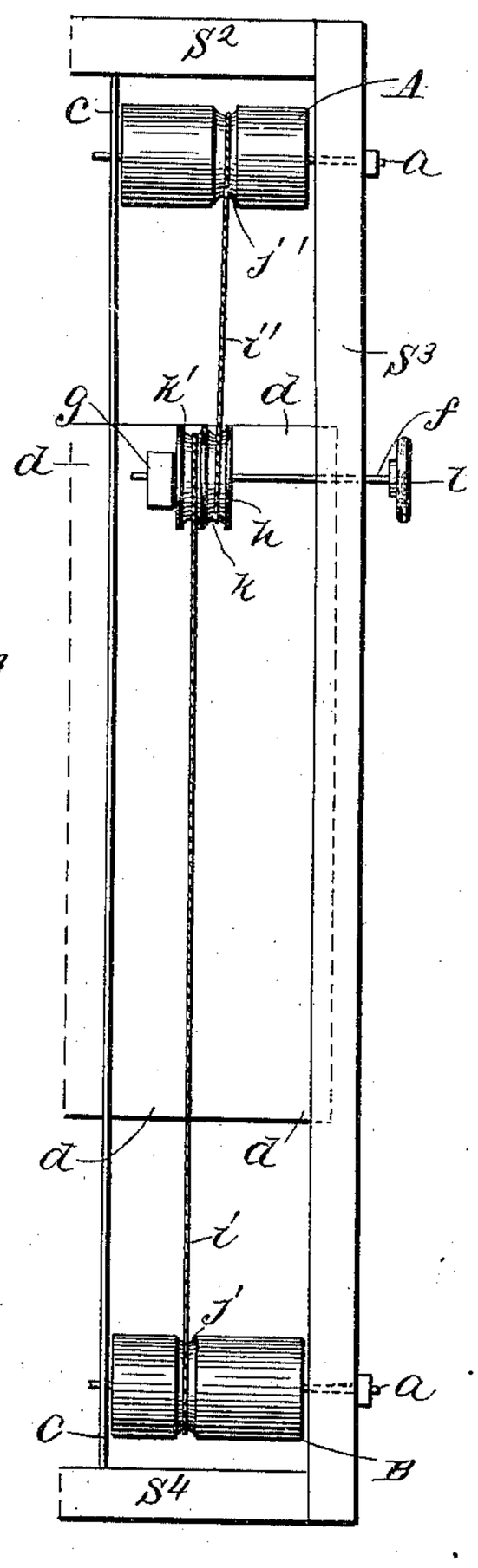


Fig. 4.



Witnesses:
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Timothy R. Ostrand.

Inventor:
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(No Model.) 2 Sheets—Sheet 2.

W. M. GILMORE.

INTERCHANGING WORD OR NUMBER CHART.

No. 474,732. Patented May 10, 1892.

Fig. 2.

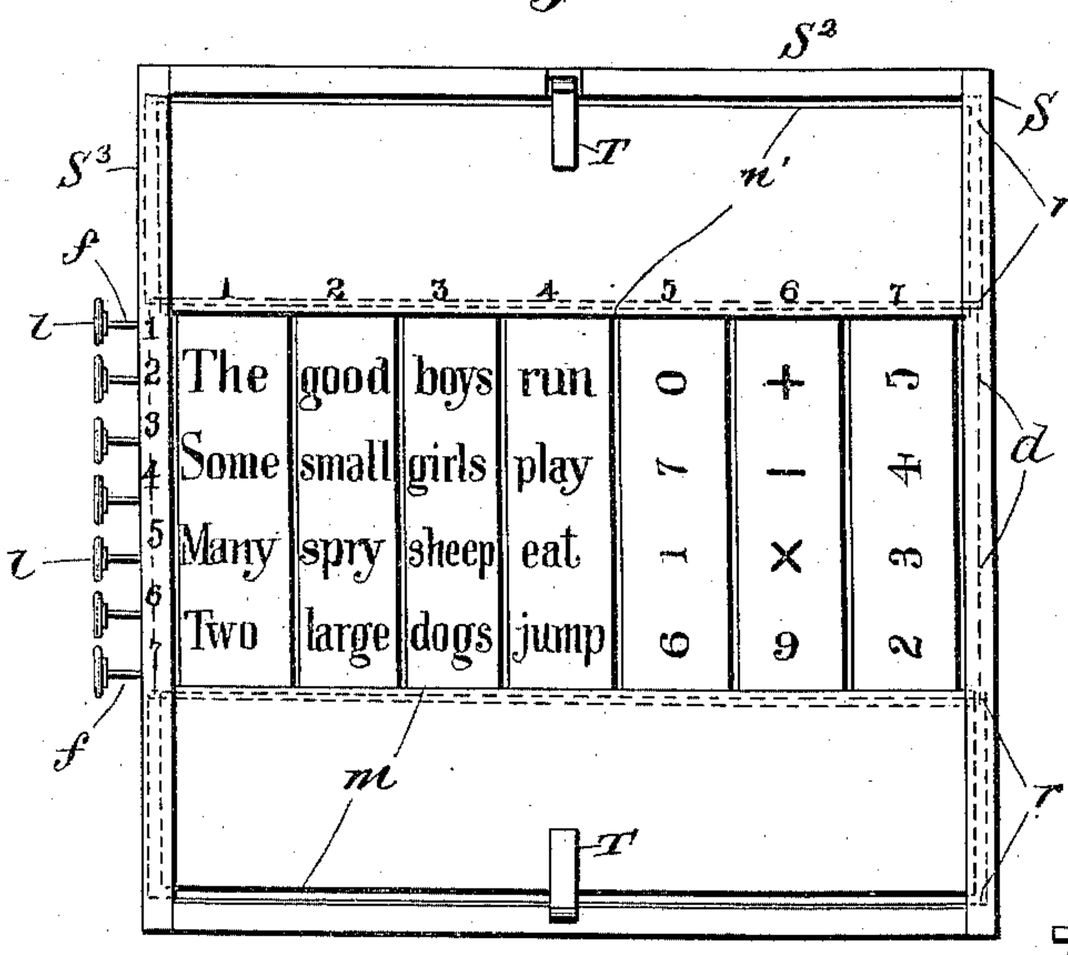


Fig. 3.

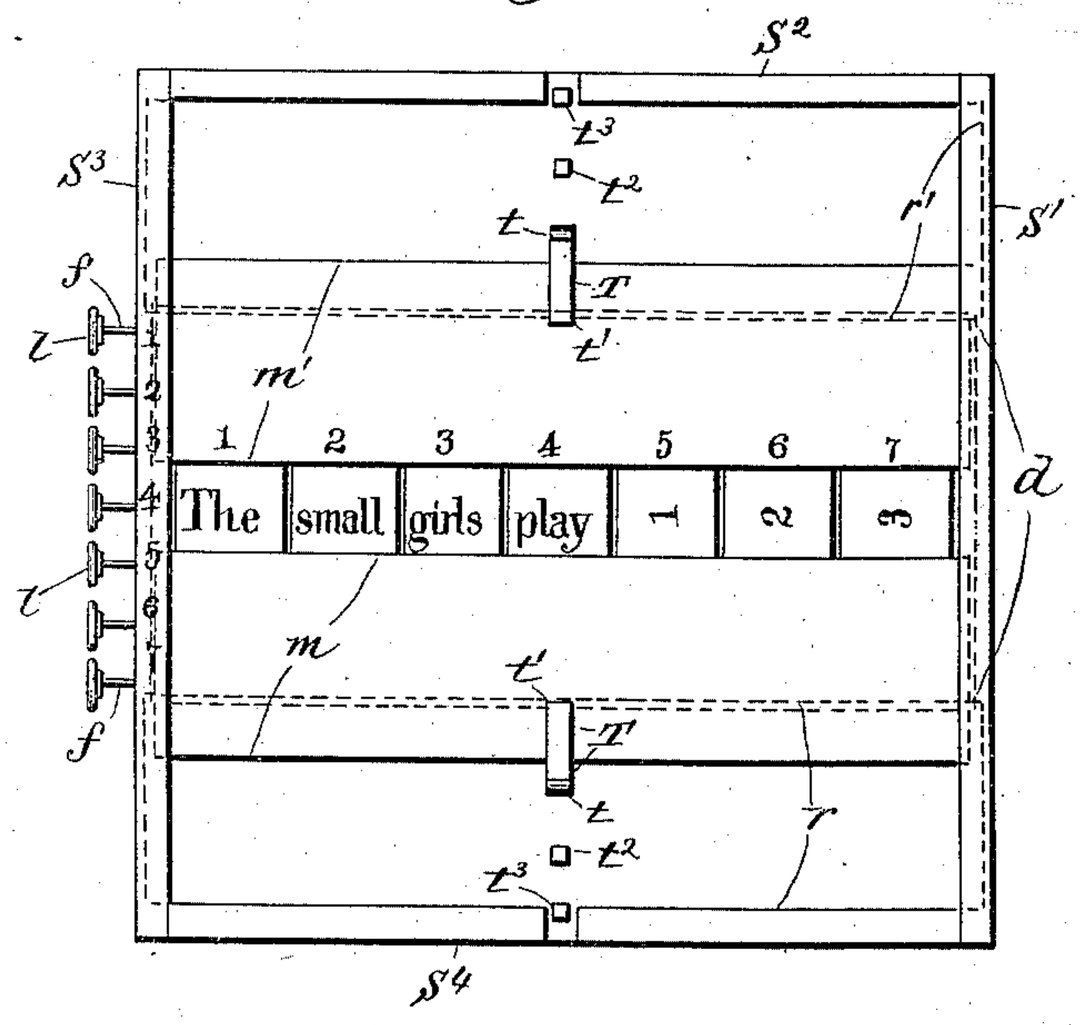
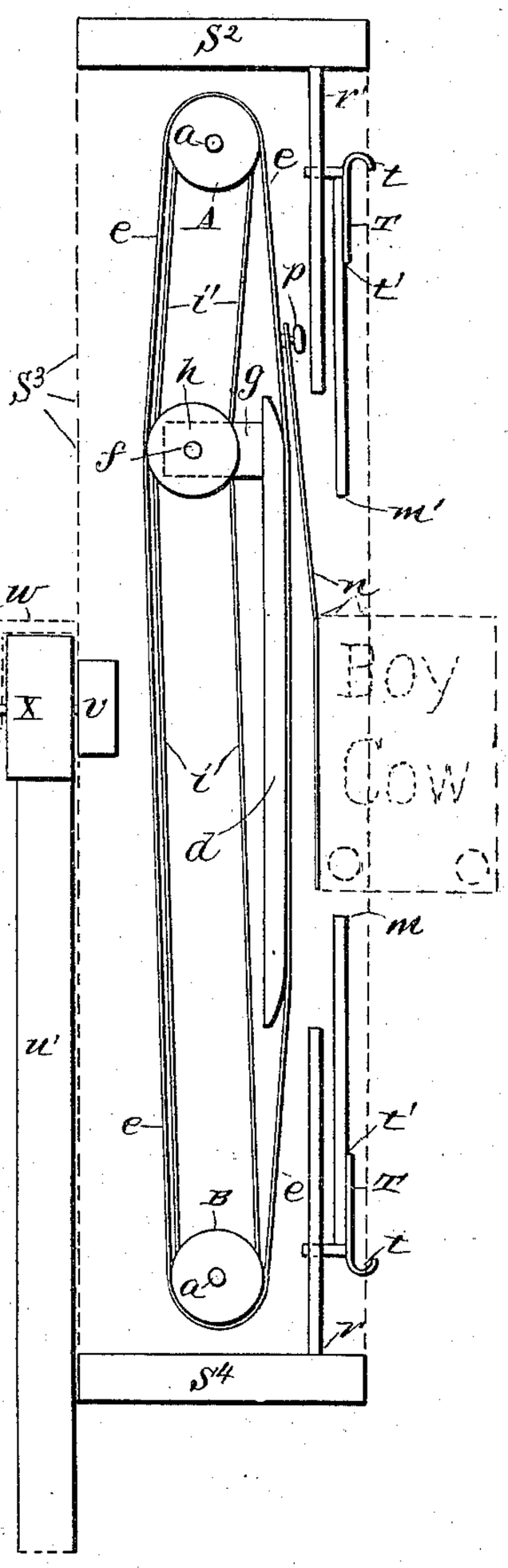


Fig. 5.



Witnesses:
Charles Mac Donough.
Timothy R. Nostrand.

Inventor:
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UNITED STATES PATENT OFFICE.

WILLIAM M. GILMORE, OF VALLEY STREAM, NEW YORK.

INTERCHANGING WORD OR NUMBER CHART.

SPECIFICATION forming part of Letters Patent No. 474,732, dated May 10, 1892.

Application filed October 15, 1891. Serial No. 408,837. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. GILMORE, a citizen of the United States, residing at Valley Stream, in the county of Queens and State of New York, have invented a new and useful Interchanging Word or Number Chart, of which the following is a specification.

The objects of my invention are, first, to mechanically produce numerous combinations of words for practice in primary reading, thereby giving extensive practice from few words and to teach pupils the forms of words unknown to them by introducing such words in place of known words in a sentence in which the other words are known, thus quickly making another sentence, and thereby enabling pupils to acquire a knowledge of words from their difference in form, association, and similar use in a sentence; secondly, to teach and develop the idea of number and the significance of figures or other symbols of number and the signs of the fundamental operations of number by mechanically producing a change in one or more figures or other symbol of number or sign of operation in any combination, thereby changing the result of the whole combination, and thus giving extensive practice in the fundamental operations of number. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a back view of the entire chart with strips *e* and *n* removed from three pair of rollers; Fig. 2, a view of the face with the slides *m'* and *m* adjusted so as to show several lines of inscriptions; Fig. 3, a view of the face with the slides *m'* and *m* adjusted so as to show one line of inscriptions; Fig. 4, a view showing the combination of rollers and pulleys; Fig. 5, an end view with the side piece S^3 removed and a section of a strip *n* turned at a right angle to its position on the face-board *d*.

Similar letters refer to similar parts throughout the several views.

The chart may be any convenient size and rectangular shape, as thirty inches square, as shown in the accompanying drawings.

At the top of the chart is a line of rollers A of uniform length and diameter revolving on a small rod *a*, that extends across the chart. At the bottom of the chart is an exactly similar line of rollers B. In the accompanying drawings there are seven rollers in each line; but there may be more or less than that number, as desired. The side pieces S' S^2 S^3 S^4 are a little wider than the diameter of the rollers, so as to allow the proper adjustment of the face-board *d*, the boards *r'* and *r*, that inclose the front above and below the face-board *d*, the slides *m'* and *m*, and the cross-braces *v v*, all shown in Fig. 5, and referred to hereinafter. The inner surface of side pieces S^4 and S^2 are about one-half an inch from the surface of the line of rollers immediately opposite. Between each pair of rollers is a thin brace *c*, extending from one rod *a* to the other rod *a*, its ends touching the inner surface of side pieces S^2 and S^4, so as to prevent the rods *a* and *a* from sagging.

Across the front of the chart extends a thin board *d*, the ends of which are let into the side pieces S' and S^3 by tenons or other fastenings. This board *d* covers about one-half of the front surface and is equally distant from each line of rollers. It is so placed that the strips of carrying-belt *e*, that extend tightly around each pair of rollers, press lightly on the front surface of it as they revolve, as shown in Fig. 5. The front surface of this face-board *d* is very smooth and the upper and lower front edges rounded, so as to avoid unnecessary wear and friction of strips of carrying-belt *e*, referred to hereinafter. The uses of this face-board *d* are, first, to permit the inscriptions on strips *n*, referred to hereinafter, to appear on a firm plane surface, as shown in Figs. 2 and 3; secondly, to afford a surface for attaching pulley-blocks *g*, referred to hereinafter, as shown in Figs. 1, 4, and 5.

On the back surface of the face-board *d*, between each top and its companion bottom roller, is fastened a pulley-block *g* of suitable size to support firmly and allow to revolve in it the end of a rod *f*, that has firmly fastened to it a pulley *h* of about the same diameter as the rollers and thick enough to admit two small endless belts *i* and *i'* to run in separate grooves *k* and *k'*. These pulleys *h* run close against the pulley-blocks *g* and far enough above the back surface of the face-board *d* to allow the belts *i* and *i'* to be put on them, and the rods *f* extend through braces *c* and side

pieces S^3 and have knobs *l* on their outer ends. The pulley-blocks *g* are on a line running diagonally across the back surface of the face-board *d*, as shown at *g g g*, Fig. 1, so that the rods *l* will not interfere with each other. The groove in each roller in lines A and B is half the width of the partition between the grooves in pulley *h* to one side of the middle of the roller. The rollers in line B are placed reverse to the rollers in line A, and the pulley-block *g* is so placed between each pair of rollers as to bring each groove in pulley *h* in line with a groove in each roller, as shown in Fig. 4. The endless belts *i* and *i'*, previously referred to, extend around the rollers in lines A and B, one running from the pulley over an upper roller and another over the companion lower roller and run in grooves *j* and *j'*, so as to be entirely below the surface of the rollers. The belts *i* or *i'*, applied to one line of rollers A or B, will operate the chart if those belts are sufficiently tightened, leaving the other line of rollers A or B to be revolved by the strips of carrying-belt *e*, hereinafter referred to. Small endless chains may be used instead of belts *i* or *i'*, small cogs being placed in grooves *k k'* and *j* and *j'* to prevent the chain from slipping. Around each pair of rollers revolves a strip of carrying-belt *e*, made of material firm enough to bear the necessary wear and tension and corresponding in width with the length of the rollers, and which in revolving passes alternately behind and in front of the face-board *d* and presses lightly on the front surface of it, as shown in Fig. 5.

The use of the strips of carrying-belt *e* is to save the strips *n*, hereinafter referred to, from the wear and tension to which they would be subject if placed immediately upon the rollers. These strips of carrying-belt *e* may be made of suitable material and contain inscriptions similar to strips *n*, in which case each strip of carrying-belt will serve the purpose of one strip *n*. On each of these strips of carrying-belt *e* are fastened two studs or buttons *p p*, on which are buttoned the ends of strips *n*, as shown in Figs. 1 and 5.

On the above-described strips of carrying-belt *e* are fastened strips of paper or cloth *n*, containing pictures, words, and letters in print and script, punctuation-marks, or other inscriptions giving instruction in language, figures or other symbols of number, and the signs of the fundamental operations. The words may be arranged on the strips, as shown on the face in Fig. 2, or letters and one or more of the different parts of speech may be on the same strips. Pictures used to illustrate words may be on separate strips or on the same strips alternately with the words they illustrate. One or more blank spaces are left on each strip between lists of inscriptions that can be combined in sentences, and in one of these blank spaces on each strip placed the number of the exercise which the lists of inscriptions following them compose. In exercises in number the strips may be carried vertically or horizontally, figures or other symbols of number being arranged accordingly, the chart being adjusted as hereinafter described. Signs of the fundamental operations in number may be on a separate strip *n* on a section of a strip containing figures or other symbols of number. These strips *n*, containing inscriptions, as above described, are fastened to the strips of carrying-belt *e* by being buttoned on the studs or buttons *p p*, previously referred to. One end of the strips *n* is buttoned on the studs or buttons *p p* when they are over the front surface of face-board *d*, as shown in Fig. 5, and the rollers in lines H and B turned by knobs *l* till the strips of belting *e* are carried once around, when the other end of strips *n* is buttoned on. One or more strips *n* may be thus fastened to any strip of carrying-belt *e* at once. By this arrangement the chart may be confined to reading only or to number work only, or the two above uses combined, as the instructor desires. Some of the strips *n* are short and buttoned on by one end, such strips extending downward, but not around the rollers in line B. A narrow strip containing punctuation-marks to terminate sentences is buttoned on one of the studs *p* on any piece of carrying-belt *e* where desired, as shown in Figs. 2 and 3. These strips may be long or short and fastened on the same as strips *n*. Eyelets are put in all strips *n* where required.

By turning the knobs *l* the strips of carrying-belt *e* are caused to revolve on the rollers by means of the pulleys and their belts and bring into view on the face-board *d* any desired inscription previously referred to. Hence by this chart numerous sentences may be composed by interchanging words, pictures, or letters, thereby enabling pupils to remember words from their difference in form, association, and similar use in sentences and extensive practice given in the fundamental operations of number by interchanging figures or other symbols of number and the signs of the fundamental operations.

II. *The adjustment of the chart for use.*— The chart is so adjusted on the cross-piece *x x'* by bolt *z* passing through the center of cross-braces *v v* and the center of cross-piece *x x'* that it will revolve to the right and left, being fastened when the side containing the knobs is vertical by catch *w* passing over the end *x* of the cross-piece, and when the side containing the knobs is horizontal by catch *w'* passing over the end *x'* of the cross-piece. The cross-braces *v v* are let into each other at *z*, where they cross, so as to make a flush surface, one being a little wider at that point, so as to give sufficient strength to support the chart. The ends of the cross-braces *v v* are let into the back edges of side pieces S' S^2 S^3 S^4, so as to make a flush surface, and the legs *u* and *u'* are let into the back side of the cross-piece *x x'*, so that the front surface of the cross-piece is flush with the front sur-

face of the legs, all as shown in Fig. 5. The back edges of the side pieces S′ S² S³ S⁴ therefore touch the front surface of the cross-piece *x x′* and the front surface of the legs *u* and *u′*, and the chart is thereby steadied. At *z* a thin flat piece of metal is let into the front surface of the cross-braces *v v*, and a similar piece of metal is let into the back surface of the cross-piece *x x′*, so that the bolt *y*, connecting them, will not chafe the wood when the chart is revolved. The catches *w* and *w′* are flat pieces of metal. One end of each is screwed into or otherwise fastened to the back edges of two joining side pieces, as shown in Fig. 1, and the catches extend backward perpendicular to the back edges of the side pieces a distance corresponding to the thickness of the cross-piece *x x′*, and are then turned at a right angle, so as to pass over the back surface of the cross-piece *x x′* when the chart comes in the proper position, as shown in Figs. 1 and 5. These catches may be placed so that the side containing the knobs *l* will come either on the left or on the right when it is vertical. A small pin *w²* passes through the lower section of catches *w* or *w′* and into the back of the cross-piece *x x′* to hold the chart firmly in position, as shown in Fig. 5. The object of this adjustment is to permit the strips *n*, containing figures or other inscriptions of number and signs of the fundamental operations of number, to be carried vertically or horizontally when the rollers are operated by knobs *l*.

A box *w²* to contain the strips *n* not in use on the chart is fastened to the inner surface of the legs *u* and *u′* and serves as a brace between them. The front surface of this box *w²* is flush with the front surface of the legs, so as to not interfere with the side pieces of the chart when it is revolved, as above described. The feet *u³* and *u⁴* are of sufficient length to support the chart properly and furnished with casters, if so desired.

III. *The relative position of the face-board d and boards r′ and r and the adjustment of slides m′ and m.*—The front surface of the chart above and below the face-board *d* is covered by thin boards *r′* and *r*, the ends of which are let into the side pieces S′ and S³ by tenons or other fastenings. These boards *r′* and *r* are far enough in front of the face-board *d* to permit the studs *p p* to run clear when the carrying-belts *e* are revolved, as shown in Fig. 5. The use of these boards *r′* and *r* is to conceal the inscriptions on strips *n* above and below the face-board *d*, where they appear on a firm plane surface, as shown in Fig. 2. On the boards *r′* and *r* move slides *m′* and *m* up and down in grooves in the side pieces S′ and S³. The object of these slides is to show on the face-board *d* one sentence or one column of figures, as shown in Fig. 3, or several sentences or columns of figures, as shown in Fig. 2. These slides *m′* and *m* are held in desired position by catches T, one of which is on each slide, as shown in Figs. 2 and 3. Catch T is a flat thin piece of steel fastened to the slide by its end *t′*, its end *t* projecting beyond the slide, as shown in Fig. 3. On the under surface of the projecting end *t* is a small bolt or bar long enough to pass through the boards *r′* or *r*. The end *t* of this piece of steel is curved forward, so as to be easily held, when desired, to remove the bolt or bar out of any socket on *r′* or *r*. The location of these sockets is shown by *t² t³*, Fig. 3.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, in an interchanging word or number chart, of rollers in lines A and B, revolving on rods *a* and *a*, respectively, steadied by braces *c*, with pulleys *h*, fastened to rods *f*, revolving in blocks or brackets *g* on the back surface of the face-board *d*, supported by side pieces S′ and S³ and having its front surface adapted to strips *e*, said rods *f* extending through side piece S³ and terminating in knobs *l* to operate said rollers by belts or endless chains *i′* and *i*, revolving, respectively, in grooves *j′* and *k′* and *j* and *k* in said rollers, and pulleys to revolve strips of carrying-belt *e*, extending around them and pressing lightly on the front surface of said face-board to carry strips *n*, buttoned thereon at *p p*, containing inscriptions to give instruction in reading or number, all substantially as described.

2. The combination, in an interchanging word or number chart, of side pieces S′ S² S³ S⁴, two of which contain rectangular catches *w* and *w′*, respectively, adapted to a cross-piece *x x′*, supported by legs *u u′*, with cross-braces *v v*, connected at their center with the middle of said cross-piece by bolt *z*, all substantially as described, for the purpose specified.

3. The combination, in an interchanging word or number chart, of face-board *d*, with inclosures *r′* and *r*, supported by side pieces S′ and S³ forward of said face-board, leaving spaces adapted to studs or buttons *p p* above and below it, respectively, with slides *m′* and and *m*, moving in grooves in said side pieces and adjustable independently of each other by catches T and T, respectively, on inclosures *r′* and *r*, respectively, all substantially as described.

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Witnesses:
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