(No Model.) 2 Sheets—Sheet 1.

H. S. ROSS.

MECHANICAL REGISTER.

No. 417,840. Patented Dec. 24, 1889.

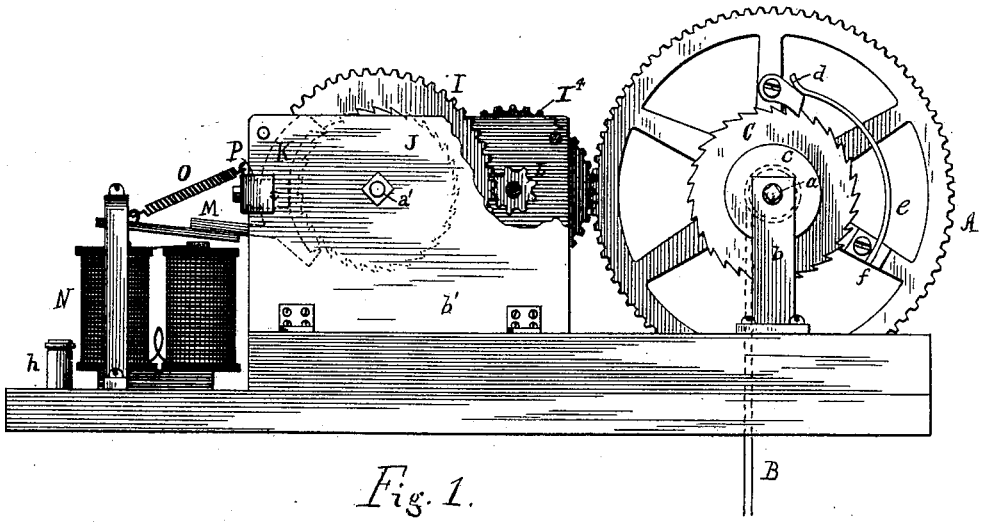

Fig. 1.

WITNESSES:

Geo H Sonneborn

Eugene L. McDonald.

INVENTOR

Henry Schuyler Ross

BY

W. P. Preble Jr

his ATTORNEY

(No Model.) 2 Sheets—Sheet 2.

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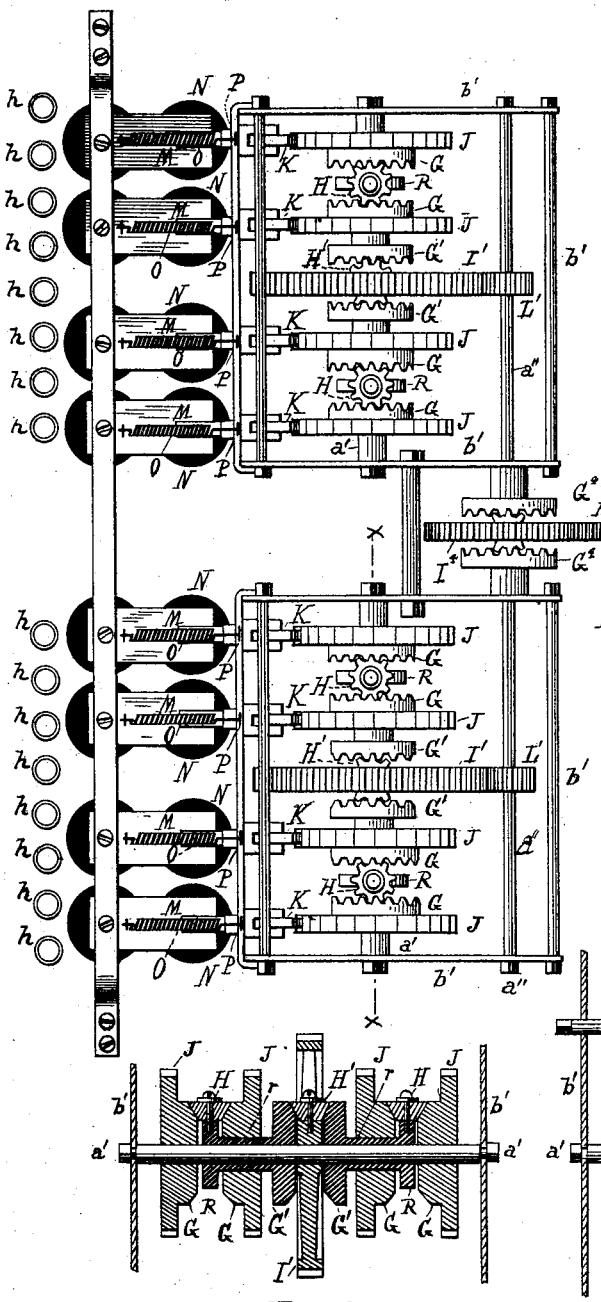

Fig. 3.

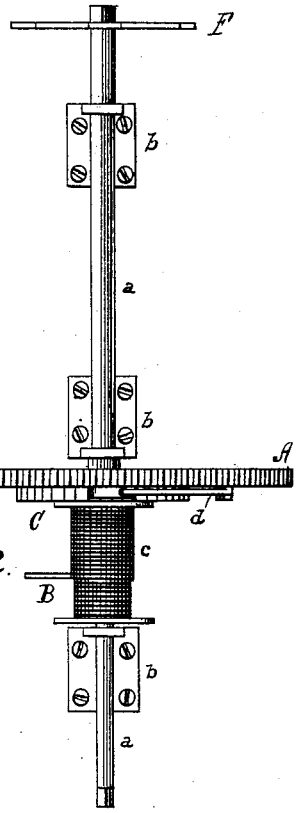

Fig. 2.

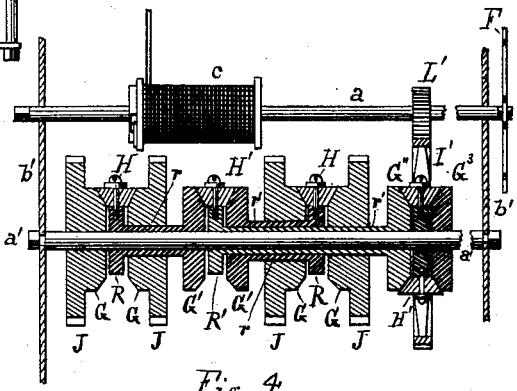

Fig. 4.

WITNESSES:

Geo. H. Sonnebarn

Eugene A. McDonald

INVENTOR

Henry Schuyler Ross

BY

W. P. Preble Jr

his ATTORNEY

UNITED STATES PATENT OFFICE.

HENRY SCHUYLER ROSS, OF NEW YORK, N. Y.

MECHANICAL REGISTER.

SPECIFICATION forming part of Letters Patent No. 417,840, dated December 24, 1889.

Application filed April 3, 1889. Serial No. 305,891. (No model.)

To all whom it may concern:

Be it known that I, HENRY SCHUYLER ROSS, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Mechanical Registers, of which the following is a specification.

The object of my invention is to provide an improved system or systems of gear-wheels in mechanical registers or adding-machines, by which the number of parts, friction, and cost are greatly reduced and an even or equal pressure maintained against each escapement of the machine, and giving a greater capacity to said register to receive rapid impulses simultaneously.

My invention consists in a system of gear-wheels in a mechanical register composed of two pairs of beveled gears mounted loosely on a shaft, each gear being provided with an escapement-wheel rigidly secured thereto; a carrier secured to a sleeve for each pair of gears, supporting a loose or running pinion which engages both said gears; a middle pair of beveled gears, each mounted on a sleeve secured to one of said carriers; an intermediate transmitting gear-wheel carrying a loose or running pinion which engages both gears of said middle pair; a properly-proportioned receiving-wheel placed upon another shaft, into which said transmitting-wheel meshes, the whole arranged and adapted to receive through any or all of said gears a given amount of motion, and to transmit it unaltered by means of said intermediate gear and properly-proportioned receiving-wheel.

My improved system of gear-wheels is capable of almost indefinite extension, and one form thereof, which may be taken as an illustration of the changes required, may be described as follows: a series of pairs of beveled gears mounted loosely on a shaft, each gear being provided with an escapement-wheel rigidly secured thereto; a carrier for each of said pairs of wheels supporting a loose or running pinion which engages both gears; a series of middle pairs of beveled gears, each mounted on a sleeve rigidly secured to some one of said carriers; a secondary carrier for each of said middle pairs of gears, supporting a loose or running pinion which engages both gears; a pair of resultant beveled gears, each mounted on a sleeve rigidly secured to one or the other of said secondary carriers; an intermediate transmitting gear-wheel carrying a loose or running pinion which engages both gears of said resultant pair, and a properly-proportioned receiving-wheel placed upon another shaft, into which said transmitting-wheel meshes, the whole arranged and adapted to receive through any or all of said gears a given amount of motion, and to transmit it unaltered by means of said intermediate transmitting-gear and properly-proportioned receiving-wheel.

One form of my invention is shown in the accompanying drawings, in which—

Figure 1 is a side elevation of an adding-machine and register, one or more of which are placed at any location desired, each being provided with and operating an individual signal-dial, (not shown,) and each arranged to receive and sum up the impulses received by it and announce the result upon said dial. Fig. 2 is a top plan of the same. Fig. 3 is a vertical section on line $x\,x$ on Fig. 2. Fig. 4 is a vertical section similar to Fig. 3, except that the motion of eight wheels is taken up and transmitted to a single receiving-wheel instead of the motion of four wheels, as in Fig. 3.

Only four wheels are shown in Fig. 4, the rest being on the same shaft broken away.

The same letters indicate the same or similar parts in the different figures.

A is the power-wheel, by means of which the whole or some part of the adding mechanism is moved when released by the escapements, and is mounted upon the shaft *a*, turning in the bearings *b b*. This wheel is turned by means of weights (not shown) hung upon the rope B, which, when wound up, is coiled around the drum *c* on the shaft *a*. The ratchet-wheel C, pawl *d*, and drum *c* on the power-wheel A are usual devices for winding up a weight when run down.

Although I prefer to have the series of escape-wheels operated thus by one wheel, called the "power-wheel," still each escape-wheel might, if preferred, be supplied with an independent source of power; or the wheels may

be driven positively by the electric current through suitable pawls instead of escapements. The shaft a carries at its outer end the pointer F. The shafts a' a' are hung in the frame-work b' b' and do not turn with the wheels which they carry. These wheels are divided into systems and operate as follows:

The electro-magnets N receive electrical impulses by closing the circuit at the corresponding reporting-stand, the same being received through the set-screws h h. As soon as the magnet receives an impulse it draws the armature M down toward the magnet. This armature carries the escapement K, and is normally held away from the magnet by the spring O, which is fastened to the armature and to the plate P on the frame-work. The escapement K operates the escapement-wheel J, which is rigidly secured to or made part of the beveled gear G, which, as before stated, is mounted loosely on the shaft a. These beveled gears G, with their escapements, are arranged in pairs facing each other, and between them runs a carrier R, which supports a loose or running pinion H, which engages both of the beveled gears G G and receives motion from them when their escapement-wheels are released by the action of its magnets, and thus causes the carrier R to revolve, and with it the shaft a. Of course the motion taken up by the carrier through the pinion H is only half the sum of the motions of the two beveled gears G G; but this loss is made up afterward. The motion taken up by the pinion H and carrier R is handed on through a sleeve to another pair of beveled gears G' G', which I will call the "middle" pair, and by them given to another loose pinion H'. This is accomplished by mounting the carrier R upon a sleeve r, which turns loosely on the shaft a and carries one of said beveled gears G' upon its outer end. In this way the motion of two pairs of beveled gears is handed on by means of the middle pair to its pinion H'. This pinion H' is carried on a transmitting-wheel I', as shown in Figs. 2 and 3, in which case the motion is at once transmitted to the receiving-wheel L' on the shaft a'' or on a carrier R', as shown in Fig. 4, in which case the motion is passed on by a sleeve for one or more stages longer. Of course the transmitting gear-wheel I' only receives one-fourth of the motion of the gears G G, and hence the receiving-wheel L' can have only one-fourth the number of teeth of the transmitting-wheel I' in order to reproduce the full motion of the gears G G. In the arrangement shown in Fig. 4 the pinion H' is mounted upon a carrier, which for distinction I will call the "secondary" carrier R'. This carrier, like the others, is mounted upon an elongated sleeve r', which runs in under or through one of the pairs of gears along the shaft a' and carries at its outer end a beveled gear G'', which I will call the "resultant" beveled gear. A similar resultant beveled gear G^3 faces this gear G'' and has received motion from an exactly similar system of gears, pinions, sleeves, and carriers on its side of the shaft a'. (Shown as broken away in Fig. 4.) Between these resultant beveled gears G'' G^3 runs the loose pinion H', which engages both said gears and is mounted on the transmitting gear-wheel I', which meshes with receiving-wheel L' on the shaft a, Fig. 4.

As the motion communicated to the transmitting-wheel I' in this arrangement is only one-eighth of that originally imparted to gears G G, the receiving-wheel L' can have only one-eighth as many teeth as wheel I' in order to reproduce the original motion of the gears G G.

It is evident that instead of having all the escapement-wheels provided with the same number of teeth they may vary and be arranged with reference to each other upon some definite system with regard to the result to be produced by the different motions given to the escapements. In this way one of the escapement-wheels may be selected as a units-wheel and provided with any desired number of teeth, preferably one divisible by a large number of whole factors. Thus after deciding on the number of teeth to be made on the first or units wheel the number of teeth on the second and all subsequent wheels must correspond with some one of the whole-number factors of the number of said units-wheel. Thus if the second wheel has one-half the number of teeth of the units-wheel the pointer, whenever the second escapement is moved one tooth, will be moved twice the distance that it will when the first escapement is moved one tooth, and in any case where the number of teeth on an escapement-wheel is proportionately less than the units-wheel the amount of movement will be proportionately more when its escapement is moved the same number of times.

It is obvious that the numbers of teeth on the escapement-wheels need not all be the same factor of the units-wheel, but may constitute as large a variety as there are factors in the units-wheel. For obvious reasons escapement-wheels of which the teeth could not exactly divide the units-number without fractional remainder would be very awkward.

In the arrangement shown in Fig. 4 the power-wheel is dispensed with, the receiving-wheel L' being mounted directly on the power-shaft a, which carries the pointer, instead of being on a different shaft and meshing with the power-wheel A, as in Fig. 2.

It is, I think, obvious that any desired number of pairs of wheels may be arranged to act through a single transmitting and receiving wheel by a judicious arrangement of the sleeves r' r', &c., on the principle pointed out in these two systems.

The operation of my improved register is as follows: Whenever an impulse is sent over the connecting-wire to the register, it is re-

ceived by the proper magnet N in said register, and by charging said magnet draws the armature M toward the magnet. The escapement K thus releases one tooth of the escapement-wheel J, and the latter, being under constant pressure from the shaft *a*, moves until again caught by the escapement K. The beveled gear G moves with the escapement-wheel J and communicates motion to the loose pinion H. This pinion communicates its motion to the carrier R, and through said carrier and a number of beveled gears, pinions, and sleeves to a transmitting-wheel I′, and thence to the receiving-wheel L′. Whatever motion has been lost during this process, having been restored by the properly-proportioned receiving-wheel, is now handed on unaltered to the pointer F, either directly through the shaft *a*, as in Fig. 4, or indirectly through power-wheel A, shaft *a*, and intermediate gears G′ H′ I′, as in Fig. 2.

It is evident that impulses may be received simultaneously by all the magnets and the amounts registered on the proper dials.

I claim—

1. A system of gear-wheels in an adding-machine, composed of two pairs of beveled gears mounted loosely on a shaft, each gear being provided with an escapement-wheel rigidly secured thereto, a carrier for each pair of said gears, carrying a loose or running pinion which engages both said gears, such carrier being secured to a sleeve running to a middle pair of beveled gears, one of which is mounted on the other end of said sleeve, an intermediate transmitting gear-wheel carrying a loose or running pinion which engages both gears of said middle pair, and a properly-proportioned receiving-wheel placed upon another shaft, into which said transmitting-wheel meshes, the whole arranged and adapted to receive through any or all of said gears a given amount of motion and to transmit it unaltered by means of said intermediate transmitting-gear and receiving-wheel.

2. A series of pairs of beveled gears mounted loosely on a shaft, each gear being provided with an escapement-wheel rigidly secured thereto, a carrier for each of said pairs of wheels supporting a loose or running pinion which engages both gears, a series of middle pairs of beveled gears mounted on a sleeve rigidly secured to some one of said carriers, a secondary carrier for each of said middle pairs of gears, supporting a loose or running pinion which engages both gears, a pair of resultant beveled gears, each mounted on a sleeve rigidly secured to one or the other of said secondary carriers, an intermediate transmitting gear-wheel carrying a loose or running pinion which engages both gears of said resultant pair, and a properly-proportioned receiving-wheel placed upon another shaft, into which said transmitting-wheel meshes, the whole arranged and adapted to receive through any or all of said gears a given amount of motion and to transmit it unaltered by means of said intermediate transmitting-gear and properly-proportioned receiving-wheel.

HENRY SCHUYLER ROSS.

Witnesses:
W. P. PREBLE, Jr.
JAMES F. DOYLE.