(No Model.) 2 Sheets—Sheet 1.

N. SILBERBERG.

AUTOMATIC CLOCK WINDING DEVICE.

No. 297,020. Patented Apr. 15, 1884.

Fig. I

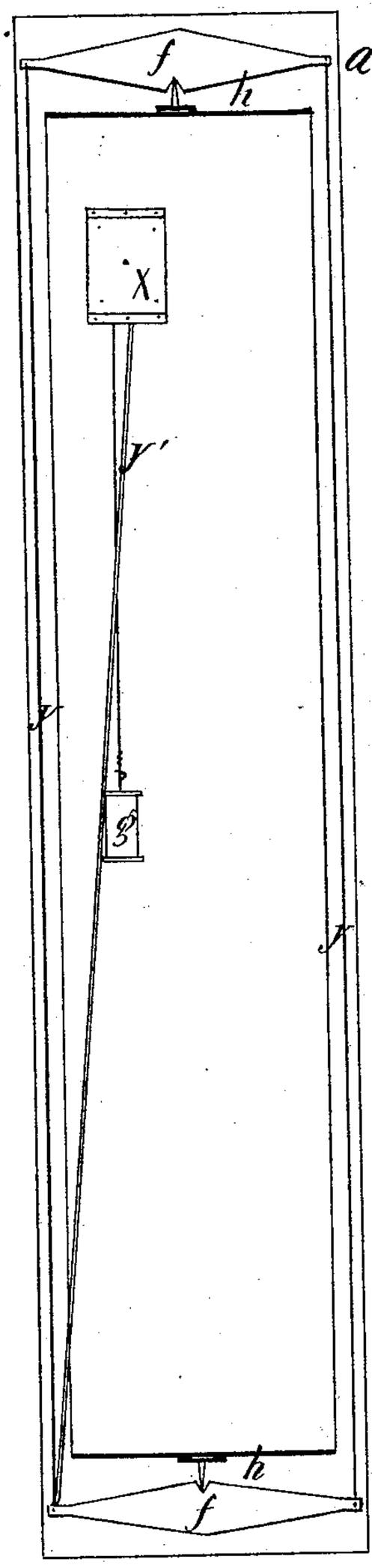


Fig. II

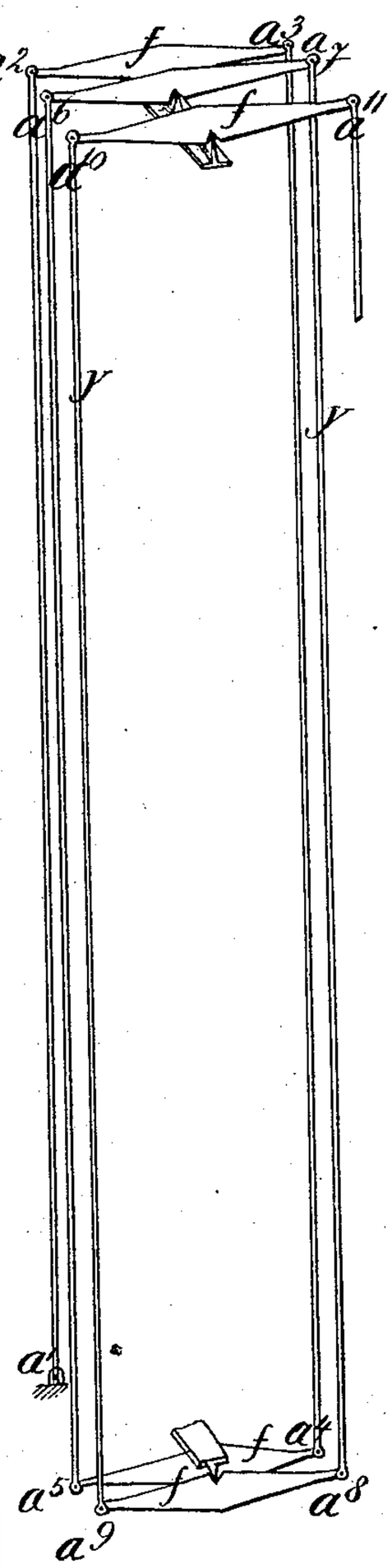
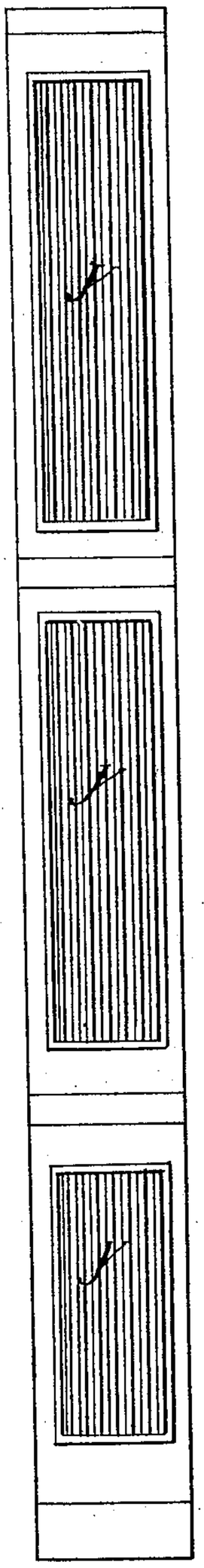


Fig. III



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(No Model.) 2 Sheets—Sheet 2.

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Fig. IV

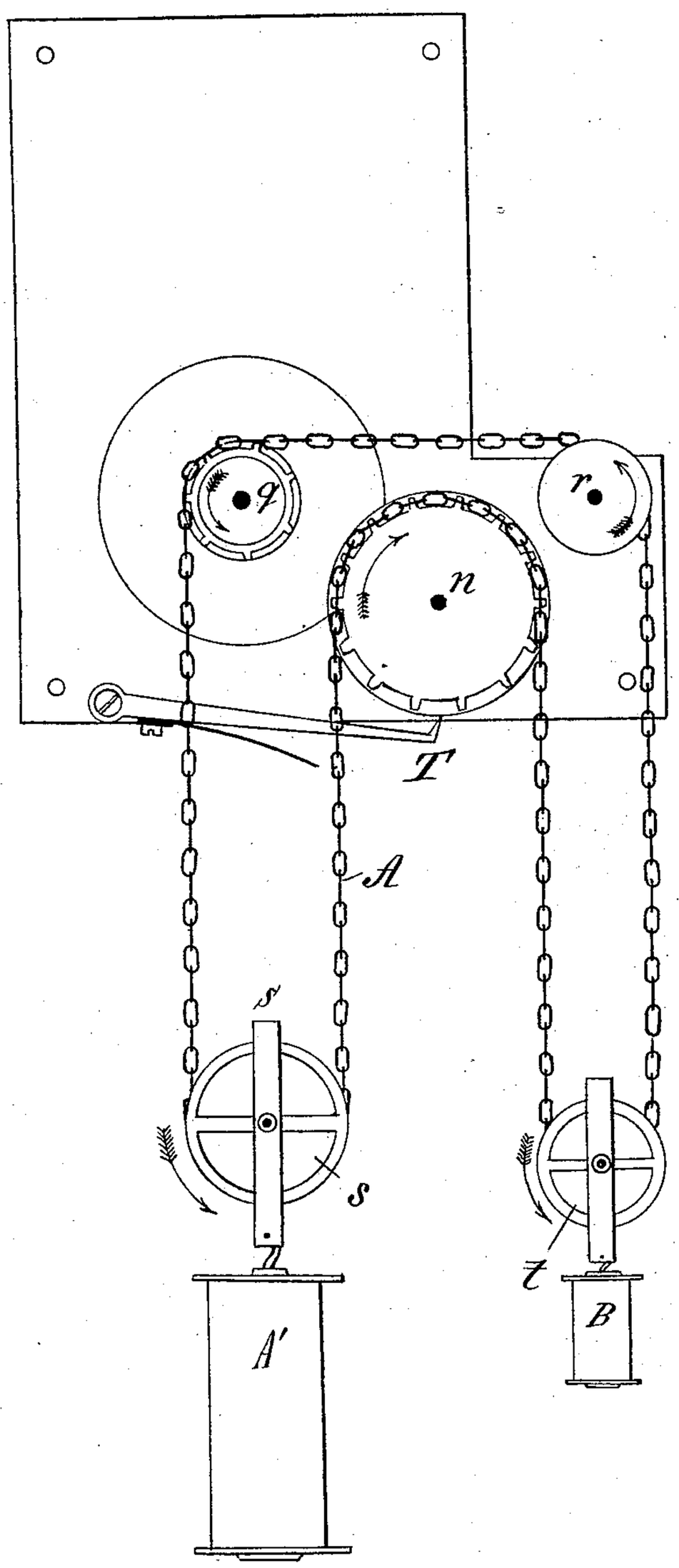
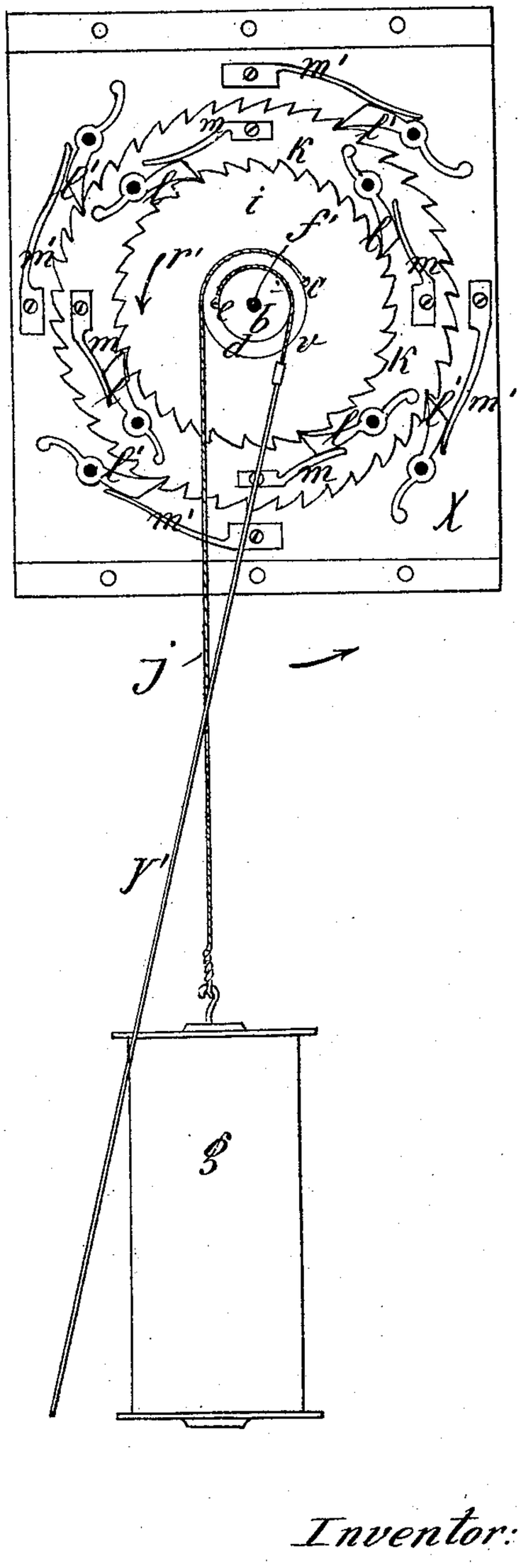


Fig. V



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UNITED STATES PATENT OFFICE.

NATHAN SILBERBERG, OF YASSY, ROUMANIA.

AUTOMATIC CLOCK-WINDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 297,020, dated April 15, 1884.

Application filed July 3, 1883. (No model.) Patented in Germany October 25, 1882; in France October 26, 1882, No. 151,758; in England November 28, 1882, No. 5,661, and in Austria-Hungary February 24, 1883, No. 35,814 and No. 7,514.

To all whom it may concern:

Be it known that I, NATHAN SILBERBERG, a subject of the King of Roumania, and a resident of Yassy, in the Kingdom of Roumania, have invented a certain new and useful Improvement in Automatic Clock-Winding Devices, to be called Perpetual Motor for Clock-Work, of which the following is a specification.

The object of my invention is to provide a new and improved self-operating device for winding up clock-works.

The invention consists in a series of metallic rods or bars connected in such a manner that the variations or changes in the length of the metal bars caused by changes in the temperature can be utilized for producing the power necessary for winding up the clock-works.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure I is a view of the back of a clock, showing the back plate of the casing removed. Fig. II is a perspective view of the chain of metal bars. Fig. III is a side view of the clock. Fig. IV is a face view of the weight, chain, and toothed wheels for winding up the clock. Fig. V is a face view of the ratchet mechanism for transmitting the motion obtained by the lengthening and shortening of the rods.

The metal chain, which is the essential feature of my invention, is formed of a number of metal bars or rods, *y*, preferably of zinc, the ends of which are connected by metal beams or levers *f*, of which one set is pivoted centrally at the top and the other centrally at the bottom of the clock-casing. The metal bars *y* and the levers *f* form a chain, the first member of which, consisting of a bar, *y*, is fixed at its end a' to the clock-casing, the other end, a^2, thereof being pivoted to the end of the first lever, *f*, of the top row of levers. To the other end, a^3, of this first lever the second metal bar, *y*, is pivoted, which reaches down on one side of the clock-case to the end a^4 of the first lever *f* of the bottom rod. To the other end, a^5, of the said lever *f* is pivoted the third bar, *y*, passing upward on the other side of the clock, and pivoted to the end a^6 of the second lever, *f*, of the upper row, and so on. Any desired number of bars or rods *y* can be connected by means of the levers *f* in the manner described. At any change of temperature the length of movement of the free end of the chain will be equal to the total length of the expansion or contraction of the metal bars *y*. The last bar, y', of the said chain is connected to a suitable mechanism, by means of which the variations in the lengths of the chain can be utilized for the purpose of winding up the clock. Several different devices can be used for this purpose, one of which I have shown in Figs. IV and V. The bar y' is fastened to a chain, *v*, which is fastened at the point *e* to the circumference of a wheel, *b*, keyed upon the shaft f', on which is also keyed a disk, *d*, to which a chain or rope, *j*, is fastened at a point, *c*, which is diametrically opposite the point *e*. To the lower end of the rope or chain *j* a weight, *g*, is attached. A ratchet-wheel, *i*, is keyed on the shaft f', and a series of pawls, *l*, are pressed against the teeth of the ratchet-wheel by springs *m*. The said pawls and their springs are held on a ratchet-wheel, *k*, mounted on a sleeve loose on the shaft f', against which ratchet-wheel *k* pawls l' are pressed by springs m'.

The above-described wheels are contained in a casing, *x*, within the space surrounded by the chain. On the sleeve of the wheel *k* a wheel, *n*, is mounted, over which an endless chain, A, passes, which also passes over wheels *q* and *r*, and over pulleys *s* and *t*, from which weights A′ and B′, respectively, are suspended. The chain is connected with the clock-work.

The operation of the winding mechanism is as follows: When by the increase of temperature the length of the chain of bars *y* and the levers *f* increases the end of the bar y' moves upward and thus slackens the chain *v*, which permits the weight *g* to descend, thereby turning the shaft *f* of the wheel *i* in the direction of the arrow r'. The pawls *l*, now acting as a clutch, cause the ratchet-wheel *k* to rotate in the same direction, and as the said wheel *k* is connected by its sleeve with the wheel *n*, the wheel *n* will revolve in the same direction, and will wind up the chain A, thereby raising the weight A′ and winding up the clock-work. When the temperature decreases, the end of the

bar y' moves downward, thereby lifting the weight g, and turning the shaft of the ratchet-wheel i in the opposite direction to that in which it was turned before; but as the pawls l permit the wheel i to rotate freely, and the pawls l' check the movement of the ratchet-wheel k, it is clear that any expansion or lengthening of the chain or of the bars and levers will be utilized for winding up the clock; but a decrease of temperature and consequent contraction of the said chain cannot cause an unwinding of the clock.

I do not limit myself to the above-described arrangement of the ratchet-wheels, pawls, and connection between them and the bar y', as many other devices for utilizing the said automatic movement of the said bar y' might be employed. It is also evident that without departing from the substance of this invention the contraction instead of the lengthening of the chain might be utilized for winding up the clock.

Instead of pivoting the levers f upon knife-edges, as shown in the drawings, other suitable methods of pivoting the same may be used.

Any suitable stop may be arranged for preventing overwinding. The construction shown in Fig. 4 has been found to give good results. It consists of a pawl, T, against which the block or frame s of the weight A' strikes when the clock is completely wound up, whereupon the pawl T engages the teeth of the chain-wheel n, and thus prevents any further winding up of the clock by checking the downward movement of the weight g.

The number and length of the bars y will depend on the length of time the clock is to run and on the dimensions of the same.

I am aware that the expansion and contraction of a metallic rod, bar, or strip have been used to operate the damper of a stove, or to operate a lever connected with the hand of a dial; but

What I do claim as new and of my invention is—

1. In a clock, the combination, with a metal chain formed of a series of bars or rods connected by levers, of the weight g, the chain j, the disks b d on the shaft f, the rope v, the ratchet-wheels i k, the pawls l l', and the springs m m', which ratchet-wheel k is connected with the chain for winding up the weight or spring of the clock, substantially as herein shown and described, and for the purpose set forth.

2. In a clock, the combination, with a metal chain formed of a series of bars or rods connected by levers, of devices for winding up the weights or springs of a clock, and of a safety-catch for automatically preventing the further winding of the spring or weight at the proper time, for the purpose of preventing overwinding of the clock-work, substantially as herein shown and described.

In testimony whereof I have affixed my signature in presence of two witnesses.

NATHAN SILBERBERG.

Witnesses:
F. ED. MEYER,
TH. KROCHMAL.