

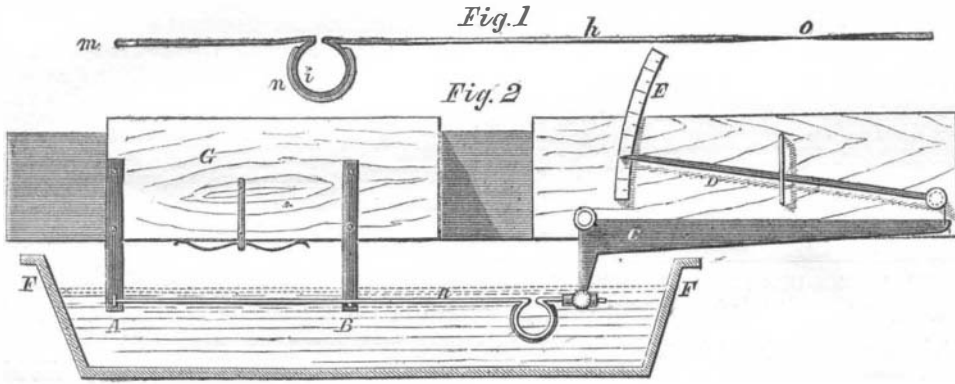
IMPROVED COMPENSATING PENDULUM.

About 230 years ago, Galileo, the great astronomer and mathematician, while sitting in a church in Florence, happened to notice the swinging of a lamp which was suspended by a long chain from the ceiling. As the oscillations became shorter, he observed that the motion grew slower, and it occurred to him that perhaps the vibrations of a pendulum occupied precisely the same length of time whether it swung through a greater or less distance from the perpendicular. On trying the experiment carefully at home he found that his surmise was correct, and the truth of this singular law having been fully established, the pendulum is now universally regarded as the best of all mechanical means of measuring time. Connected with weights by an escapement device, its oscillations are made perpetual, and it regulates the

matter will please address the inventor, Merrick Bemis, at Ashburnham, Mass.

PLAIN DIRECTIONS FOR MAKING A HORIZONTAL SUN-DIAL.

There are many forms of sun-dials, but as the horizontal is the one most generally in use, a description of that will be of most practical value. A suitable material is either cast iron or bronze, and though the dial consists of two parts, they are to be cast together in one piece. The dial plate may be a simple plate of metal, say one quarter of an inch thick, and from four inches to a foot square. On this is to be erected the gnomon, a triangular plate of metal, also about one quarter of an inch in thickness, with its perpendicular edge rising from the back side of the dial-plate, and its acute angle near the front edge of the dial. This acute angle must correspond



BEMIS' NEW COMPENSATING PENDULUM.

movements of clocks with surprising precision. This regularity of movement, however, is subject to one cause of disturbance which is in perpetual operation. Though the time occupied in the vibration of a pendulum is not varied in the least by the length of the arc through which it swings, it is varied by the slightest change in the length of the pendulum rod; a short pendulum making more vibrations in a given time than a long one. As rods, of whatever substance made, vary in length with the changes in the temperature or moisture of the atmosphere, it has been found practically almost impossible to construct a pendulum which will always preserve the same length, and which will, consequently, have absolutely isochronous oscillations. Innumerable plans have been tried for so constructing a pendulum that the expansion in one direction should be compensated for by counteracting expansion in the opposite direction, and thus the length of the pendulum be preserved. One of the latest, and perhaps the very simplest, of all these plans is illustrated in the annexed cut.

It consists simply of an iron rod, *h*, Fig. 1, which is to be suspended at *o*, and to have the bob at its lower end, *m*. Near its lower end it is bent in part of a circle *i*, which has the brass piece, *n*, soldered upon the outside of the curve. As the expansive power of brass, compared with iron, is as 8 to 5, when the temperature rises and the rod, *h*, is lengthened, the brass, *n*, being lengthened more than the iron inner part of the ring, *i*, partially closes the opening in the ring, thus tending to shorten the rod and compensating for the expansion in the rod. As this compensating effect is in proportion to the size of the bent curve, the latter must be adjusted to the length of the rod. In order to test this adjustment with great nicety, the apparatus represented in Fig. 2 has been devised.

The pendulum rod, *h*, is rigidly secured at one end, *A*, with its middle supported by the pin, *B*, and its opposite end attached to the short arm of the bent lever, *C*. The long arm of the lever, *C*, is connected by a chain to the short arm of the lever or index, *D*, the end of which vibrates over a graduated arc, *E*. The pendulum thus arranged is dipped alternately in hot and cold water; when the slightest change in its length is multiplied and plainly indicated by the movements of the index over the graduated arc. The part, *G*, slides back and forth to adjust it to pendulums of different lengths.

This is the invention of a practical clockmaker, who says that he is constantly trying it, and that when the size of the bent segment is properly adjusted to the length of the pendulum, the compensation is very accurate indeed. The patent was issued Nov. 8, 1859, and persons desiring further information in relation to the

with the latitude; that is, if the latitude is 42°, the angle which the inclined edge of the triangle—called the "style"—makes with the plane of the dial-plate must be 42°. The dial-plate must be placed exactly level, with the plane of the gnomon precisely in a north and south direction; this brings the style or edge which casts the shadow parallel with the axis of the earth, that is, pointing to the poles of the heavens. Now, all that is required is to draw the hour lines on the dial-plate, where the shadow of the style will fall at the several hours of the day. These vary with the latitude, and may be computed by the following theorem in plane trigonometry. As is the radius to the sine of the latitude, so is the tangent of the hour from noon (reckoning 15° to the hour) to the tangent of the hour angle at the center. We give a table of these angles for the even degrees of latitudes from 35 to 43, which embraces the larger portion of the United States:—

A.M.	P.M.	35°	36°	37°	38°	39°	40°	41°	42°	43°
XI.	I.	80°44	80°57	90°10	90°23	90°34	90°46	90°58	100°10	100°21
X.	II.	18°20	18°45	19°10	19°34	19°58	20°23	20°45	21°07	21°29
IX.	III.	29°50	30°27	31°02	31°37	32°11	32°44	33°16	33°47	34°18
VIII.	IV.	44°23	45°31	46°11	46°50	47°28	48°04	48°39	49°13	49°45
VII.	V.	64°27	65°29	66°19	67°09	67°56	68°23	68°47	69°11	69°33
VI.	VI.	90°	90°	90°	90°	90°	90°	90°	90°	90°

As the sun is sometimes too fast and sometimes too slow, the time, as shown by the dial, is not always right. A table for correcting the dial time should be cast or engraved on each instrument. We append the proper table for this purpose, taken from the *American Almanac* for 1860, and verified by standard works on astronomy.

In order to obtain the true time from the dial time, on—

Jan. 2, add 4 min.	Apr. 23, sub 3 min.	Sept. 28, sub. 11 min.
4, " 5 "	May 6, " 4 "	Oct. 2, " 11 "
6, " 6 "	24, " 3 "	5, " 12 "
8, " 7 "	June 2, " 2 "	8, " 13 "
11, " 8 "	11, " 1 "	12, " 14 "
13, " 9 "	12, " 0 "	17, " 15 "
17, " 10 "	18, add 1 "	22, " 16 "
19, " 11 "	22, " 2 "	Nov. 14, " 15 "
22, " 12 "	26, " 3 "	19, " 14 "
26, " 13 "	July 2, " 4 "	25, " 13 "
30, " 14 "	9, " 5 "	26, " 12 "
Feb. 29, " 13 "	14, " 6 "	29, " 11 "
26, " 12 "	Aug. 8, " 5 "	Dec. 2, " 10 "
Mar. 6, " 11 "	14, " 4 "	4, " 9 "
10, " 10 "	19, " 3 "	6, " 8 "
14, " 9 "	23, " 2 "	9, " 7 "
18, " 8 "	26, " 1 "	11, " 6 "
22, " 7 "	Sept. 30, " 0 "	13, " 5 "
24, " 6 "	Sept. 3, sub 1 "	15, " 4 "
28, " 5 "	5, " 2 "	17, " 3 "
30, " 4 "	8, " 3 "	19, " 2 "
Apr. 4, " 3 "	11, " 4 "	21, " 1 "
6, " 2 "	14, " 5 "	25, " 0 "
9, " 1 "	17, " 6 "	28, add 1 "
14, " 0 "	19, " 7 "	30, " 2 "
18, sub 1 "	22, " 8 "	31, " 3 "
20, " 2 "	25, " 9 "	

A time-ball is to be erected on the top of the Custom House in this city, and it will be elevated to such a height as to be seen from vessels in the bay. It will be secured by a trip catch on a pole, which will be detached by an electro-magnete very day at noon exactly, when the ball will descend. The electro-magnet will be operated by an electric wire from the Dudley Observatory at Albany, 150 miles distant.



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CHAS. MASON.
Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addressed to us the subjoined very gratifying testimonial:—

Messrs. MUNN & CO. :—It affords me much pleasure to bear testimony to the able and efficient manner in which you discharged your duties as Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and, I doubt not, justly deserved) the reputation of energy, marked ability, and uncompromising fidelity in performing your professional engagements. Very respectfully,

Your obedient servant, J. HOLT.
Communications and remittances should be addressed to
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