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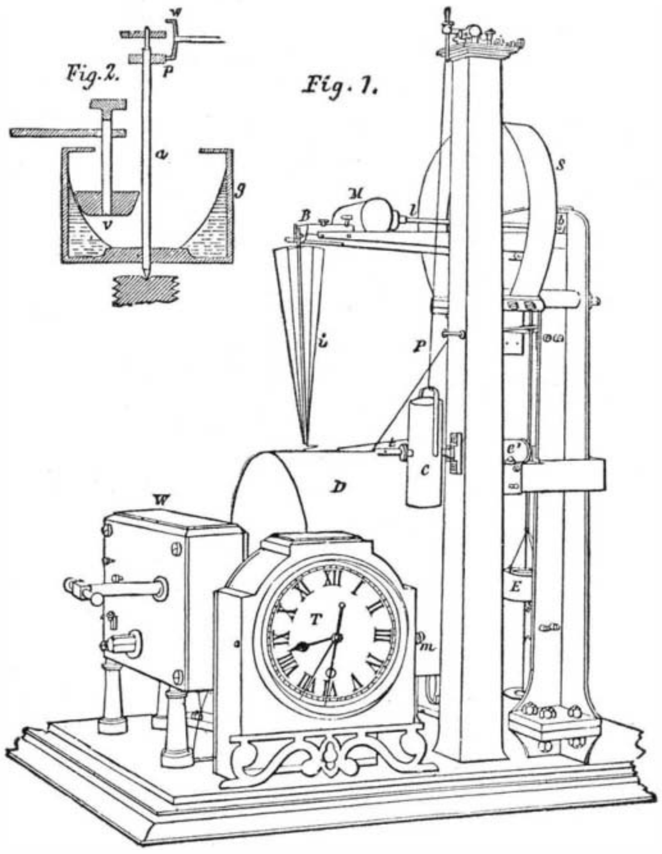
IMPROVED CRANK SHAFT LATHE.

We illustrate an exceptionally large lathe for turning crank shafts, constructed by F. Berry & Sons, of Sowerby Bridge, Eng. *Engineering* gives the following description: The lathe is quadruple geared, and is 48 inches from the center to the top of the bed. This latter is 43 feet long, 11 feet broad in its widest part, 2 feet 3 inches deep, and weighs 40 tons. Upon the bed there are fitted four sliding carriages, one furnished with a compound slide rest, and the other three with pillar rests. All the rests have a traverse of 2 feet 9 inches, and all the carriages are self-acting longitudinally, by means of screws 4½ inches in diameter. A complete set of change wheels is provided for screw cutting, and quick traverse of the carriages can be effected by means of pulleys fixed on the ends of the screws. The face plate is 8 feet 3 inches in diameter, and the spindle in the fast headstock is 16 inches in diameter by 20 inches long in the front neck, and 12 inches in diameter by 15 inches long in the back neck, and is made of steel. The massive size of this magnificent tool will be best appreciated from a consideration of the weight of the various parts. The fast headstock, including the spindle and gearing, weighs 12½ tons, the loose headstock 4½ tons, and the total weight of the lathe is about 90 tons.

THE EARTHQUAKE RECORDER.

During the past session of the Philosophical Society of Glasgow, a paper was read giving a description of an apparatus which had been designed for the purpose of recording the time of occurrence, the duration, and the nature and magnitude of the motions in an earthquake. In the light of recent events this paper has a special interest. The author was Mr. Thomas Gray, B.Sc., F.R.S.E., recently a member of the professional staff of the University of Tokio, Japan, and now assistant to Sir William Thomson in the physical laboratory of the University of Glasgow. He stated that the apparatus had been made by Mr. James White, the well known scientific instrument maker of that city, and that it is to be used by a former colleague, Professor Milne, of Tokio, in the investigations which are being carried out by him as one of the committee appointed by the British Association for the investigation of the earthquake phenomena of Japan.

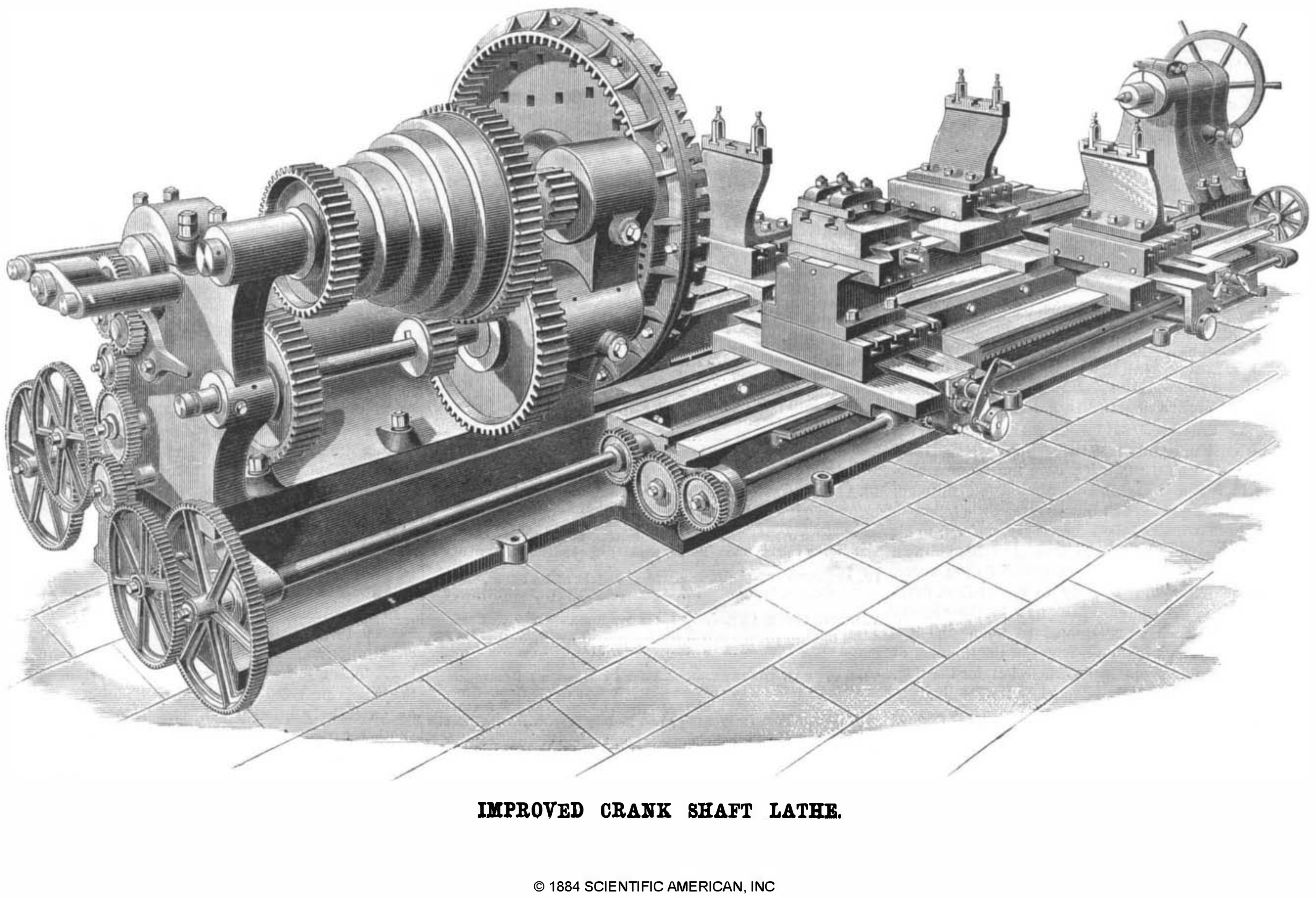


THE EARTHQUAKE RECORDER.

An earthquake, he remarked, generally consists of a considerable number of separate to-and-fro movements of a part of the earth's surface. These movements are irregular in period during any one earthquake, and vary very much as to period, duration, and magnitude in different earthquakes. From past experience in Japan, it is inferred that the instrument described in the paper may have to record motions varying from one-tenth of a millimeter to ten millimeters in amplitude, and from one-fifth of a second to something near one second in period; while the duration of the earthquake may vary from half a minute to about four minutes.

In order to determine the amount of movement, it is found convenient to record three rectangular compounds of it—two horizontal and one vertical. The horizontal compounds are recorded by means of the two pendulums indicated at P, Fig. 1. Each of these pendulums consists of a hollow brass cylinder, *c*, filled with lead, and suspended by a silk thread. The cylinder is held deflected from the position in which it would hang with its center of gravity vertically under the point of suspension by means of a thin tube, *t*, which terminates at one end in a sharp, vertical knife edge. One of these tubes is continued by a long and very light index of aluminum foil; while a similar index is attached to the tube on the other pendulum, close to the knife edge, and with its length at right angles to that of the tube. The knife edge rests in a flat V, cut in a hard steel plate, and the point of suspension is regulated by means of screw adjustments, capable of giving motion in three directions at right angles to each other, until it is very nearly vertically above the knife edge, and at such a height that the knife edge bears along all its length. The points of suspension are so adjusted that the planes through the axes of the tubes, *t*, and the suspending threads are at right angles to each other. In this way the indices are parallel to each other, and they are arranged to be in a horizontal plane.

The vertical component of the motion is recorded by means of the mass, M, supported on the end by the lever, *l*, by means of the spring, S, and actuating the vertical index, *i*. To the crossbar, B, which is sharpened to a knife edge on its upper side, there is firmly attached the lever, *l*. The sharpened edge of B rests in a flat V-shaped groove formed on the under side of a steel plate, while the spring is attached to the lever by links working round knife edges. The mass, M, is considerably further from the knife edge than the spring, S, the reason for which is that a moderately long period of free vibration can thus be obtained without an inconveniently long spring. By placing the point of attachment of the spring a little below the line joining the knife edge and the center of inertia of the mass, M, the period of vibration is lengthened to some extent, and it is still more increased by a box, which is mounted on a long horizontal axis and supported at one end of the lever, *l*. In order to give rigidity to the index, *i*, without making it massive, it is made of a very thin tube of aluminum, which is prevented from bending sideways by fine silk threads attached to its point, and to light crossbars of aluminum at its upper end. The threads are kept stretched by means of



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