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PATENTED JAN. 21, 1908.

O. R. P. BERGLUND, W. A. W. E. HJORTH & C. E. LJUNGMAN.

ELECTRIC APPARATUS FOR THE IGNITION OF MINES.

APPLICATION FILED OCT. 25, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

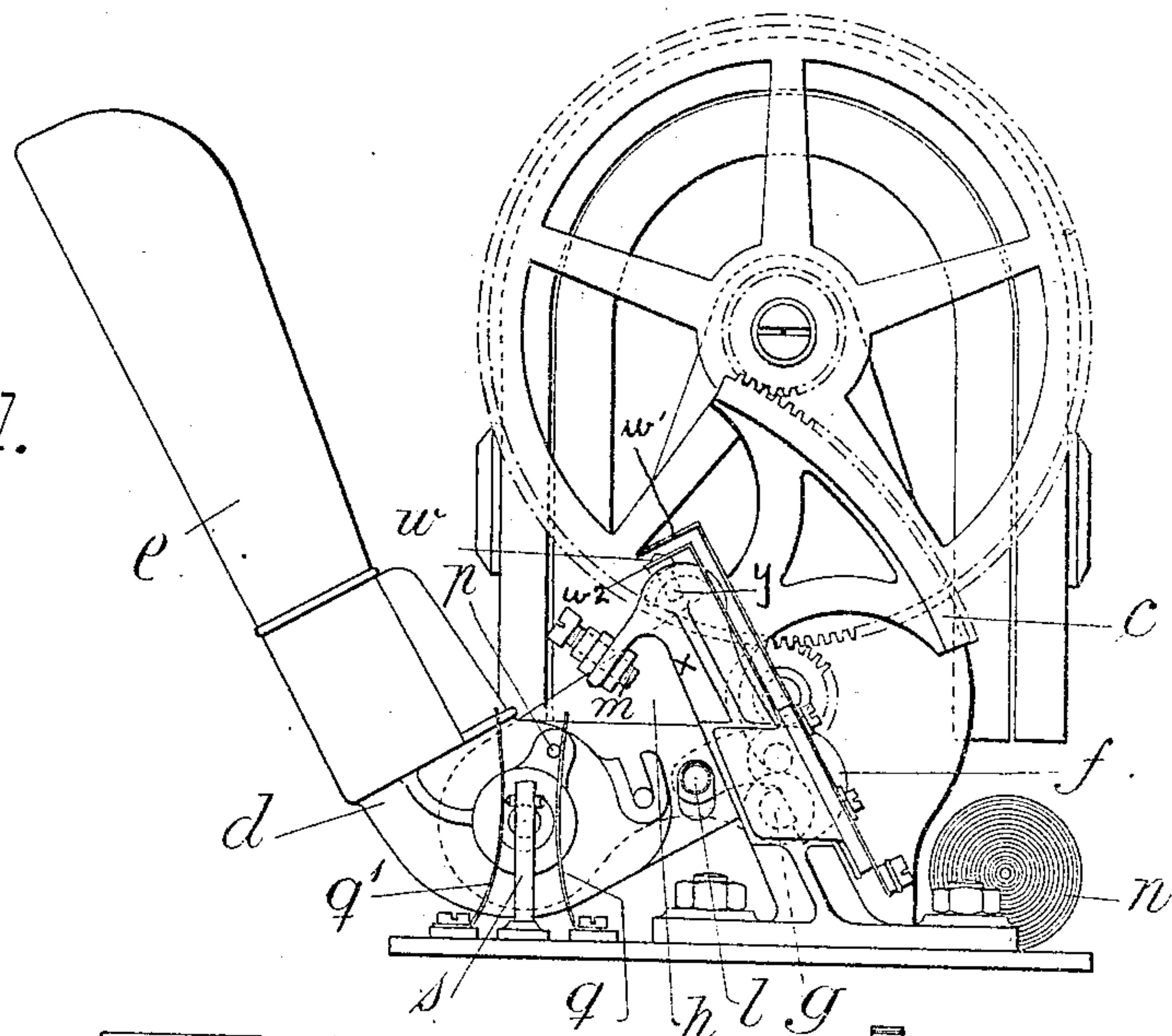


Fig. 2.

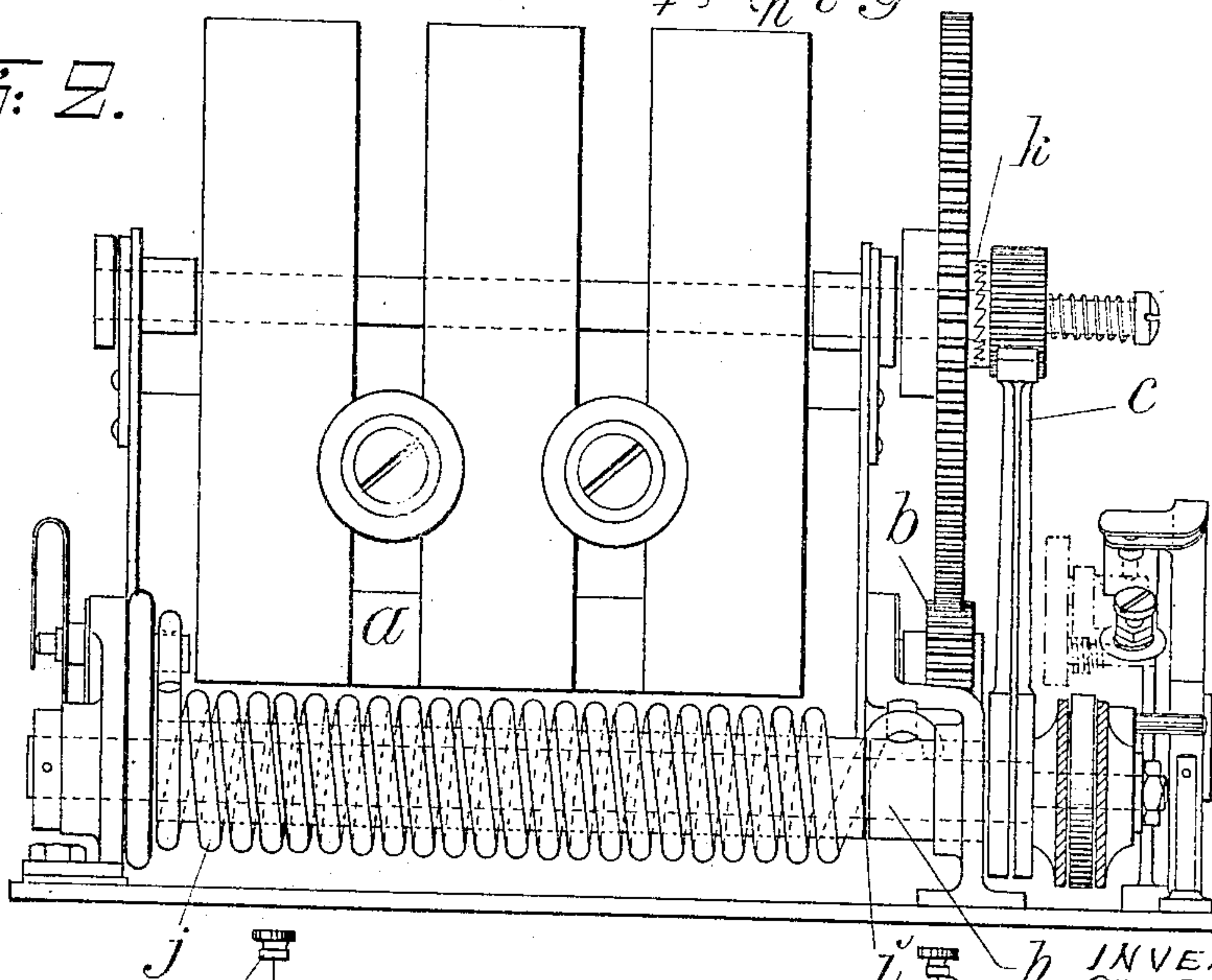
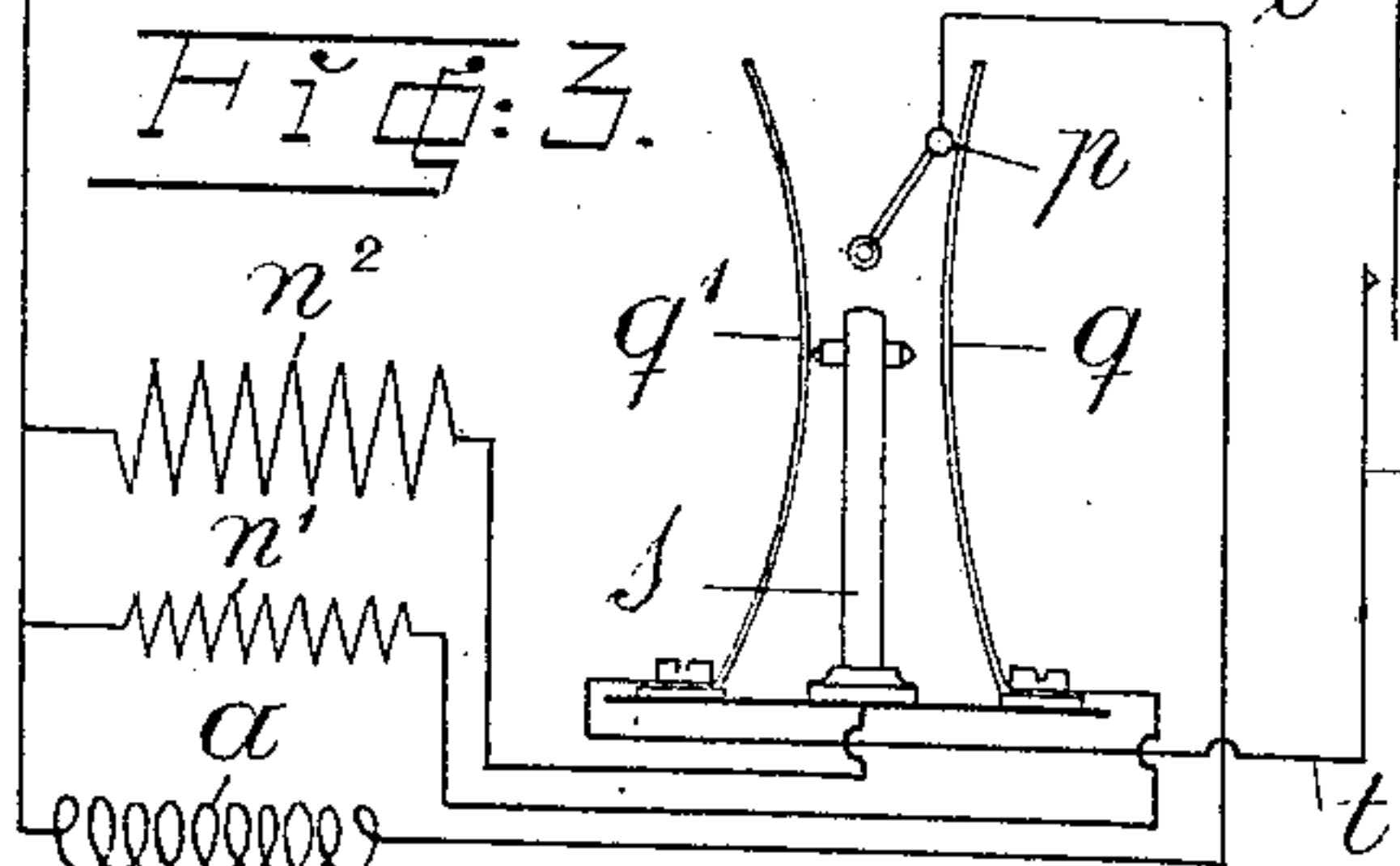


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

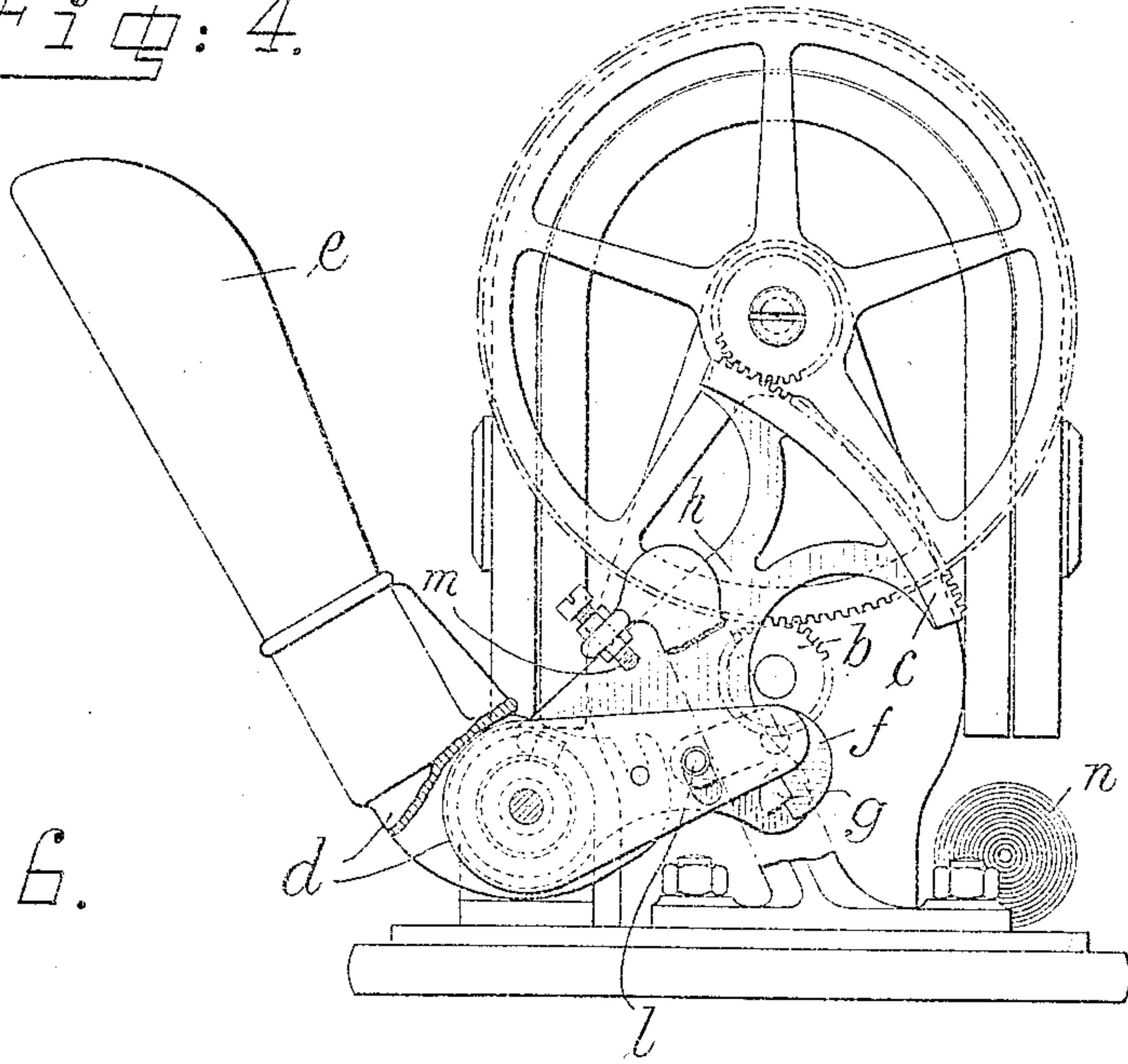


Fig. 6.

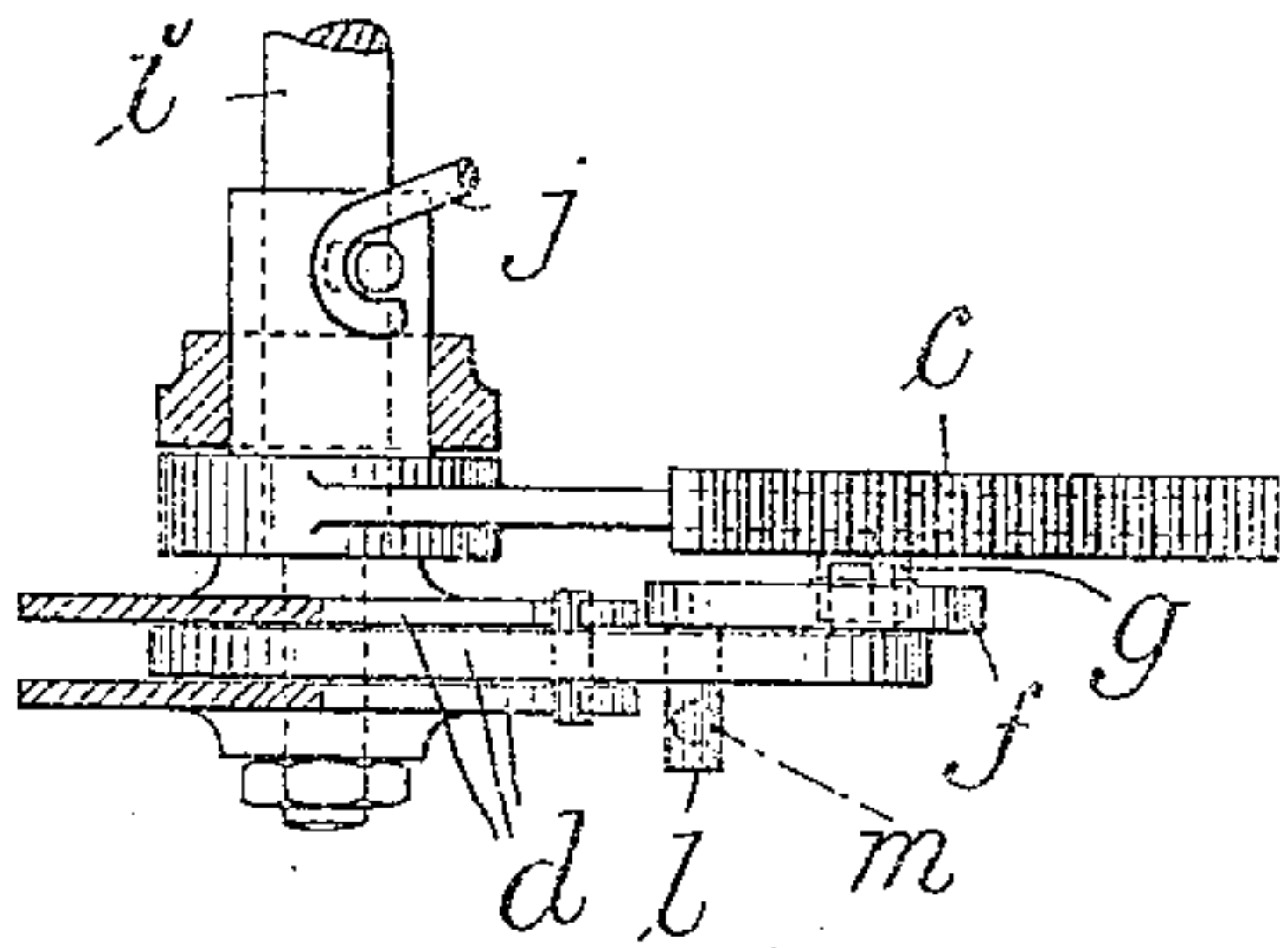
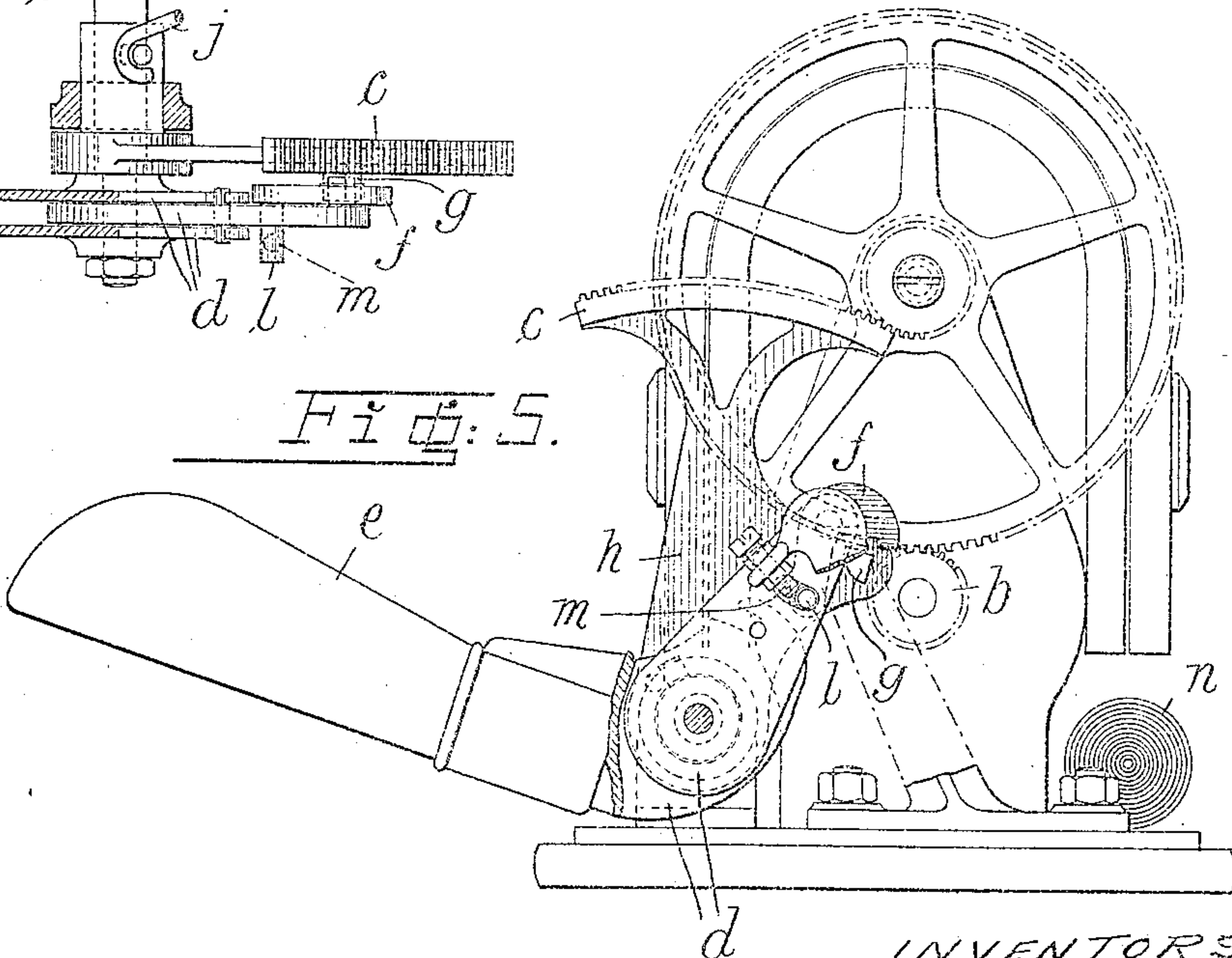


Fig. 5.



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OTTO ROBERT PERCIVAL BERGLUND, WALTER AXEL WILHELM EMANUEL HJORTH, AND
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ELECTRIC APPARATUS FOR THE IGNITION OF MINES.

No. 877,284.

Specification of Letters Patent.

Patented Jan. 21, 1908.

Application filed October 25, 1905. Serial No. 284,407.

To all whom it may concern:

Be it known that we, OTTO ROBERT PERCIVAL BERGLUND, WALTER AXEL WILHELM EMANUEL HJORTH, and CARL ERNST LJUNGMAN, subjects of Sweden, residing at 8 Mäster-Samuelsgatan, Stockholm, Sweden, have invented new and useful Improvements in Electric Apparatus for the Ignition of Mines, of which the following is a specification.

The present invention relates to such electric apparatus for the ignition of mines in which one or more springs are brought into tension by moving a lever, the power thus accumulated in said springs setting an inductor in motion, when the springs are released, thereby generating the current sufficient for the ignition of the mine.

The invention has for its purpose to arrange apparatus of this kind in such a manner that they may be used for sending out as well a low-tension current for the simultaneous ignition of several mines connected in parallel as a high-tension current for the ignition of mines connected in series, which latter cannot be ignited by currents of low tension. By the said arrangement, consisting in a contact device, which at the rotation of the inductor switches the current generated and conducts it through a transformer, the same igniting apparatus can be used independently of the manner in which the mines are connected.

A form of the apparatus is illustrated in the accompanying drawing in which

Figure 1 is an end elevation and Fig. 2 a side elevation, while Fig. 3 is a diagram of the electric circuit. Figs. 4 and 5 are end views of the apparatus with certain parts broken away to illustrate two different positions of the lever *d*, by which the spring *j* is brought into tension, the one of those positions being the same as in Fig. 1 and the other being that in which the spring is released by means of a latch *f* on the lever or bell crank *d*, striking with a lug *l* against a fixed abutment *m*. Fig. 6 is a detail view of the end of the shaft *i* for the lever *d*, illustrating the toothed segment *c* on the said shaft and also the lever *d* (partly in section) with the latch *f* and the stud *l* of the same.

A pinion *b* mounted on the inductor *a* can be rotated by means of a gearing engaging with a toothed segment *c* rotatable on a shaft *i*, on which is loosely mounted a swinging

bell-crank *d* one arm of which is formed as a handle *e* while the other carries a latch *f* which at one extreme position of the arm catches a lug *g* attached to the body part *h* of the toothed segment. The shaft *i* just mentioned is surrounded by a spiral spring *j* one end of which is secured to the said segment body, while the other is secured to the frame of the apparatus. When the handle *e* and thus also the bell-crank *d* is swung over in one direction, the latch *f* will compel the part *h* with the segment *c* to swing over and bring the spring *j* into tension. In this rotation, however, the inductor will not take part, because of a clutch *k* introduced in the gearing in such a manner as to transmit motion in one direction only. When the handle *e* and the bell-crank *d* have been swung over to a certain point, a lug *l* on the latch will strike an adjustable abutment *m* so that the latch is turned and disengaged from the lug *g* and the spring *j* being consequently released will throw the segment suddenly back into its original position, the segment as a result by means of the gearing and clutch *k* revolving the inductor *a* thereby generating the current which is transmitted to the conduit and accomplishes the ignition.

To allow of the conversion of the current generated by the inductor from low to high tension a transformer *n* is used the primary coil *n'* of which is connected partly with one terminal *o* of the apparatus and partly with one *q* of two contact springs *q, q'* arranged on each side of a terminal *p* mounted on the shaft *i* and connected with the inductor *a* which in its turn is connected with the said terminal *o* of the apparatus in the usual manner. The other spring *q'* is in electric connection with the other terminal *o'* of the apparatus and the secondary coil *n''* of the transformer is in electric connection partly with the terminal *o* and partly with a post *s* situated between the two springs *q, q'*.

After the lever *d* has been swung into the position where the spring *j* is released (that is in the opposite position to that shown in Fig. 1 of the drawing) the low-tension current generated in the release will flow from the inductor *a* through contact *p*, spring *q'*, against which the contact *q* then bears, and further through the circuit *t* and terminal *o'* to the mine ignition and subsequently back through the terminal *o*. But in the further rotation of shaft *i* actuated by the spring *j*

the contact p will be carried against the spring q and the inductor current will consequently be made to flow through the contact p , spring q , and the primary coil n' of the transformer so that a current of high tension induced in the secondary transformer coil n^2 will flow through the post s , the spring q' now bearing thereon, the wire t and the terminal o' , to the igniting device.

10 In the return movement of the segment c to its position of rest there will consequently be generated partly a low-tensioned and partly a high-tensioned current, and as a result the same apparatus can be used for igniting mines whether these be connected in parallel or in series.

Evidently the arrangement of the apparatus may be varied, the essential feature being the combination with the apparatus of a transformer which either immediately in the beginning of the movement of the segment for revolving the inductor will be automatically set into operation and subsequently be disconnected before the end of said movement, or which will be switched into operation in the course of the movement so that the current of the inductor will during one period be despatched directly to the igniting apparatus while during another period the said current will be converted.

As illustrated in Fig. 1 a spring contact w , consisting of two springs w' and w^2 is arranged on an arm x of the frame in such a manner that the two springs are normally held out of contact with one another. Beneath the one w^2 of the said springs there is placed in the arm x a movable insulated stud y , which is situated at such a point, that it will be moved by the bell crank d first when the same reaches its extreme position at its revolution in one direction. In that moment the stud is raised and presses the spring w^2 against the spring w' , thus closing the circuit, which is normally open as diagrammatically illustrated in Fig. 3 where the spring contact w is also shown. The object of this arrangement is that the inductor shall be enabled to transmit current only when the spring j has acquired the

determined tension, and consequently not on revolving the lever part of its stroke and then releasing it, since in the latter case the current generated by the inductor would be of smaller strength, whereas the object of the invention is to have it uniform. For the toothed gearing evidently any other gearing may be substituted adapted to be set in motion by the tension of the spring j as the latter is released, the toothed segment in this case of course being replaced by other suitable means. It is moreover, evident that the contact p need not necessarily be arranged on the shaft i , since it may be arranged for instance on the segment c or at some other point if only so contrived as to set the transformer into operation during the motion of the inductor.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

In an electric mine igniting apparatus, the combination with a magneto and a mine exploding circuit, a transformer having primary and secondary coils, a pair of spring contacts connected one with the primary coil of the transformer, and the other with the mine circuit, a contact post located between said spring contacts and connected with the secondary coil of the transformer, said spring contacts tending normally to bear on said contact post and a switch lever electrically connected with the magneto and adapted to contact with one or the other of said springs and on said contact to move it out of contact with the post, and means whereby the lever is operated by the magneto.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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