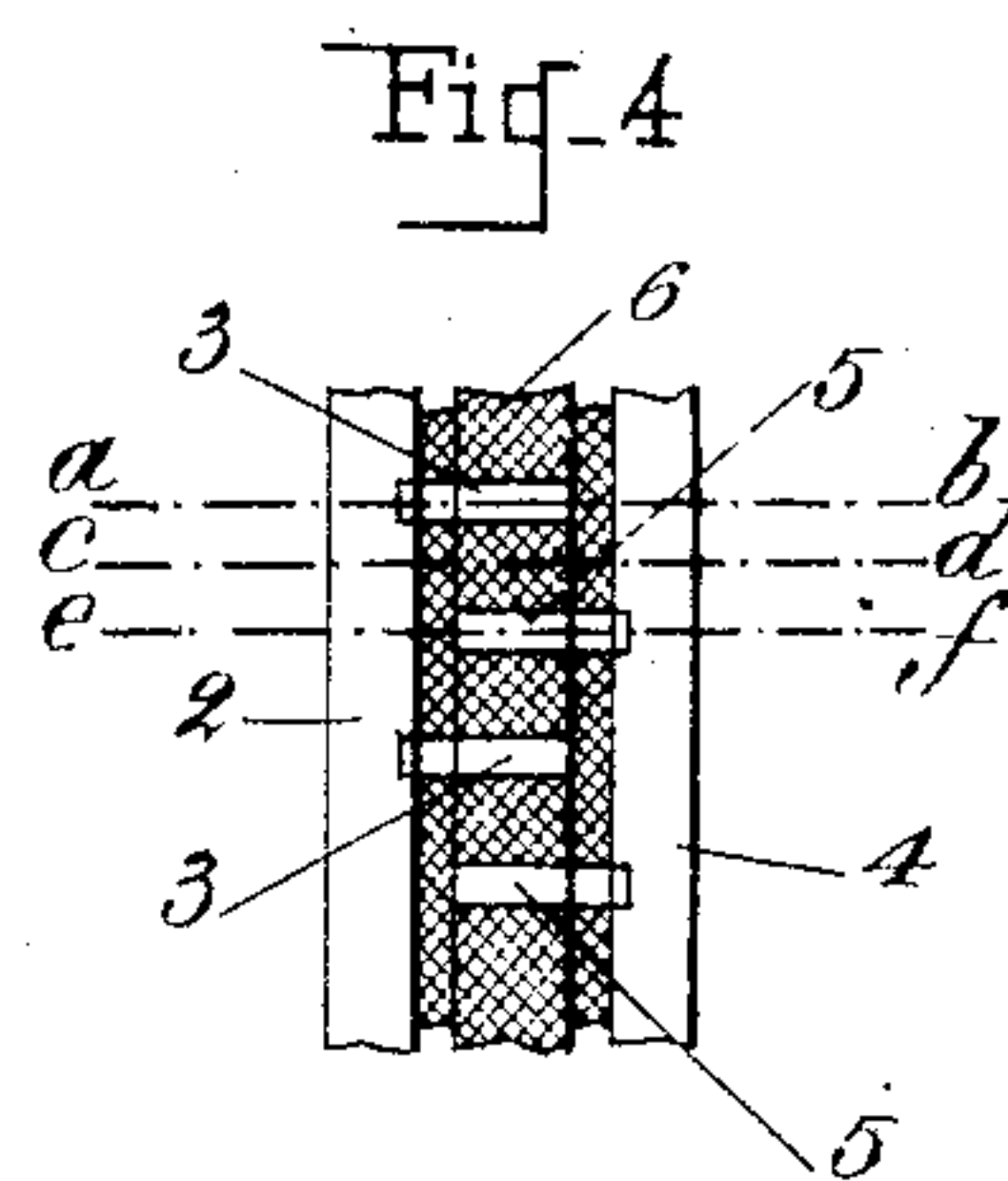
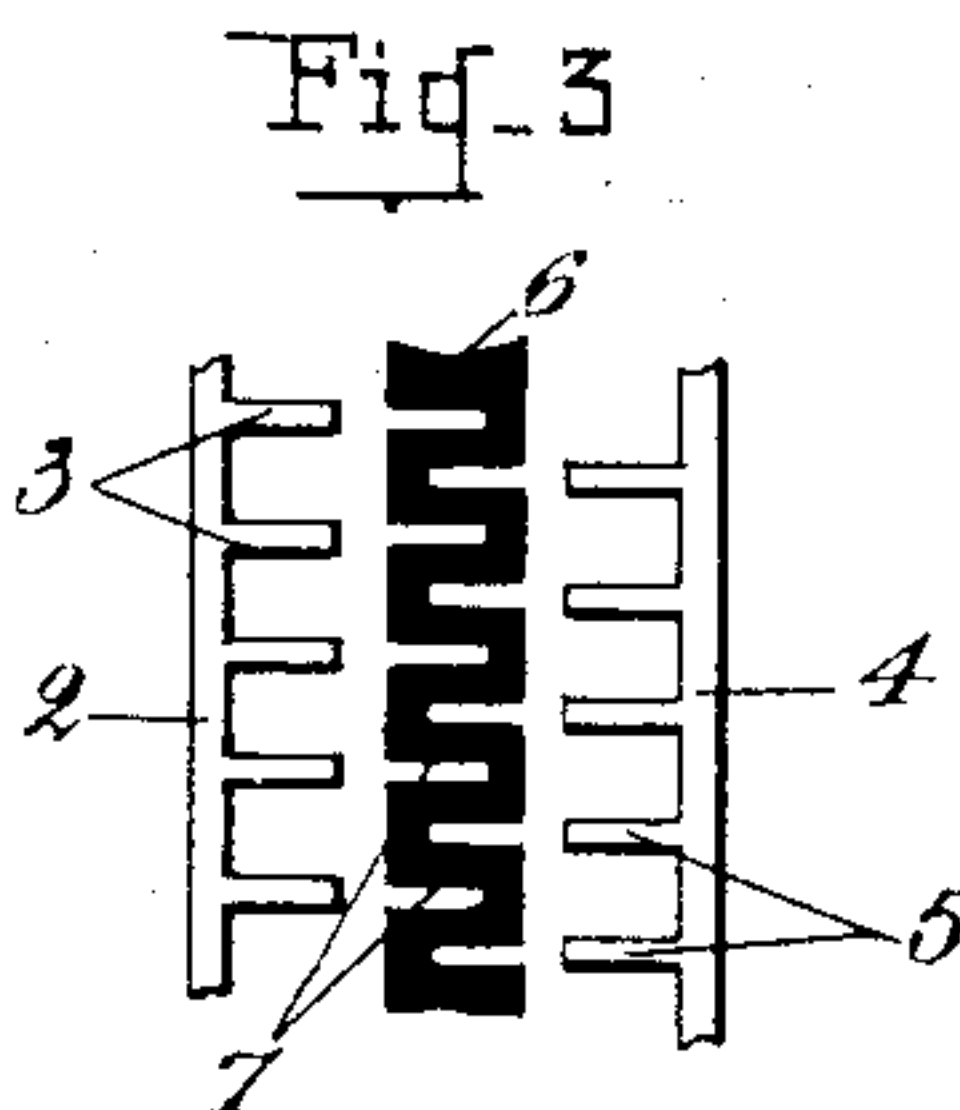
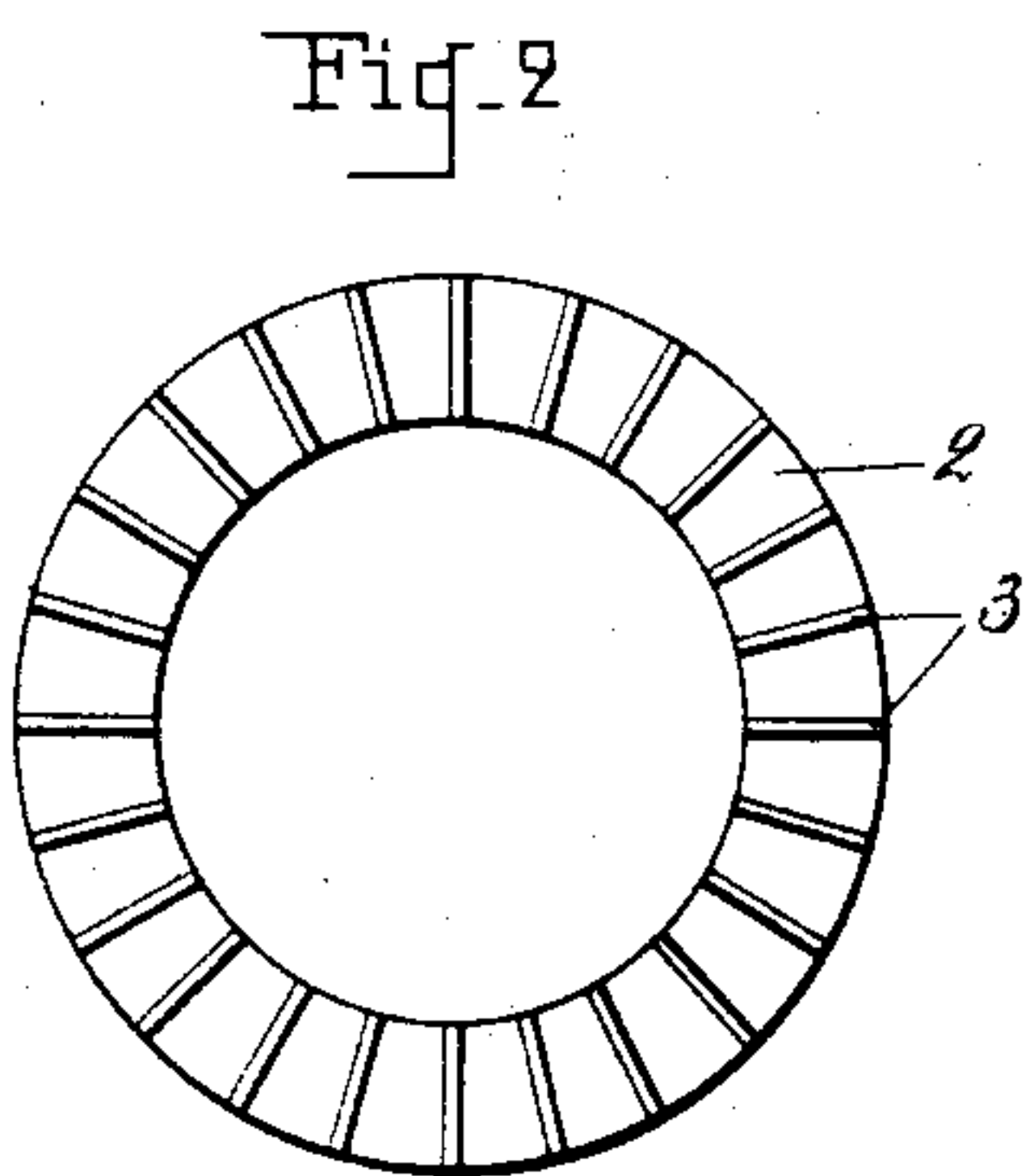
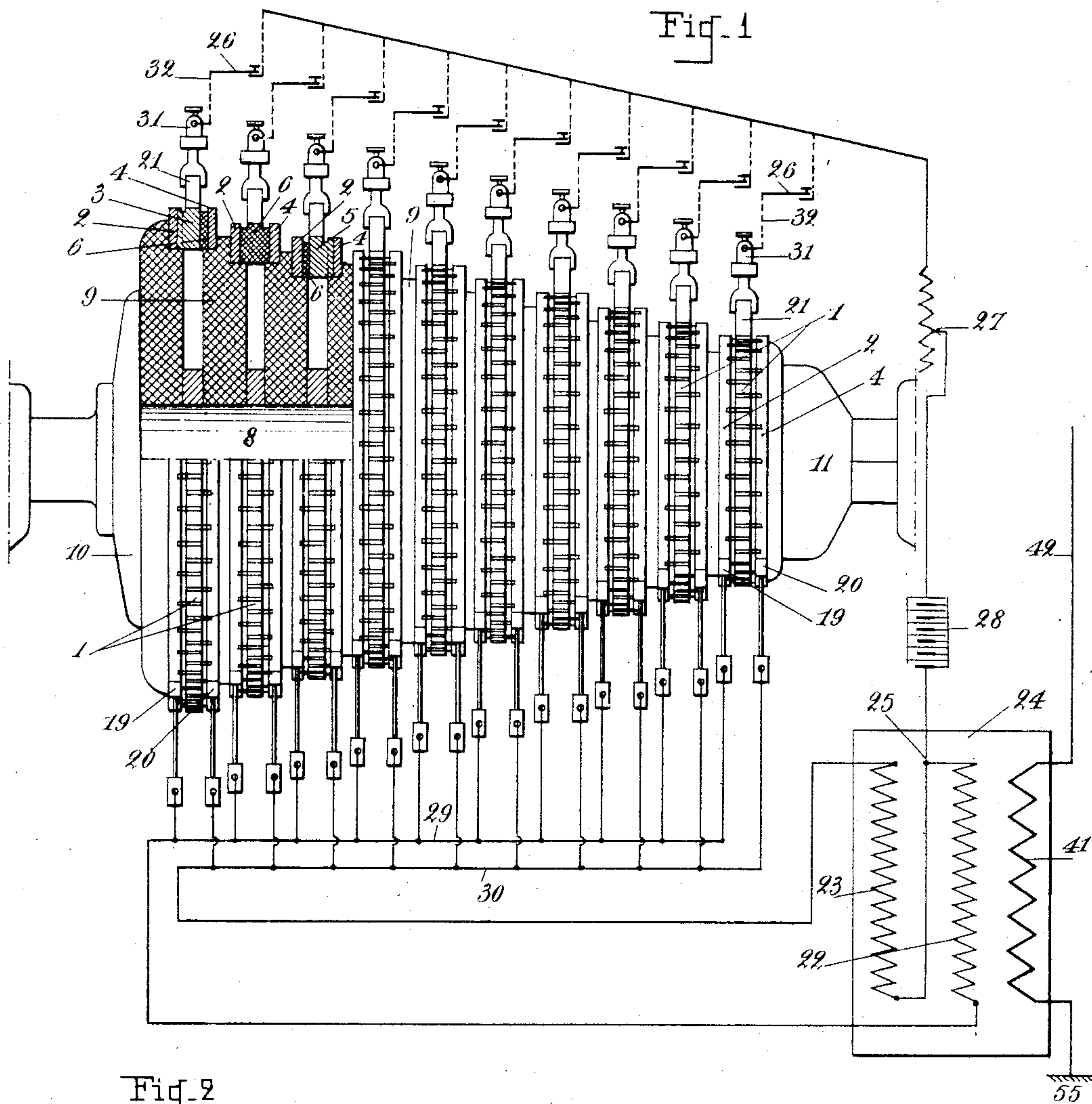


P. E. HEINA.  
TELEGRAPH APPARATUS.  
APPLICATION FILED SEPT. 12, 1903.



Witnesses.

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# UNITED STATES PATENT OFFICE.

PAUL EDOUARD HEINA, OF PARIS, FRANCE.

## TELEGRAPH APPARATUS.

SPECIFICATION forming part of Letters Patent No. 792,264, dated June 13, 1905.

Application filed September 12, 1903. Serial No. 172,868.

*To all whom it may concern:*

Be it known that I, PAUL EDOUARD HEINA, of Paris, France, have invented certain new and useful Improvements in Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an apparatus for transmitting on a single line signals generated by the simultaneous operation of any number of keys capable of transmitting on this single line alternating currents, each one being of determined and different frequencies.

The essential feature of the apparatus in question consists of a generator of alternating currents of multiple frequencies comprising a series of special commutators whereby a corresponding series of alternating currents are produced, which currents differ among themselves in frequency, each being capable of transmission through the line by the operation of a key corresponding with the current. By virtue of the known mechanical principle of the coexistence of very small undulatory movements the apparatus permits simultaneous transmission on the single line of several signals if a current of distinct frequency is used for each signal, for such currents will be propagated on the line without interference. The signals are received at the other end of the line by selecting-receivers, such as the monotelephones of the Mercadier system, a well-known form of apparatus which sounds when traversed by an alternating current the frequency of which corresponds with the number of vibrations to which the membrane of the apparatus is attuned, while it is silent when traversed by any other current. These monotelephones are particularly fitted for this purpose, and whereas they constitute a form of apparatus well known of skilled men of the art and that they form no part of my said invention it is useless to show them in the drawings. Each signal is thus received only by the monotelephone whose member can vibrate in accord with the frequency of the current transmitted to produce the signal.

The invention is illustrated by the accompanying drawings, in which—

Figure 1 is a view of the whole apparatus in which the greatest three collectors are partially broken away, respectively, on the lines *a b*, *c d*, *e f* of Fig. 4, including the complete generator and the diagrammatic installation of the accessory apparatus—source of electricity, transformer, rheostat; Figs. 2, 3, and 4, detail views of the elements of a collector.

The generator of alternating currents of multiple frequencies comprises a number of collectors 1, made in the following manner: On one face of a flat metal ring 2 are cut equidistant radial grooves obtained by means of cylindrical cutting-out, in which grooves are inserted and soldered rectangular metal plates 3 of the same width as the face of the ring. Two such rings 2 4 are fitted, with their radial plates 3 5 turned toward each other, into a ring of fiber 6, which is provided with slots 7, one to receive each plate, as indicated in Figs. 3 and 4. The compound ring thus formed is finally submitted to hydraulic pressure to fit the parts firmly together. All the collectors are similar and differ from each other only by the number of their plates. A number of such commutators are mounted on a shaft 8, each insulated from its neighbors and from the mass of apparatus in a suitable manner, such as by disks 9 between them. The whole is held against a plate 10 by the pressure of a nut 11 and turns with the angular speed imparted to the shaft 8 by any suitable motor having a sufficiently exact regulation of speed.

Against each of the collectors 1 bear three brushes 19, 20, and 21, Fig. 1, two of which, 19 and 20, bear against the metal rings 2 and 4, while the third bears against the fiber ring 6, in which are embedded the metal plates of the rings 2 and 4. Each of the brushes 19 and 20 is connected, respectively, with the end of one of two primary coils 22 23 of a transformer 24 of very low resistance and inductance, and each of the brushes 21 is connected with the middle point 25 of these coils through the intermediary of a key 26, a regulating-rheostat 27, having no self-induction,



and an accumulator 28, having a very low internal resistance. In Fig. 1 all the brushes 19 are shown mounted in parallel on the conductor 29, leading to the coil 22 of the transformer 24. All the brushes 20 are mounted in parallel on conductor 30, leading to the coil 23 of the said transformer. Each brush 21 is connected with its respective key through a terminal 31 and a wire 32.

The secondary coil 41 of the transformer 24 is connected with earth 55 at one end and with the line-wire 42.

The operation of the apparatus is as follows: At the transmitting-station the collectors 1 turn together at a common and constant angular speed, so that when one of the keys 26 is closed the primary circuits 22 23 of the transformer 24 are alternately traversed by continuous currents in opposite directions, and the secondary circuit 41 is traversed by an alternating current the frequency of which is equal to the number of inversions per second. This generator therefore sends through the wire 42 as many alternating currents as there are keys 26 closed, and each of these currents possesses a frequency proper to itself. If, now, an operator at station makes signals with the key corresponding with a frequency at 500, for example, these signals will be produced in the secondary circuit 41 of the transformer 24 and pass, on the one hand, to the earth at 55 and, on the other hand, through the line 42 at the receiving-post, in which only that telephone whose diaphragm is attuned to the frequency 500 is set in vibration, and the party using this telephone alone receives the signals corresponding with frequency 500. The apparatus therefore allows simultaneous transmission on a single line, uniting two ordinary simple or multiplex continuous-current telegraph apparatus without influencing the function of the latter. The apparatus therefore allows simultaneous transmission on a single line of signals by alternating currents differing among themselves in frequency, the number of such simultaneous transmissions being any desired and equal to the number of keys simultaneously operated at the transmitting-station and limited only by the number of collectors of the generator hereinbefore described. Nevertheless it should be understood that the apparatus which is the subject of this invention constitutes a multiple telegraphic apparatus operating with a single line connecting two ordinary continuous-current apparatus and that its application in no way necessitates the use of two wires. Finally, it may be added that there may also be placed at the disposal of the director as

means of call one of the transmissions of one of the continuous-current multiple apparatus working simultaneously with the alternating-current apparatus.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a telegraph apparatus for transmission, on a single line, of alternating currents whose respective frequencies are different; a generator of alternating currents, comprising a series of inversing collectors suitably insulated from each other; a shaft 8 on which are keyed the said collectors suitably insulated from the said shaft; brushes 19, 20 rubbing on the said collectors; an induction-transformer 24 whose two primaries 22, 23 are united to the brushes 19, 20; brushes 21 rubbing on the inversing collectors and connected with keys 26, which are connected with one of the poles of a source of electricity 28; a rheostat 27 to regulate the intensity of the said source, whose other pole is connected with the middle point of two primary coils of the transformer 24, the secondary coil of which is connected on the one side to the earth, and, on the other side to the single line 42; substantially as described.

2. In a telegraph apparatus for simultaneous transmission, on a single line, of alternating currents whose respective frequencies are different; a generator of alternating currents, comprising a series of reversing-collectors each constituted by two parallel rings 2, 4, of metals, carrying metal blades 3, bedded in insulating-ring 6, which maintains the whole, the said blades being substantially equally spaced in each of all of the said collectors, suitably insulated from each other and from the whole, and different from each other by their diameter and, therefore, by the number of their blades; an induction-transformer 24; brushes 19, 20 rubbing on the rings 2, 4 and united to the two primary coils 22, 23 of the said transformer; brushes 21 rubbing on the ring 6 and united to the middle point 25 of the two primary coils through intermediary keys 26 and of a suitable source of electricity, the secondary coil of the transformer being connected, on the one side to the earth and on the other side to the single line, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

PAUL EDOUARD HEINA.

Witnesses:

JULES FAYOLLET,  
AUGUSTUS E. INGRAM.