

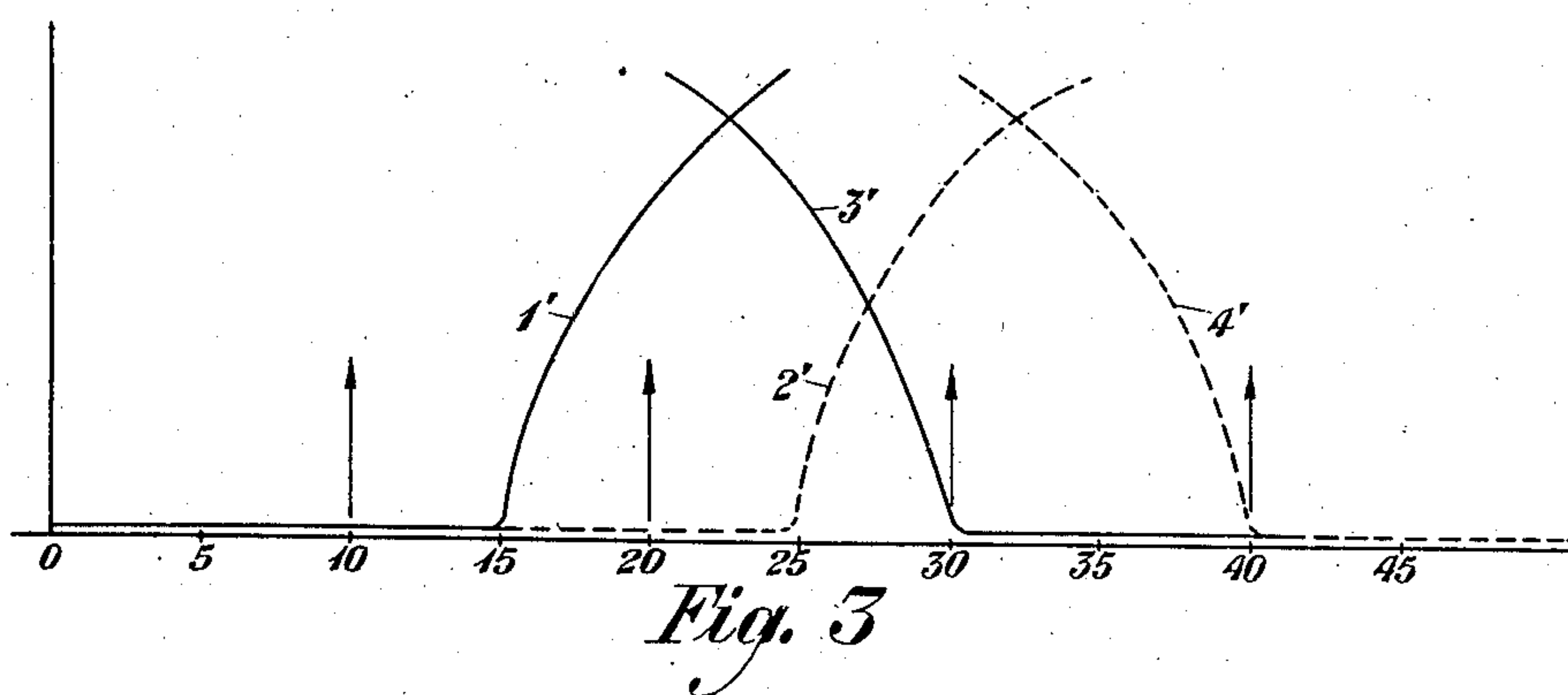
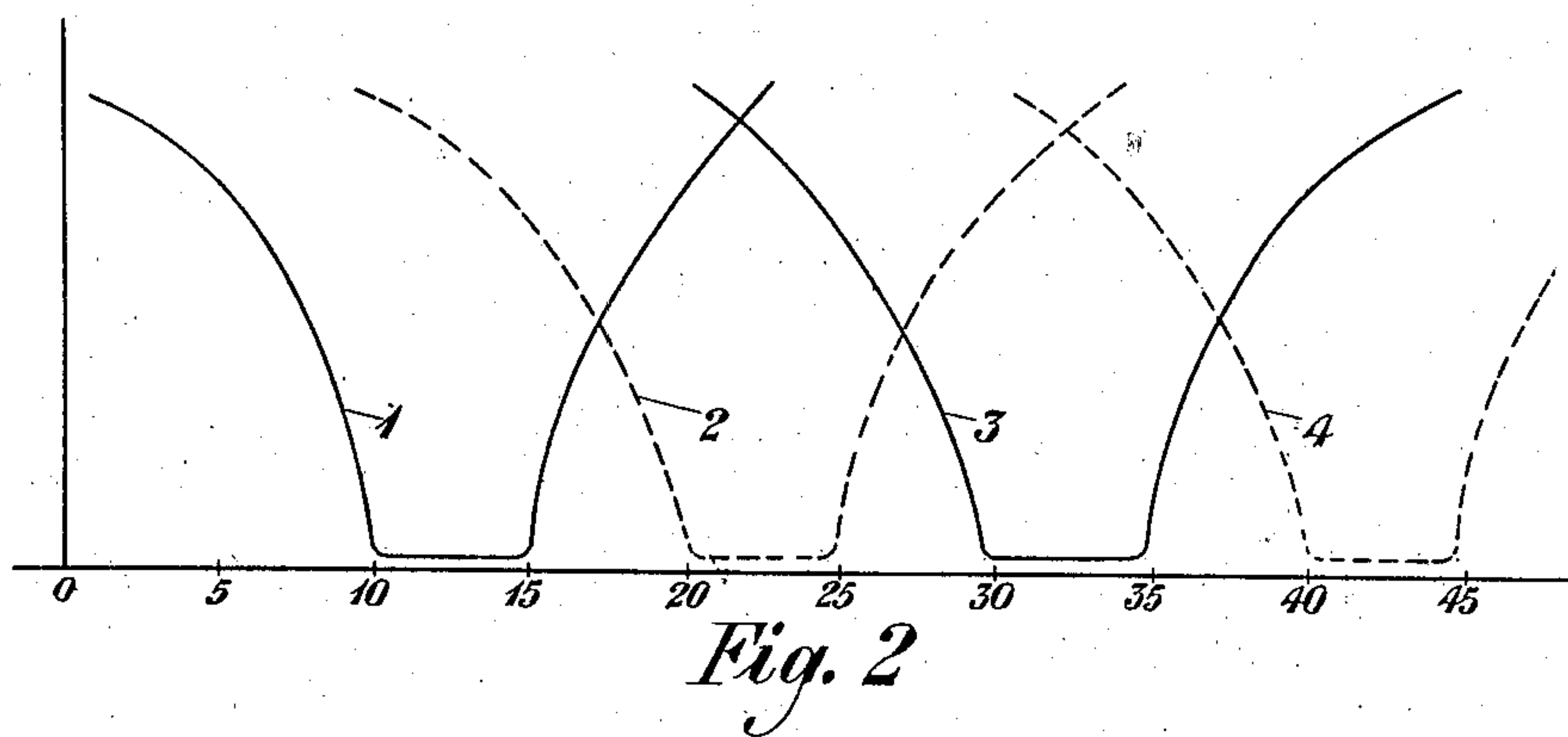
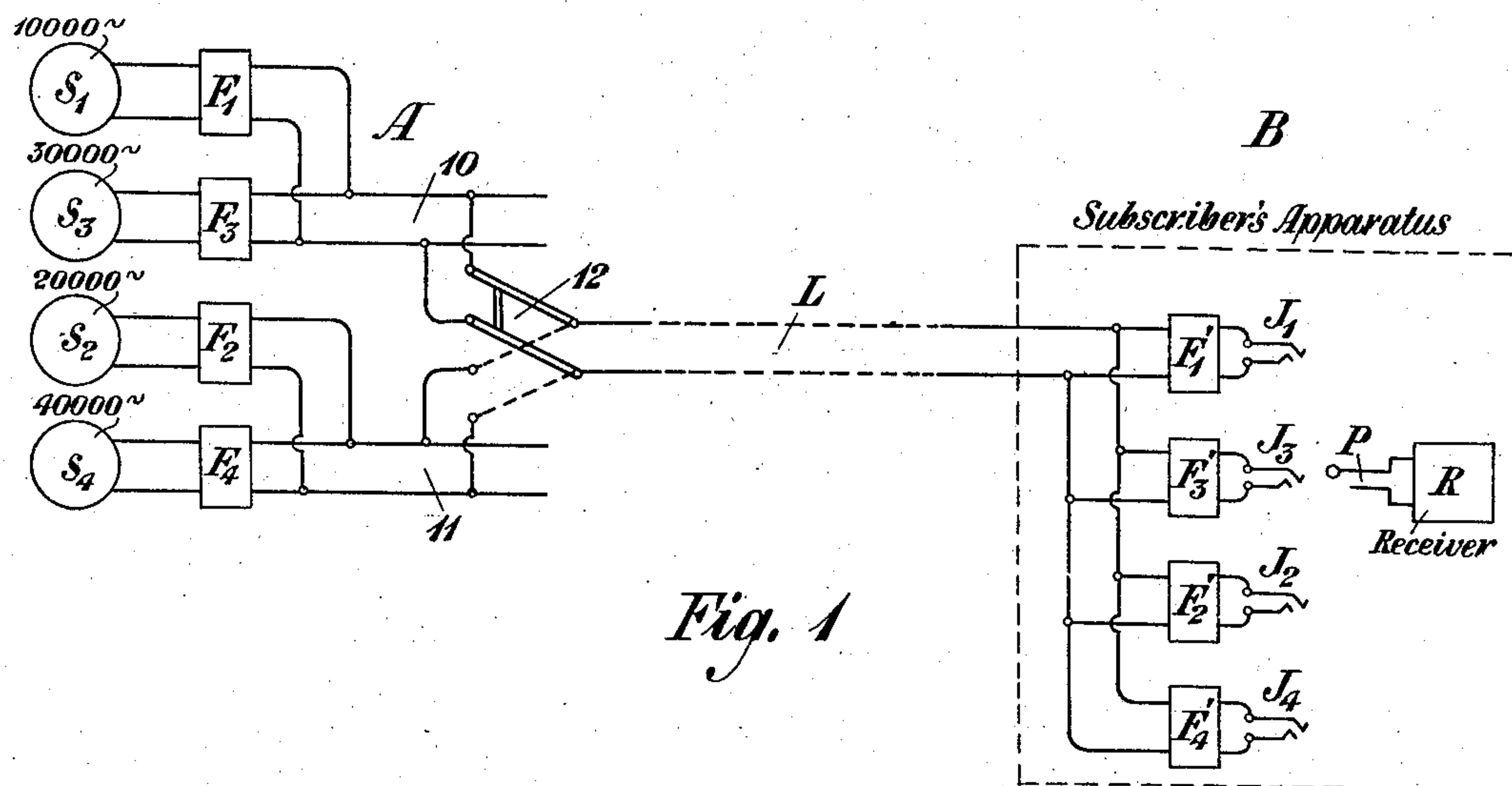
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WIRE CARRIER PROGRAM DISTRIBUTION SYSTEM

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WIRE CARRIER PROGRAM-DISTRIBUTION SYSTEM.

Application filed September 8, 1923. Serial No. 661,642.

To all whom it may concern:

Be it known that I, OTTO B. BLACKWELL, residing at Plandome, in the county of Nassau and State of New York, have invented certain Improvements in Wire Carrier Program-Distribution Systems, of which the following is a specification.

This invention relates to wire program distribution circuits and more particularly to such circuits employing carrier currents for transmitting the distributed information.

In systems of the type above referred to a plurality of different carrier frequencies are employed as carriers and upon each carrier a separate program is modulated so that by the use of suitable selective apparatus the subscriber may choose any one of a number of programs, depending upon the number of carriers employed in the system. In order that the carriers with their modulated programs may be superposed on the line the line is connected to bus-bars upon which all of the channels are impressed. In accordance with the present invention, however, it is proposed to divide the carrier frequencies into groups and apply one group of carrier frequencies to one set of bus-bars and another group of frequencies to another set of bus-bars, and provide means whereby the subscriber's line may be switched by an operator to the desired group. The subscriber may then make his own connection to any program within the group. The individual carriers of one set are preferably staggered in the frequency range between the individual carriers of the other set. This enables the use of cheaper selective devices upon the part of the subscriber because the selection is between frequencies which are more widely separated than would be the case with systems of the prior art.

The invention may now be more fully understood from reading the following description in connection with the accompanying drawing, in which Figure 1 illustrates a schematic circuit diagram illustrating the principles of the invention while Figs. 2 and 3 are curves illustrating the characteristics of the filters which may be used in accordance with the present invention.

Referring to Fig. 1, L designates a sub-

scriber's line to be used in a wire program system. At the central station A, the line is arranged to be connected to either of two sets of bus-bars 10 or 11 by means of a suitable switch 12. The program sources are shown at S_1 , S_2 , S_3 and S_4 , each program source having devices of a type well known in the art for impressing upon characteristic carrier frequencies the program to be transmitted. The sources S_1 and S_3 are connected with bus-bars 10 through the filters F_1 and F_3 while the sources S_2 and S_4 are connected to the bus-bars 11 through the filters F_2 and F_4 . For purposes of illustration the carrier frequencies characteristic of the sources are 10,000 cycles and 30,000 cycles for sources S_1 and S_3 and 20,000 cycles and 40,000 cycles for sources S_2 and S_4 . It will be seen that the carrier frequencies applied to the bus-bars 10 are, by this arrangement, twice as far apart as they would be if two adjacent carrier frequencies, such as 20,000 and 30,000 cycles, for example, should be applied to the same bus-bar, as would be the case if all four sources were connected in multiple with the same bus-bars.

At the subscriber's station four selective devices, as, for example, filters F'_1 , F'_3 , F'_2 and F'_4 are connected in multiple to the subscriber's line L and a subscriber's receiving set R is arranged to be connected to the line through any one of the filters by means of suitable switching arrangements. For purposes of illustration the switching arrangements comprise a plug P associated with the subscriber's set and jacks J_1 , J_3 , J_2 and J_4 respectively.

In order to more readily understand the advantages of the system reference is made to the curves of Figs. 2 and 3. Only two carrier frequencies will be impressed upon the subscriber's line at one time and while four different receiving filters may be provided at the subscriber's loop the rate of cut-off of each filter may be made much less sharp than if all four frequencies were impressed upon the line simultaneously. At the central office since only two filters are connected with the bus-bars and their characteristic frequencies are wide apart the cut-offs of these filters need not be so sharp.

Fig. 2 shows the characteristic curves of

a set of four filters where each filter is of the Campbell band type. If carrier frequencies of 10,000 and 30,000 cycles only are impressed upon the line it will be obvious from the curves 1 and 3 that the selectivity between the two filters which may be employed is much greater than in the case where four frequencies were on the line and separation would have to be made between closely adjacent carrier frequencies. For example, the selectivity as between the filter curves 1 and 2 is obviously much less than that between curves 1 and 3 and hence if all four carrier frequencies were present it would be necessary to provide many additional sections for each filter in order to make the cut-off sharper so that the curves of two adjacent filters would cross each other at a higher point than is the case with curves 1 and 2. It will be understood, of course, that the sharpness of cut-off of the filter depends upon the number of sections employed, the cut-off becoming somewhat sharper for each additional section employed. This means that in order to get a sufficiently sharp cut-off to afford proper selection between the first and second carriers many additional sections of the filter will necessarily have to be added. Upon the other hand, where the selection is only between the first and third frequencies sufficient selectivity between the circuits will be possible with a much smaller number of sections. Thereby, a saving will be effected in the cost of the filters, both at the subscriber's station and at the central office, although the former saving is of much greater importance than the latter.

Fig. 3 illustrates the case in which the filters employed are high pass and low pass filters. It would, of course, be absolutely impossible to use high pass and low pass filter combinations for choosing between more than two channels unless the present system were employed, as it is only possible to select between two frequencies at one time by means of a combination of high pass and low pass filters. The cut-off point of the high pass and low pass filters in this type of circuit may, as in the case of the circuit of Fig. 2, be much less sharp where only every other frequency is impressed upon the same bus-bar. It will be apparent from a comparison of the points of intersection of the curves 1' and 3' and of curves 2' and 3' that the cut-off of the curves 2' and 3', for example, would have to be much sharper to select between the channels involving 20,000 and 30,000 cycles respectively than would be necessary to select between the channels of 10,000 and 30,000 cycles respectively. Accordingly, a fewer number of sections may be used in the filters, both at the subscriber's station and at the central office.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. In a program distribution system, a plurality of program sources having different characteristic carrier frequencies, a plurality of sets of bus-bars, means to simultaneously impress certain of said frequencies upon certain of said bus-bars and means to simultaneously impress other of said frequencies upon other of said bus-bars, a transmission circuit, means to connect said circuit selectively to said bus-bars and means at a subscriber's station to discriminate between the frequencies transmitted over said transmission line from the bus-bars through which it is connected.

2. In a program distribution system, a plurality of carrier sources of different frequencies, a plurality of sets of bus-bars, means to impress certain of said carrier frequencies on one set of bus-bars and other of said carrier frequencies upon another set of bus-bars, the frequencies impressed upon one set of bus-bars being staggered with respect to the frequencies impressed upon the other, a transmission line and means to selectively associate the transmission line with any of said sets of bus-bars and a subscriber's station having selective means arranged to discriminate between the carrier frequencies simultaneously impressed upon one set of bus-bars.

3. In a program distribution system, a plurality of carrier sources of different frequencies, a plurality of sets of bus-bars, means to impress certain of said carrier frequencies on one set of bus-bars and other of said carrier frequencies upon another set of bus-bars, the frequencies impressed upon one set of bus-bars being staggered with respect to the frequencies impressed upon the other, a transmission line, means to selectively associate the transmission line with any of said sets of bus-bars and a subscriber's station having selective means arranged to discriminate between the carrier frequencies simultaneously impressed upon one set of bus-bars, said selective means being designed to give insufficient selectivity between closely adjacent carrier frequencies impressed upon different bus-bars.

4. In a program distribution system, a plurality of carrier frequency sources, a plurality of sets of bus-bars, means to impress two of said carrier frequencies upon one set of bus-bars and two other of said carrier frequencies upon another set of bus-bars, the carrier frequencies impressed upon one set of bus-bars being staggered with respect to

the other, a transmission line arranged to be selectively connected to any one of said sets of bus-bars and a subscriber's station associated with said line, said subscriber's station comprising high pass and low pass filters for selectively transmitting into separate channels the two carrier frequencies impressed upon any set of bus-bars to which the line is connected.

In testimony whereof, I have signed my name to this specification this 5th day of September, 1923.

OTTO B. BLACKWELL.