

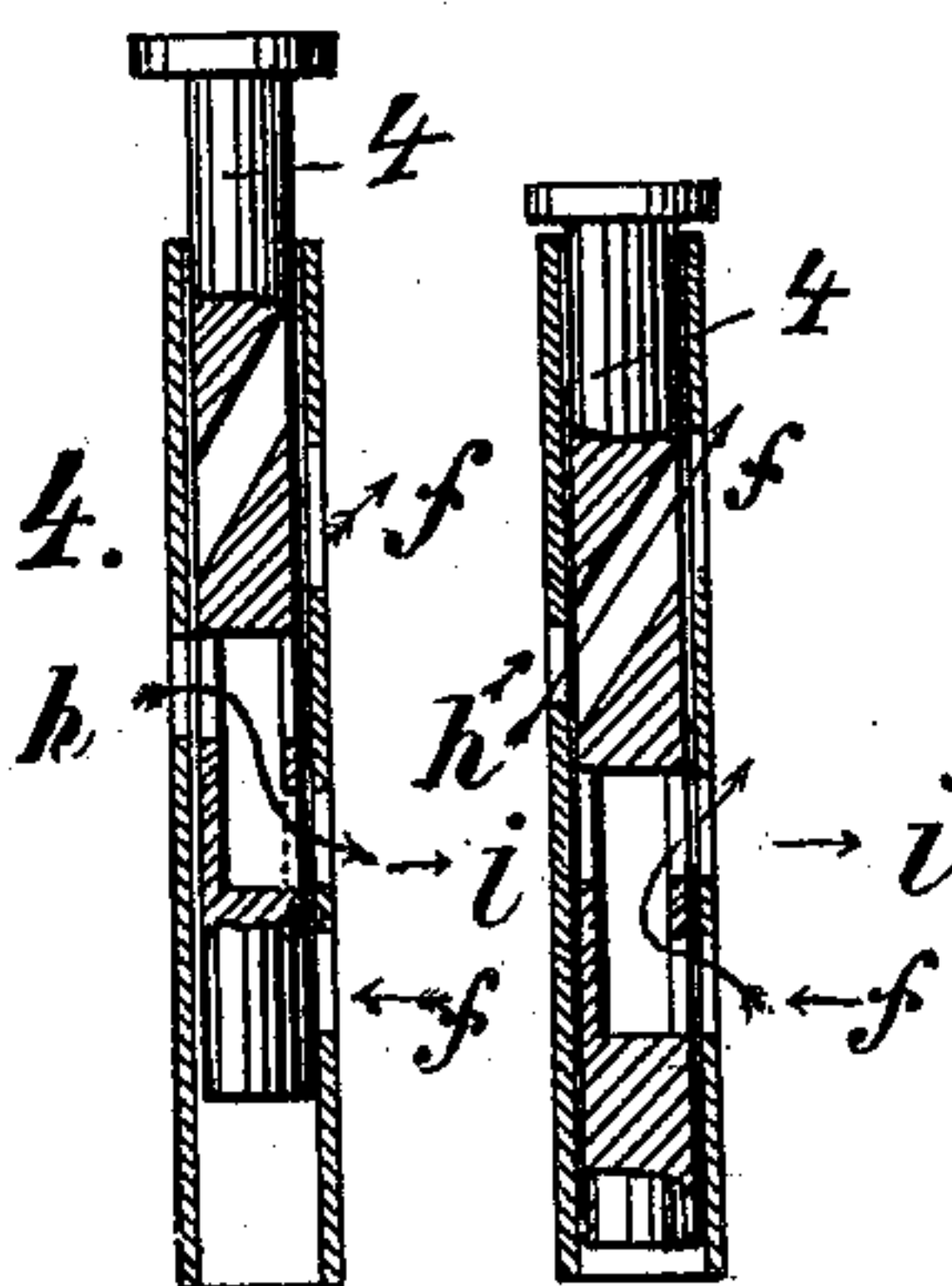
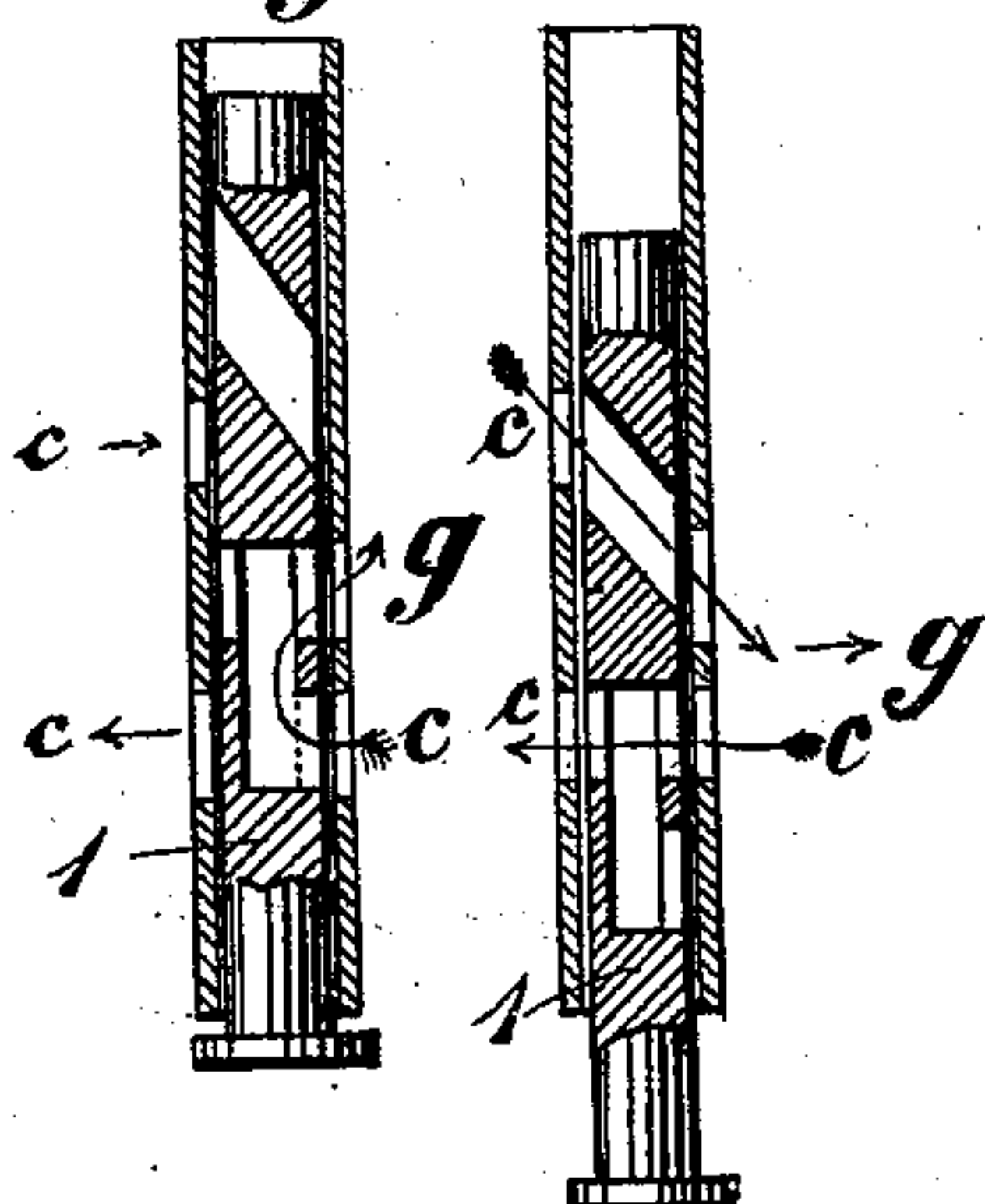
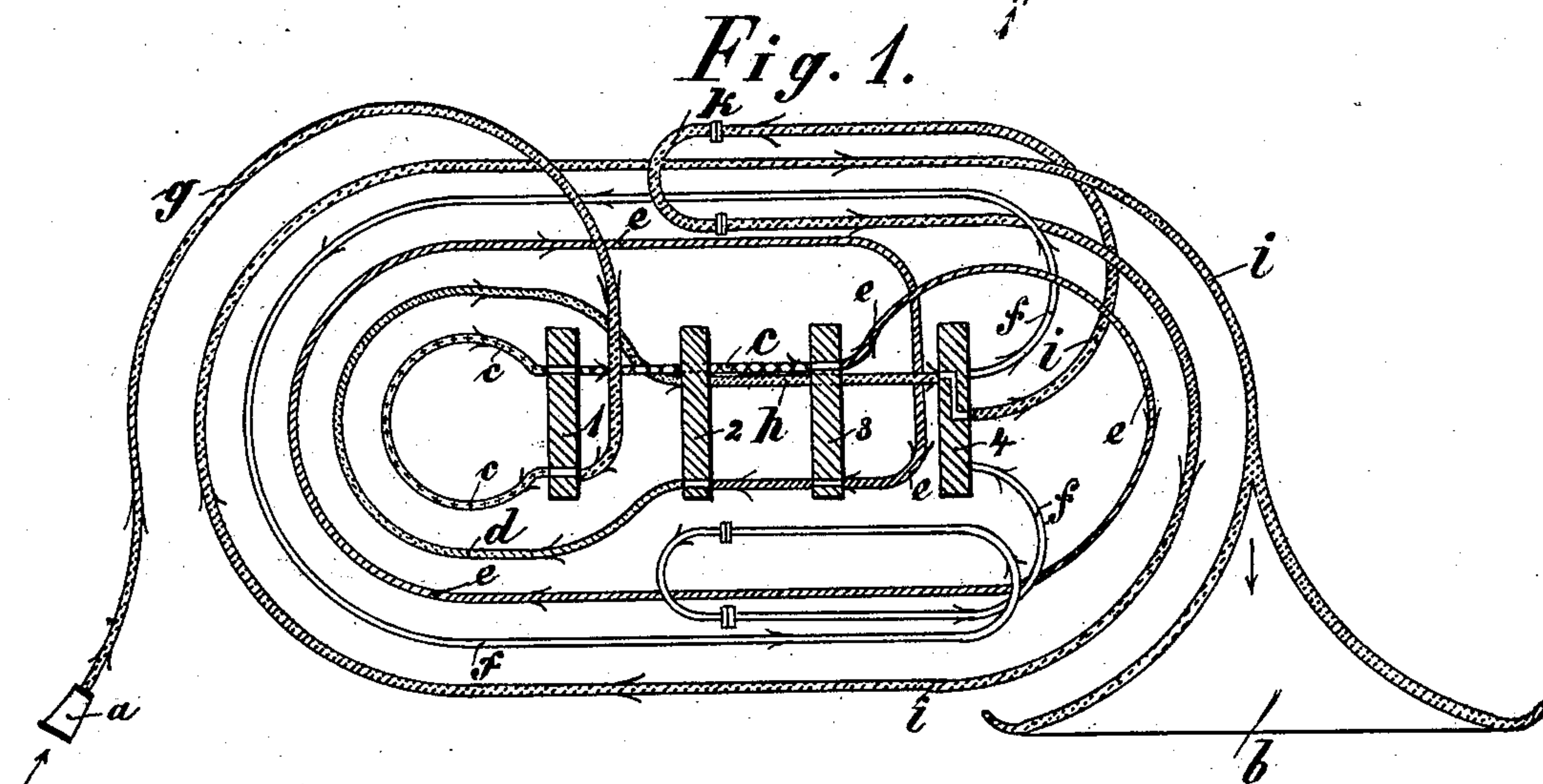
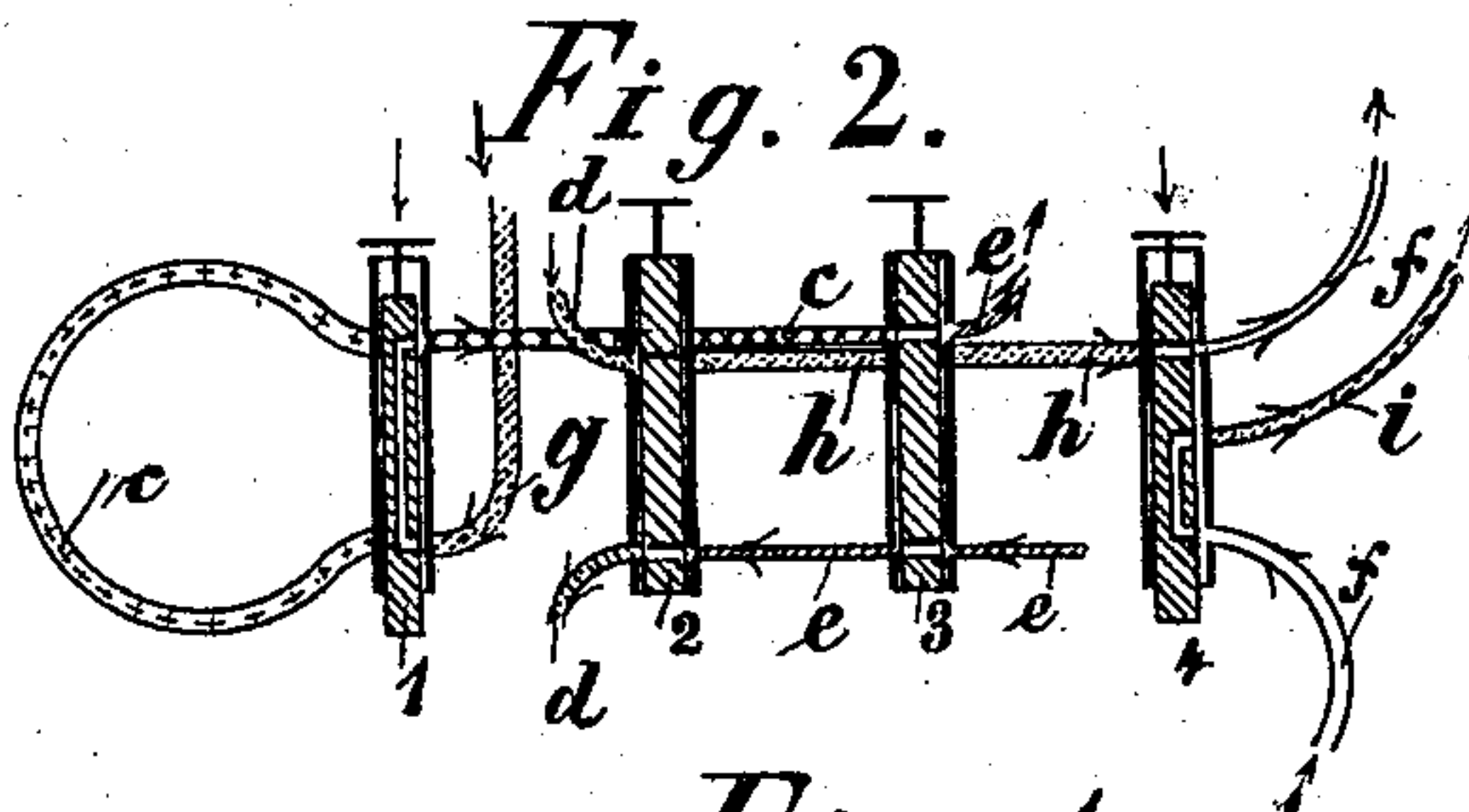
No. 691,783.

Patented Jan. 28, 1902.

J. P. KOCH.
WIND INSTRUMENT.

(Application filed Nov. 27, 1899. Renewed Dec. 17, 1901.)

(No Model.)



Witnesses
Clarence & Achely,
y
Frank S. Ober



Inventor
Jens P. Koch
by Wm. A. Rosenbaum
att'y.

UNITED STATES PATENT OFFICE.

JENS PETERSEN KOCH, OF HAMBURG, GERMANY.

WIND INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 691,783, dated January 28, 1902.

Application filed November 27, 1899. Renewed December 17, 1901. Serial No. 86,238. (No model.)

To all whom it may concern:

Be it known that I, JENS PETERSEN KOCH, a citizen of Germany, residing at Hamburg, in the Empire of Germany, have invented certain new and useful Improvements in Wind Instruments, of which the following is a specification.

The wind music instruments hitherto made are provided with valves by which the key tone can be lowered. In the case of horns especially this tone can be changed by providing tuning-slides of greater or less length.

This invention relates to a wind instrument in which only one valve for lowering the key tone is used, but several valves for raising the same. This arrangement permits of a combination that enables the instrument to cover a complete octave in excess of instruments hitherto constructed without using the tuning-slides so considerably increasing the weight of present instruments. An example of the air-duct for a French horn with such an arrangement of the valves is shown in the drawings.

Figure 1 is a diagram showing the complete course of the air when the valves are not actuated; Fig. 2, a diagram of the valves, of which the first and fourth are shown in action; Fig. 3, a section of one of the valves designed to raise the tone, shown in both the normal position and the position of action; Fig. 4, a section of the valve that lowers the tone, shown likewise in both the inactive and active positions. Fig. 5 is a notation of an extract of the A-horn part in Beethoven's "D Symphony No. 2," to be further referred to below.

As will be evident from Fig. 1, there are four valves 1, 2, 3, and 4 in this example, of which 1, 2, and 3 correspond to that shown in Fig. 3 and 4 to that shown in Fig. 4. Instead of these valves, however, the common slide-lever or cylindrical valves can be used. The instrument is so constructed that when the valves are not actuated the air blown in at the mouthpiece *a* must fill the entire length of the air-ducts up to the funnel-piece *b*, with the exception of the part *f*, that is connected with the fourth valve and by which the fundamental tone is lowered. This part *f* can be opened by the valve 4 and lowers the tone

two and one-half tones, whereas by the valve 1 it can be raised one-half tone, by the valve 2 raised one full tone, and by the valve 3 two full tones. By combination the instrument can accordingly be raised one-half, one, one and one-half, two, two and one-half, three, and three and one-half tones, and by using valve 4, together with the valves 1, 2, and 3, according to requirements, it can be lowered one-half, one, one and one-half, two, and two and one-half tones. As is well known, the fundamental tone of the horn is raised by shortening the air-duct and lowered by lengthening the same. The operation of the present horn will accordingly be evident by examining the diagram of the air-ducts given in Fig. 1. In order to facilitate the understanding of this figure, it should be stated that for constructional reasons the air-ducts do not pass direct from the valve 1 to the valve 2, but first to the valve 3. This fact, however, will not alter the principle. Further, the tubes of the instrument are in reality arranged in easy circular curves and not so wide apart as in the diagram. The air passes from the mouthpiece *a*, through the duct *g*, to the valve 1, which is open in Fig. 3, and permits the passage of the air to the duct *c*, from which it passes to the valve 3. Through this valve the air passes into the duct *e* back to the valve 3, passing to the valve 2, from whence it passes through the duct *d* to the duct *h*, that opens into the valve 4. The valve 4 takes the position shown in Fig. 1 when not actuated, (the first position shown in Fig. 4,) and in this position the air passes to the duct *i*, which is provided with a tone-duct *k* and leads to the funnel-piece *b*. The position of the valves shown in Fig. 2 will lower the fundamental tone through two tones. It is apparent that on pressing down the fourth valve the tone is lowered through two and one-half tones, and this again is raised through one-half tone by pressing down the first valve. On examining Fig. 2 it will be found that the air from the duct *g* does not now pass into the duct *c*, but through the valve 1 direct to the valve 3. It then passes through the duct *e*, valve 2, and ducts *d* and *h* to the valve 4, by which it is admitted into the duct *f*, after

passing through which it returns to the said valve 4 again, finally passing through the duct *i* to the funnel-piece *b*.

Whereas it has hitherto been necessary in order to augment the range of tone to meet requirements to provide various tuning-slides, by which the length of the air-duct is increased, and whereas, further, the intonation of certain series of tones, especially of high tones, has hitherto occasioned considerable difficulty, in the present invention the use of the tone-lowering valve in combination with the tone-raising valves provides an instrument that can meet the strictest requirements of practice without necessitating the use of inconvenient assisting agents and without even approximately occasioning the difficulty hitherto experienced in playing certain passages.

With regard to the convenience in playing and the musical advantages of this arrangement the following examples will furnish exhaustive explanation. In a French horn in F with change-valves or tuning-slides in the middle of the instrument or in any similar horn in F the tones C, E, G, C of the C-horn are F, A, C, and F. This horn has three valves for raising the F tone to upper C and a fourth for lowering the F tone to lower C. The first valve raises the fundamental tone through one-half tone, the second through one tone, the first and second through one and one-half tones, the third through two tones, the first and third through two and one-half, the second and third through three and one-half, and all three together through three and one-half. The fourth valve lowers the fundamental tone to lower C thus through two and one-half tones. This lowered tone can be raised again by the first three valves, so as to complete the range of the lower-tone ducts from C to F. The fourth tuning-slide, which is inserted by pressing the fourth valve, lowers the fundamental tone of the horn to lower C. The tones are C, E, G, C and are sounded as G, B, D, G. The first and fourth valves together: The first valve raises the fourth through one-half tone, and the fundamental tone is changed into C-sharp. The tones are C-sharp, E-sharp, G-sharp, C-sharp and are intonated as G-sharp, B-sharp, D-sharp, G-sharp. The second and fourth valves together: The second valve raises the fourth through one tone, and the fundamental tone is thus changed into D. The tones are D, F-sharp, A, D and are sounded as A, C-sharp, E, A. The first, second, and fourth valves together: The first and second raise the fourth through one and one-half tones and change the fundamental tone into E-flat. The tones are E-flat, G, B, E-flat and are sounded as B, D, F, B. The third and fourth valves together: The third raises the fourth through two tones, and the fundamental tone is thus changed into E. The tones are E, G-sharp, H, E and are sounded as H, D-sharp, F-sharp, H. When no valve is in action, the fundamental

tone is F. The air now passes through the three valve-ducts. By actuating the valves these ducts can be shut off, and thus shortened to give upper C. As just stated, when no valve is actuated the horn is in F. The tones are F, A, C, F and are intonated as C, E, G, C. The first valve raises the fundamental tone through one-half tone, and the horn is changed into F-sharp. The tones are F-sharp, A-sharp, C-sharp, F-sharp and are played as C-sharp, E-sharp, G-sharp, C-sharp. The second valve raises the fundamental tone through one tone, and the horn is changed into G. The tones are G, B, D, G and are sounded as D, F-sharp, A, D. The first and second valve raise the fundamental tone through one and one-half tones, and the horn is changed into A-flat. The tones of the scale are A-flat, C, E-flat, A-flat and are sounded as E-flat, G, B, and E-flat. The third valve raises the fundamental tone through two tones and changes the horn into A. The tones are A, C-sharp, E, A and are sounded as E, G-sharp, H, E. The first and third valves raise the fundamental tone through two and one-half tones and change the horn into B-flat. The tones are B-flat, D, F, B-flat and are sounded as F, A, C, F. The second and third valves raise the fundamental tone through three tones and change the horn into B. The tones are B, D-sharp, F-sharp, F and are sounded as F-sharp, A-sharp, C-sharp, F-sharp. All three valves together raise the fundamental tone through three and one-half tones, and thus change the horn into upper C. The tones are C, E, G, C and are sounded as G, H, D, G. In spite of all these various changes of the fundamental tone from lower C to upper C the whole horn with four valves has a length about twenty-five centimeters less than the F-horns with the valves usually used and covers nearly an entire octave more.

The horn has been named, like every other instrument, whether of metal or wood, according to the scale C-natural. It is remarkable, however, that whereas nearly all instruments have the semitones close together, in brass wind instruments it is not so. For example, in the violin the lowest tone commences with the open G string. On grasping G-sharp the string will be shortened for a distance corresponding to half a tone. This is similar in all instruments with the exception of metal wind instruments. If after sounding C, C-sharp is to be given, the instrument is lengthened for a distance corresponding to three full tones, although it appears that in order to sound C-sharp the tube should be shortened through a distance corresponding to half a tone instead of lengthening it for three tones.

We may now consider the present F-horn having three valves. This horn is called an "F-horn" because the tones C, E, G, C of the scale C-natural, which are sounded without actuating any valve or tuning-slide, are F, A,

C, F. The second valve or tuning-slide lowers the fundamental tone of the instrument through one-half tone, and the horn is thus changed into E. The tones are E, G-sharp, H, E and are sounded as B, D-sharp, F-sharp, B. The first tuning-slide lowers the fundamental tone of the instrument through one tone, and the horn is thus changed into E-flat. The tones are E-flat, G, B, E-flat and are sounded as B, D, F, B. The first and second or third tuning-slide lower the fundamental tone and change the horn into D. The tones are D, F-sharp, A, D and are sounded as A, C-sharp, E, A. The second and third tuning-slide lower the fundamental tone through two tones, and it is thus changed into D-flat. The tones are D-flat, F-flat, A-flat, D-flat and are sounded as A-flat, C, E-flat, A-flat. The first and third tuning-slide lower the fundamental tone through two and one-half tones, and it is thus changed into C. The tones are C, E, G, C and are sounded as G, H, D, G. All three valves together lower the fundamental tone through three tones, and the fundamental tone is thus changed into B. The tones are B, D-sharp, F-sharp, B and are sounded as F-sharp, A-sharp, C-sharp, F-sharp.

From this it appears that in the present instruments the lower-tone ducts from F to B can be inserted by the valves; but there is no upper-tone duct. The lower tones do not as

a rule occasion difficulty, but only the upper, and it is for this reason necessary that the A-horn be raised two tones, and in order to permit of the playing of all the tones that occur to lower the horn through two tones. 35

In the "Symphony No. 2 in D" from Beethoven there is an A-horn part in Fig. 5 that illustrates the efficiency of the present invention. 40

What I claim, and desire to secure by Letters Patent of the United States, is—

A wind instrument provided with valve-chambers, loops of tubing beginning and ending in said chambers, and through which the air-circuit normally leads, and valves in said chambers adapted to cut the loops out of the air-circuit to thereby raise the tone, in combination with another valve-chamber, a loop of tubing beginning and ending in the chamber and normally out of the air-circuit and a valve in said chamber adapted to cut said loop into the air-circuit to thereby lower the tone, whereby by the use of the several valves in combination, the various tones can be produced without the use of tuning-slides. 45 50 55

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

JENS PETERSEN KOCH.

Witnesses:

F. HAIRIG,
AUGUST LÜHRS.