

G. H. UNDERHILL.
SOUND REPRODUCING OR SOUND RECORDING MACHINE.
APPLICATION FILED JUNE 11, 1904.

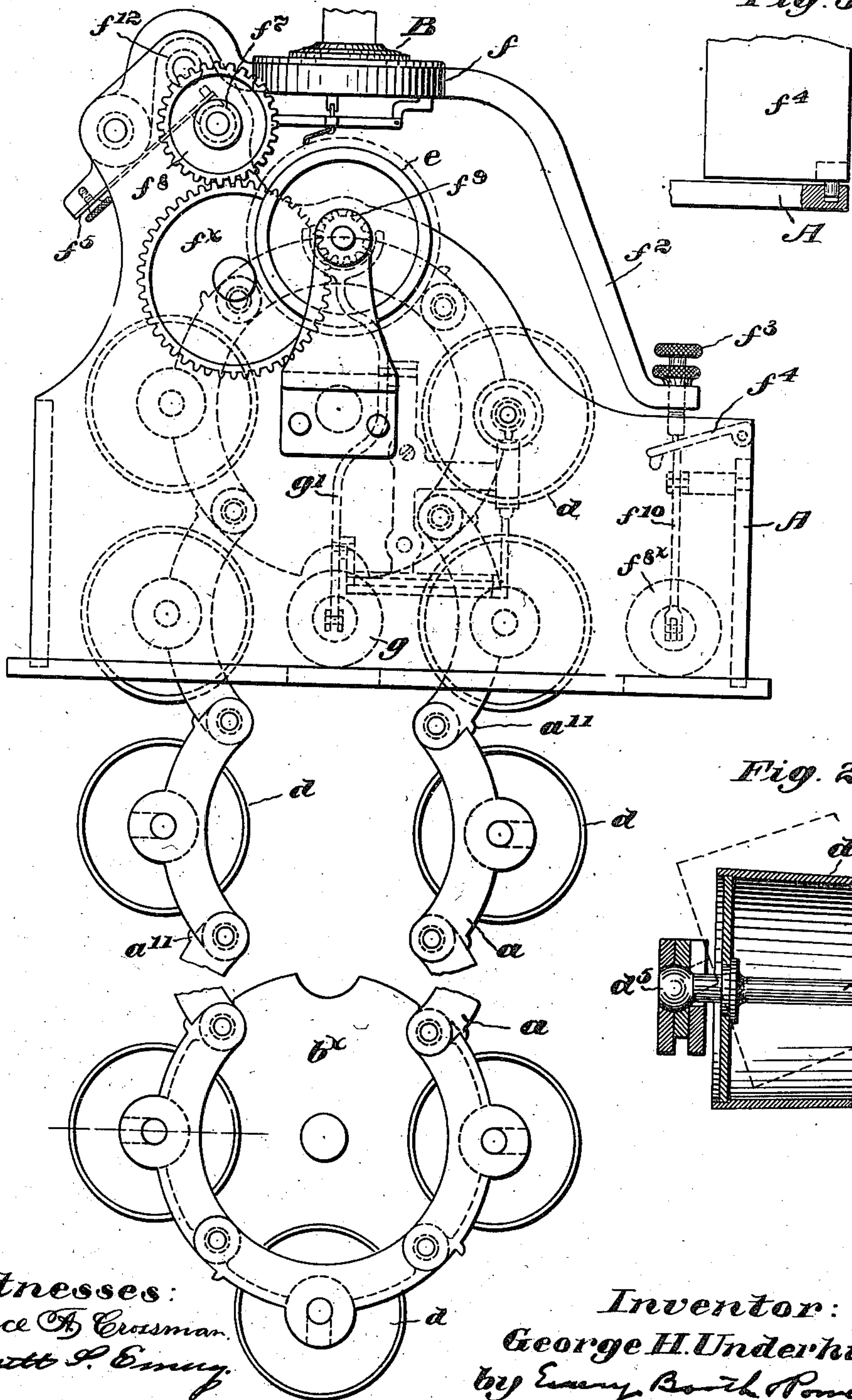
989,737.

Patented Apr. 18, 1911.

5 SHEETS—SHEET 1.

Fig. 1

Fig. 3



Witnesses:
Horace H. Crossman.
Ernest P. Emery.

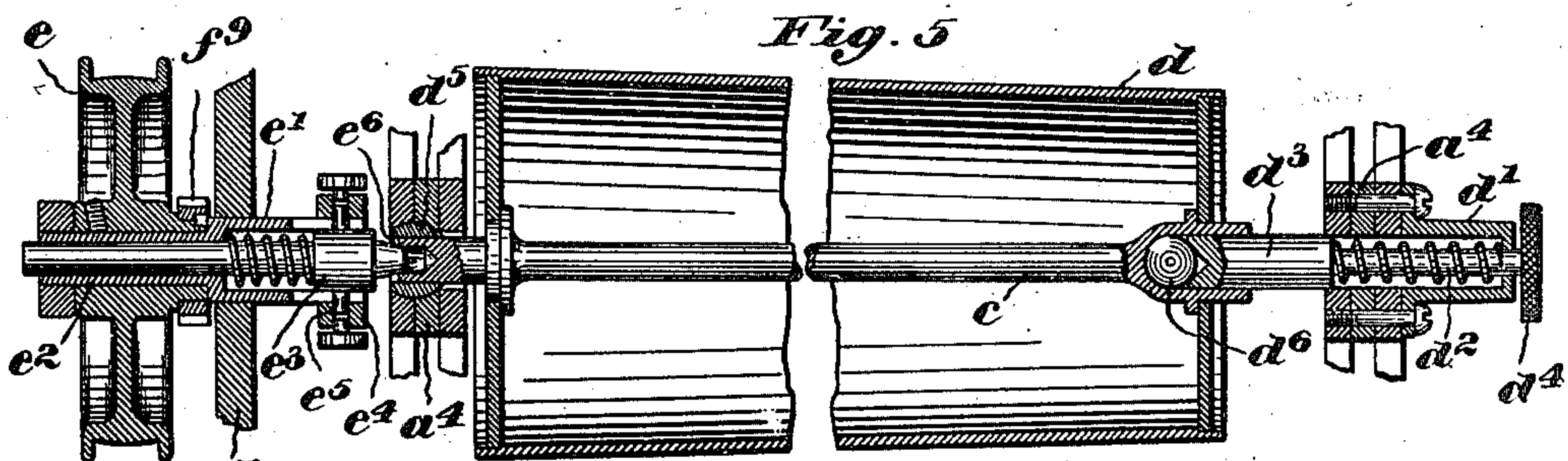
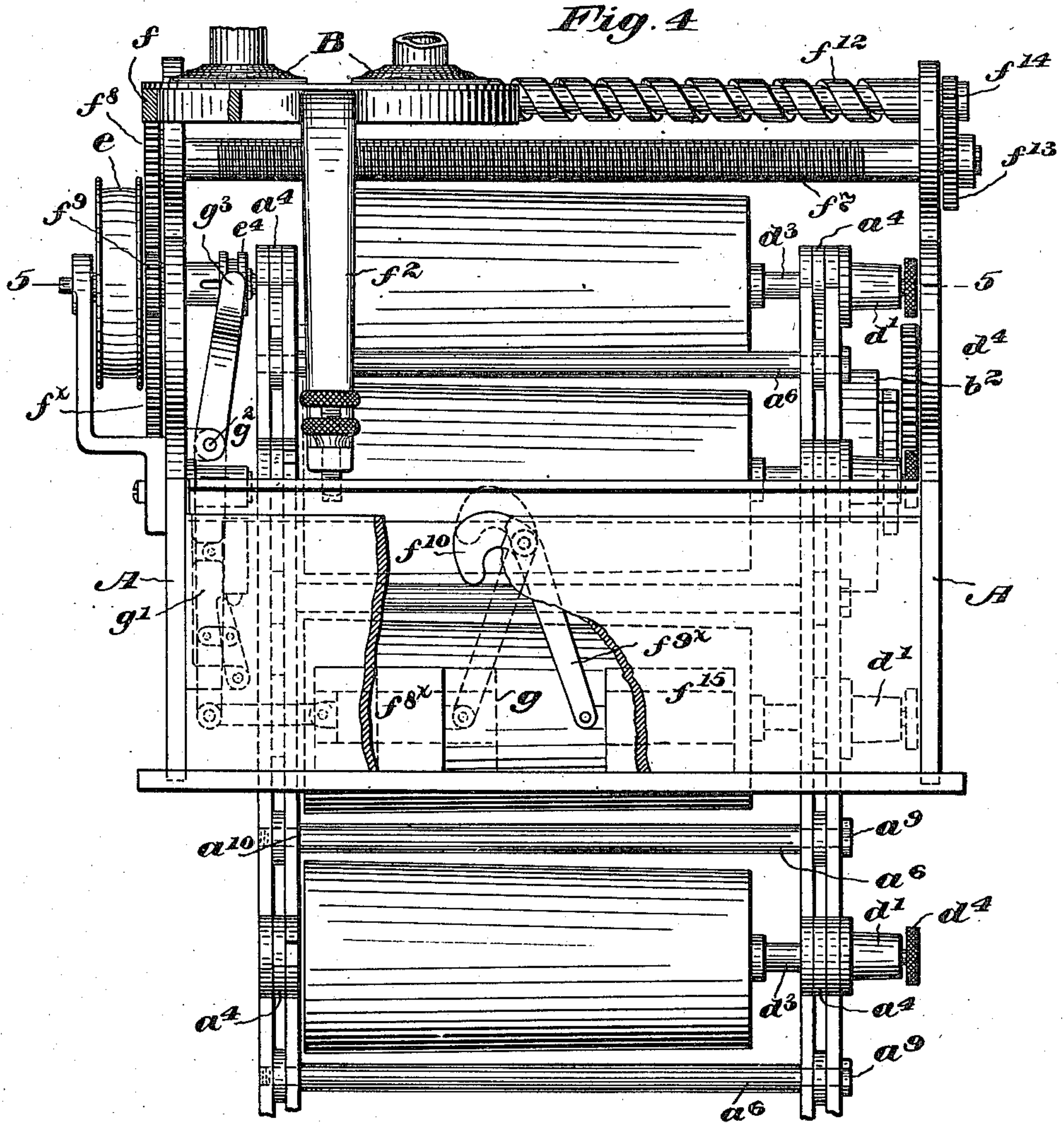
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5 SHEETS—SHEET 3.

Fig. 6

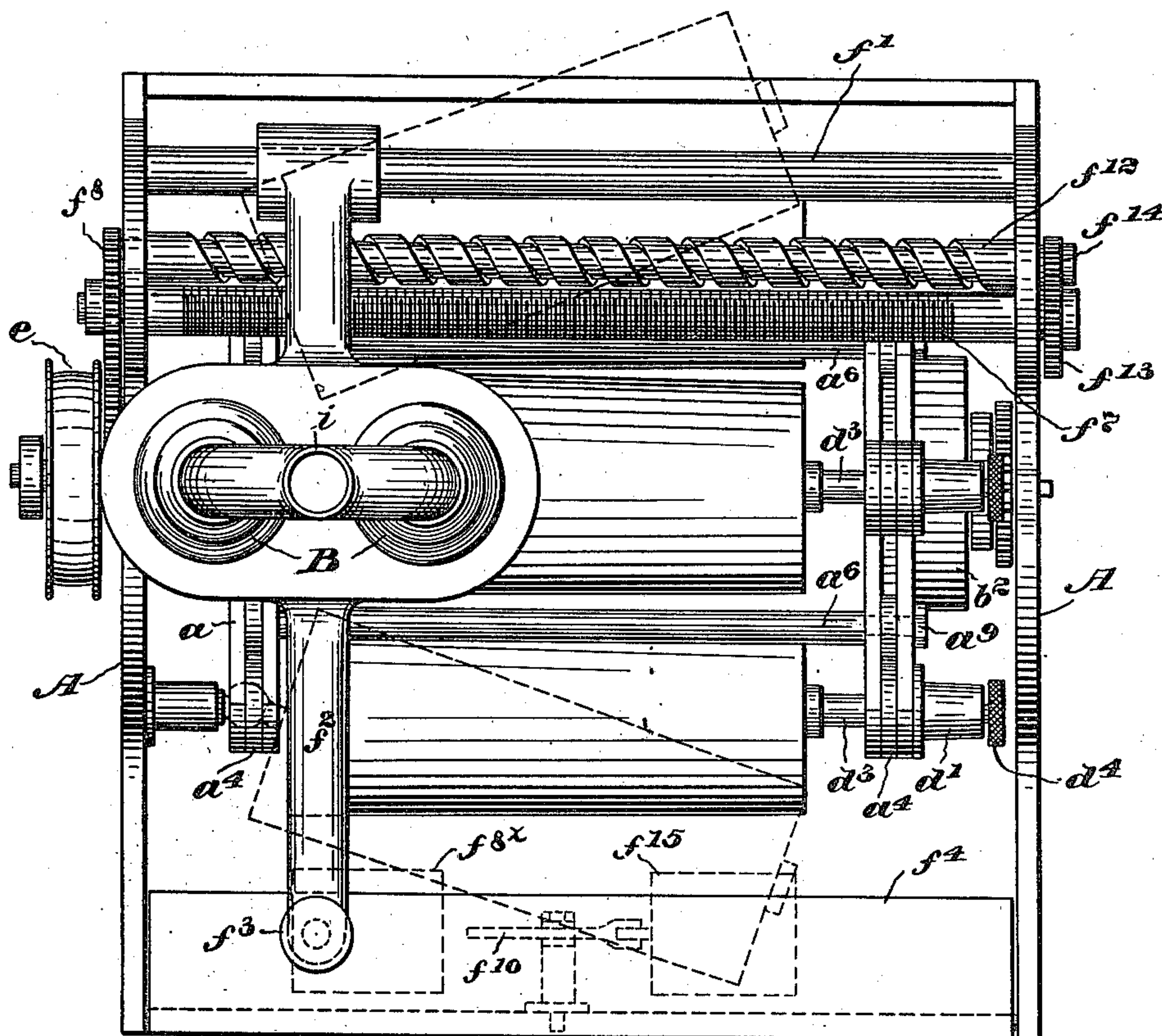
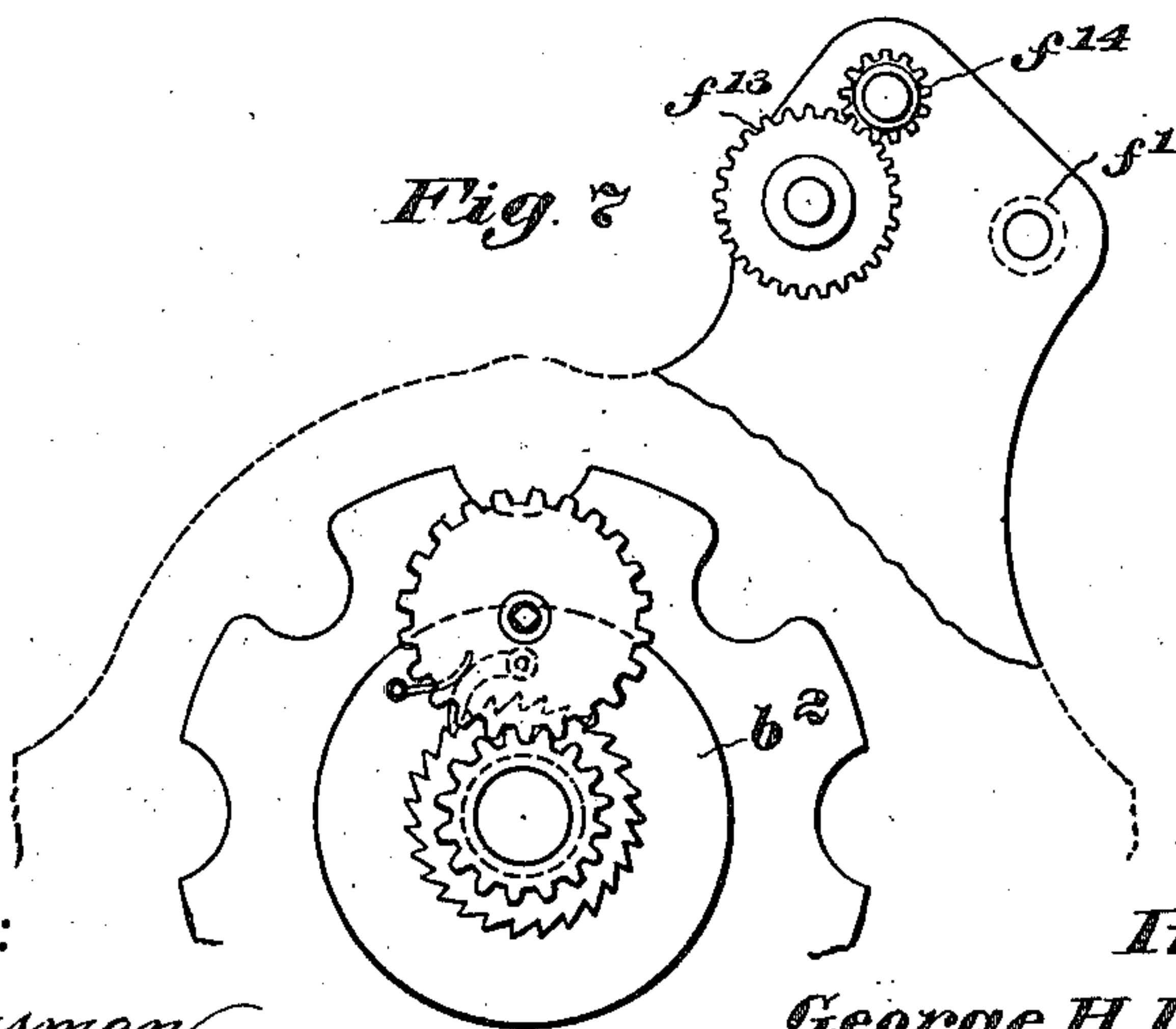


Fig. 7



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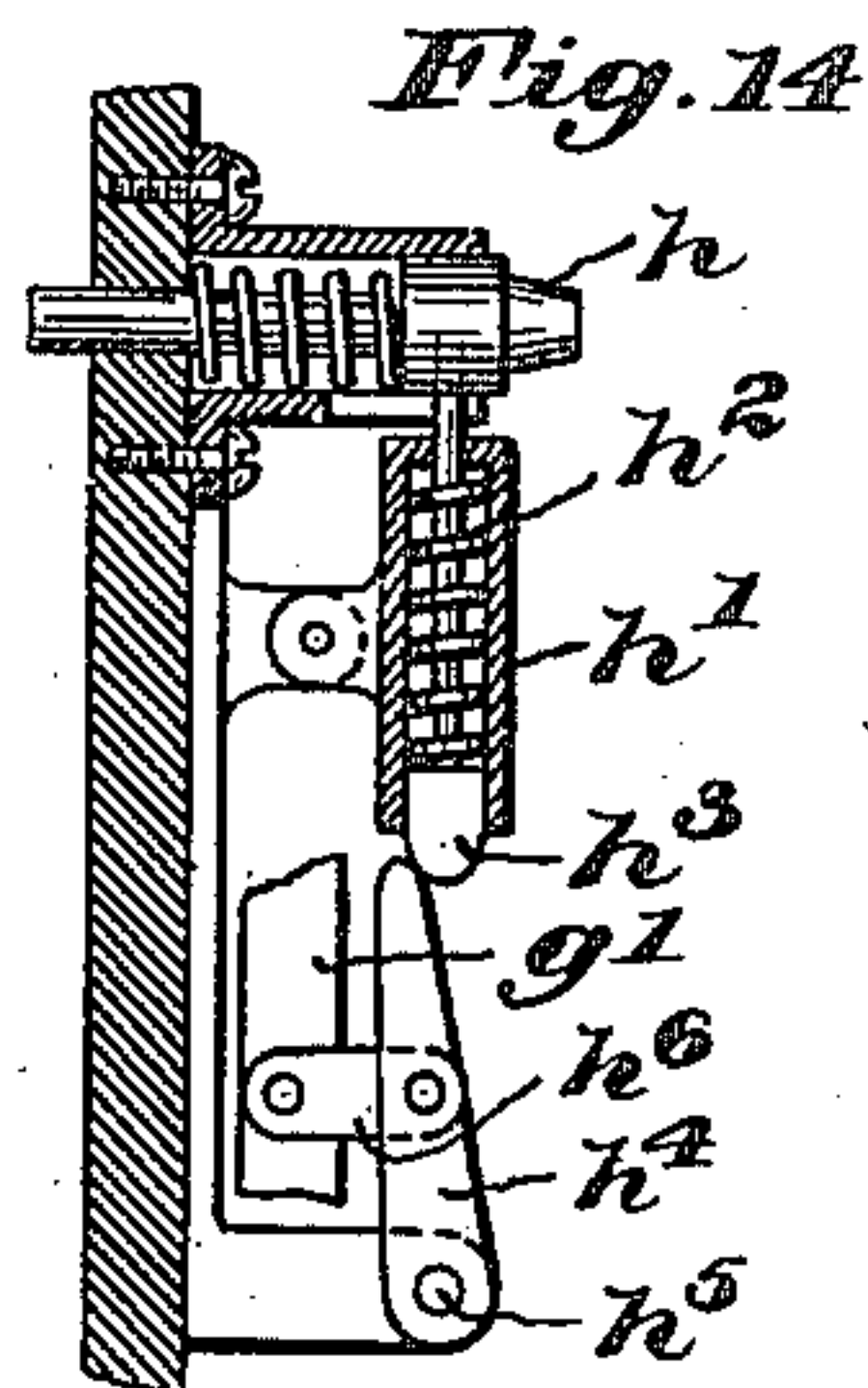
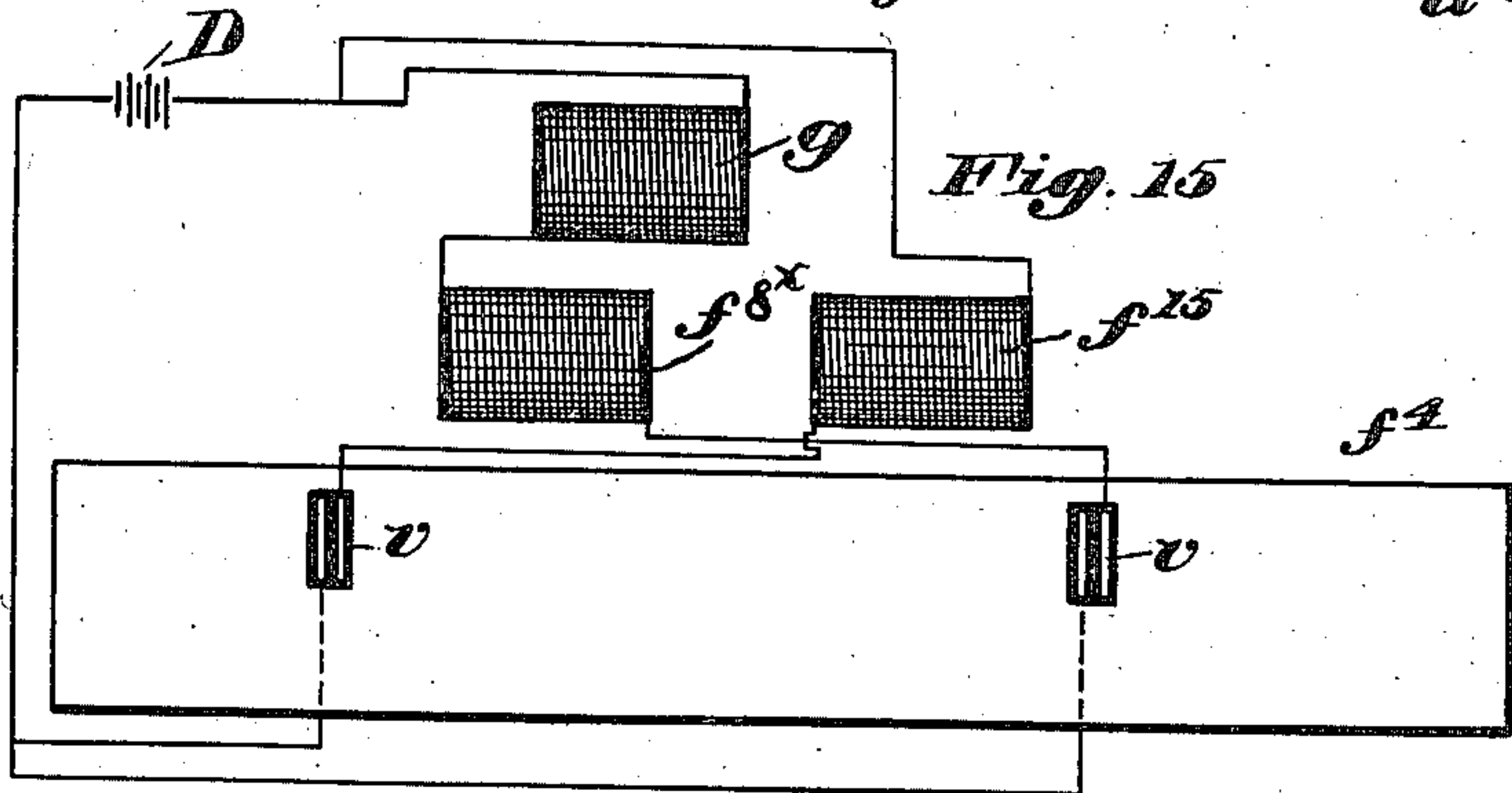
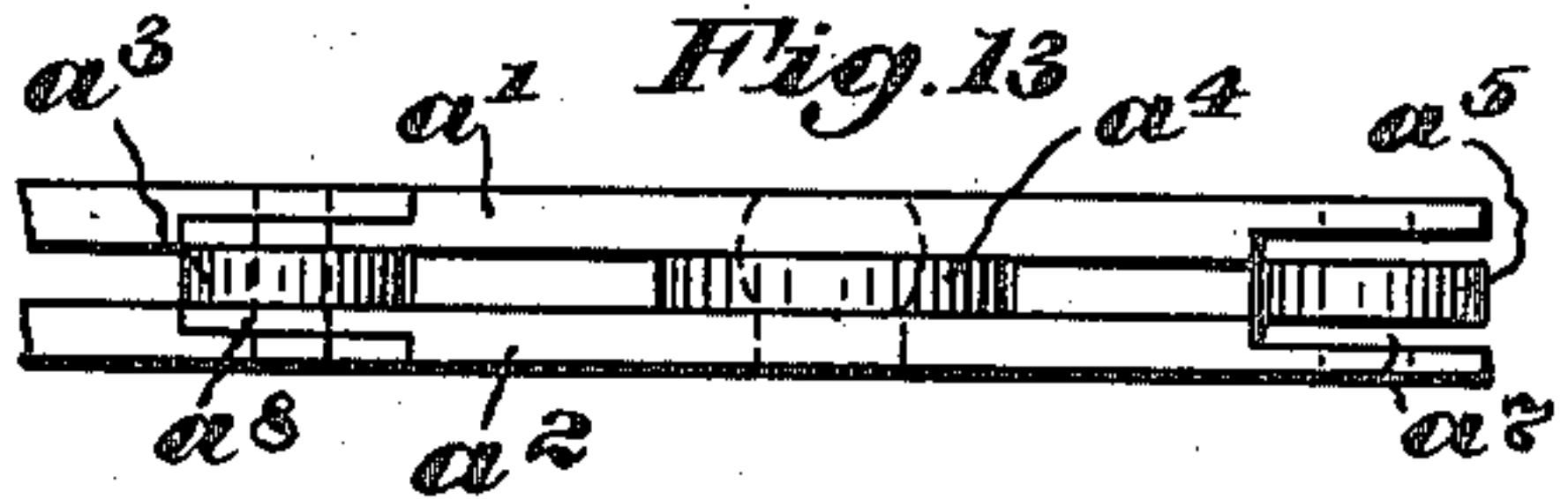
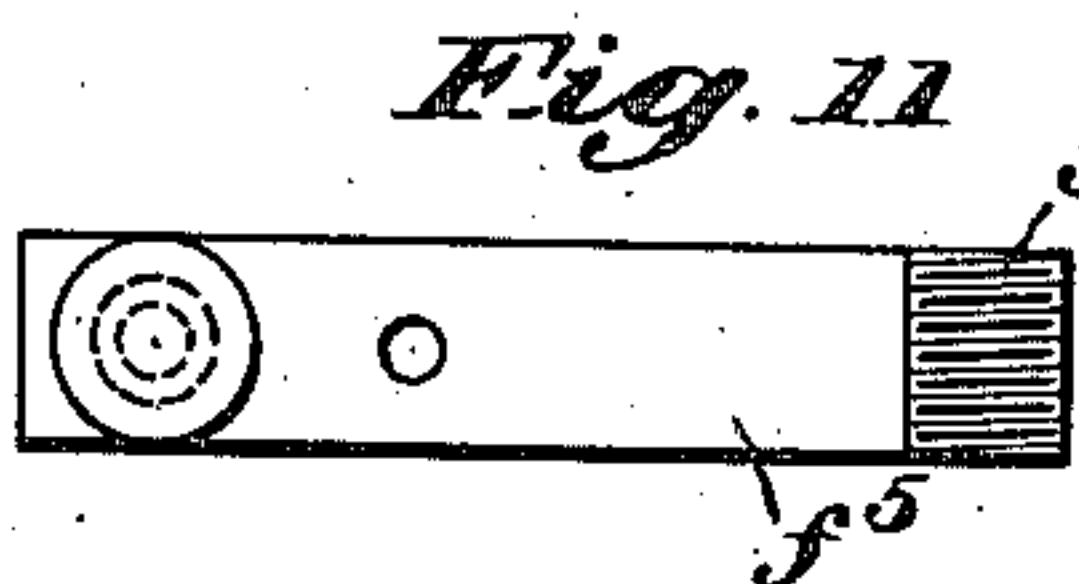
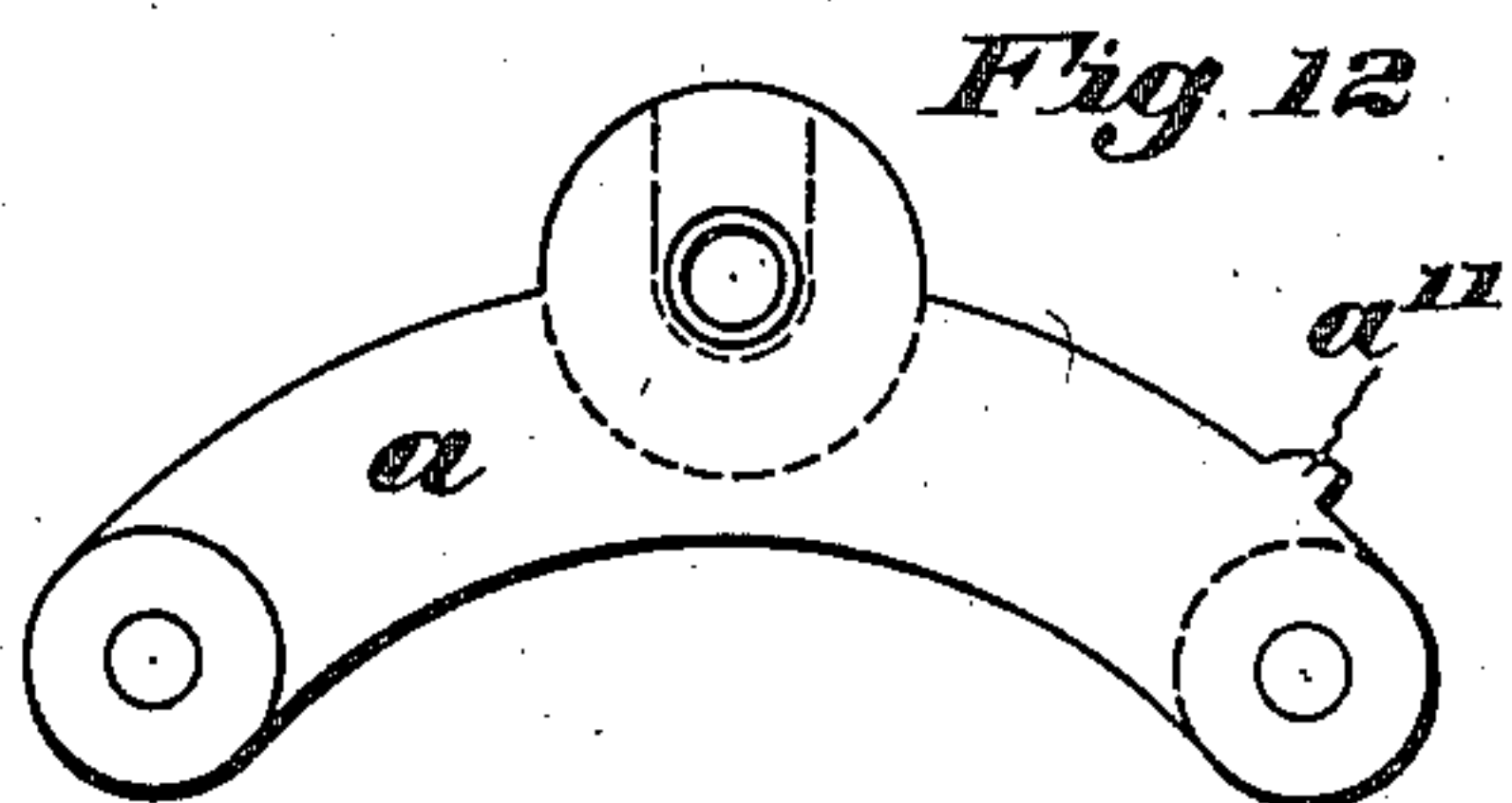
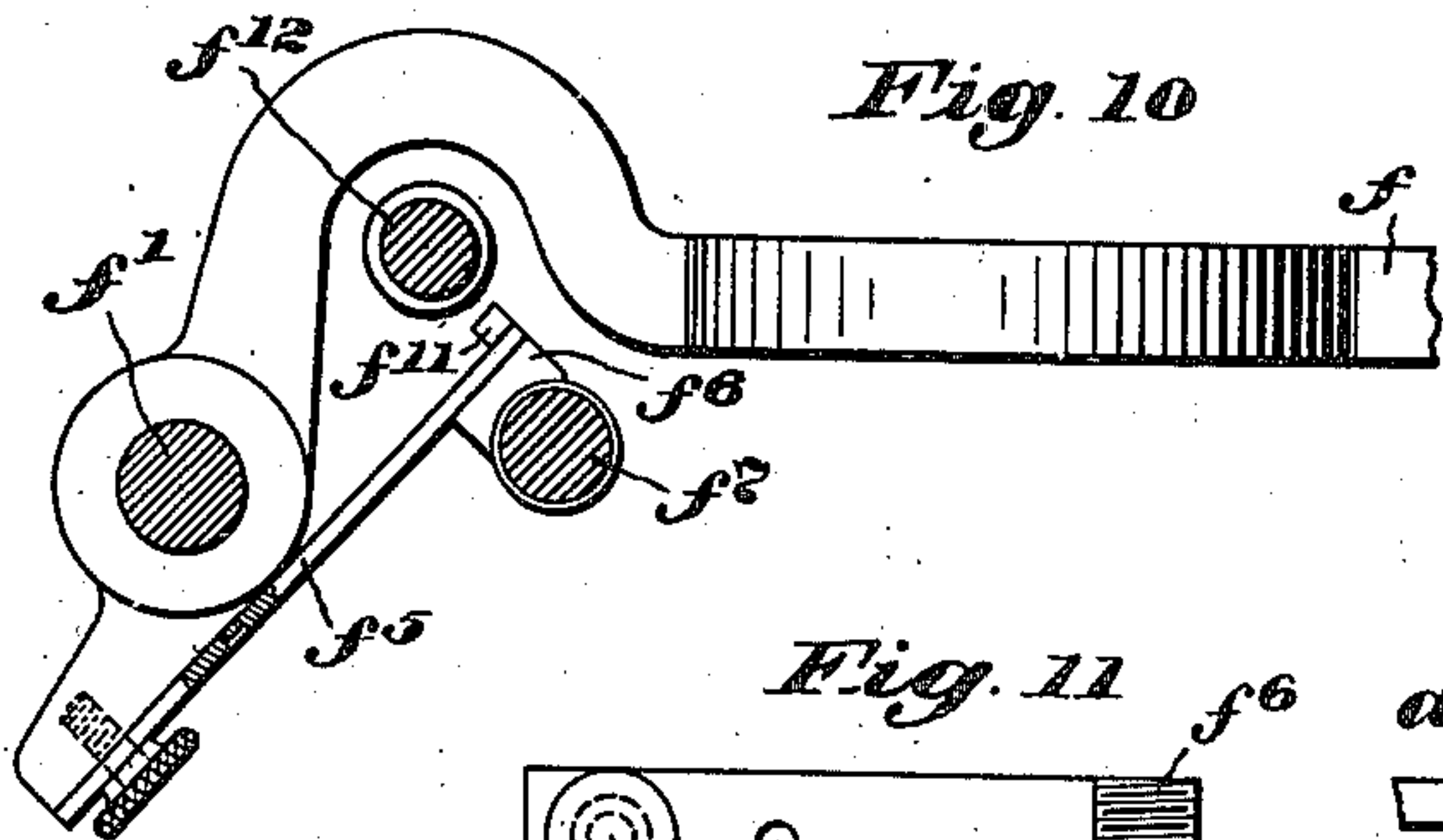
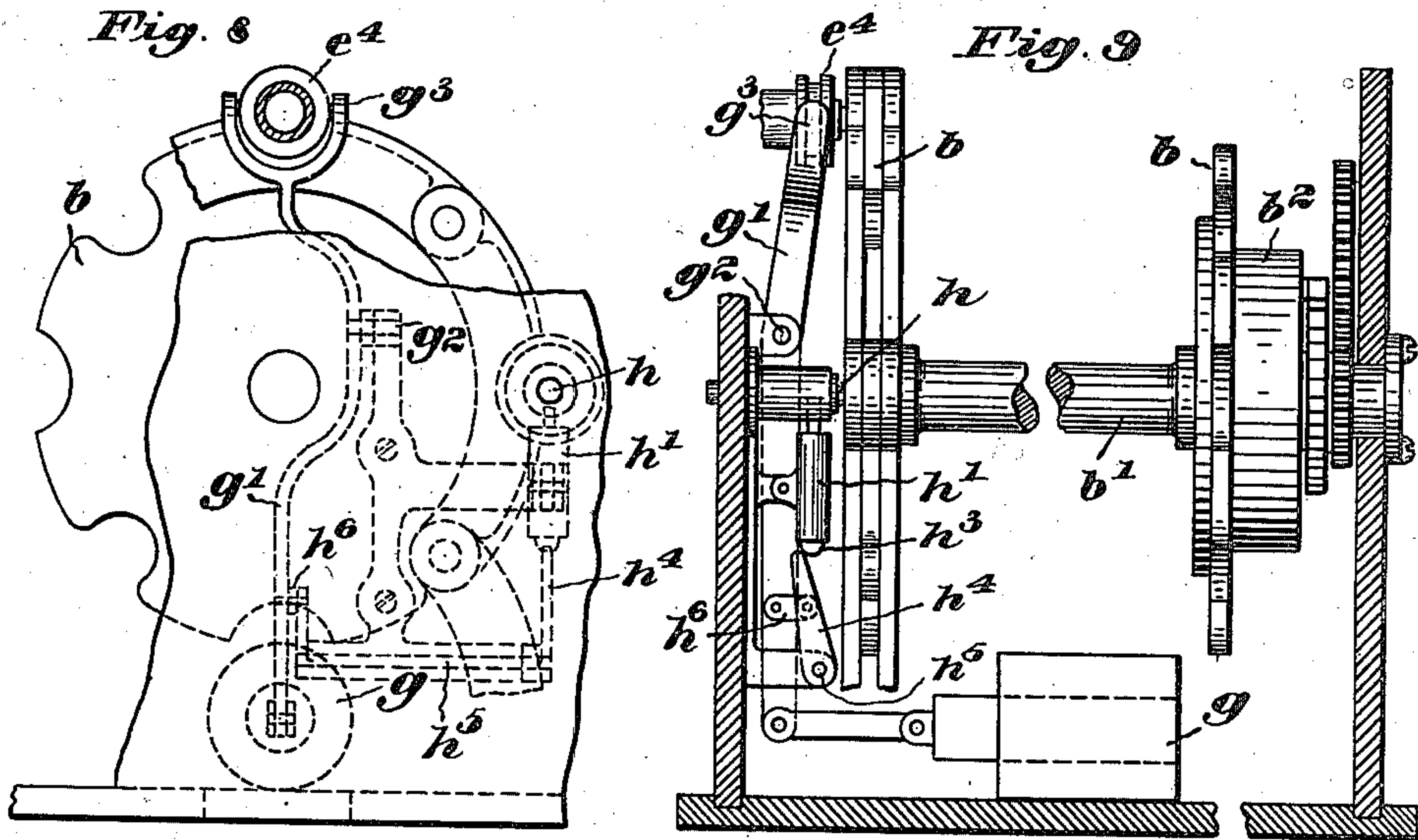
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5 SHEETS—SHEET 4.



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5 SHEETS—SHEET 5.

Fig. 1 is a perspective view of a cylindrical device, possibly a core or a component of a machine. It features a central circular opening. A vertical rod with a circular head is positioned through the center. The device is surrounded by concentric circular lines, indicating a magnetic field or a series of rings. Labels 'i' and 'p2' are present.

Fig. 21

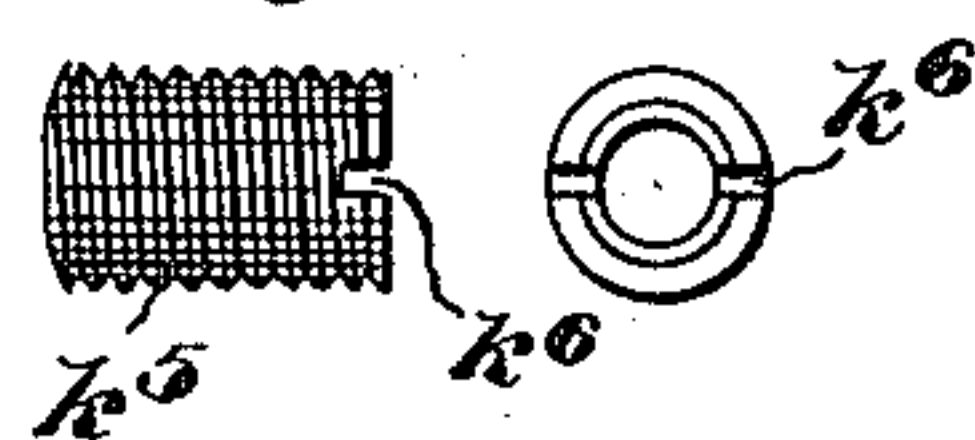
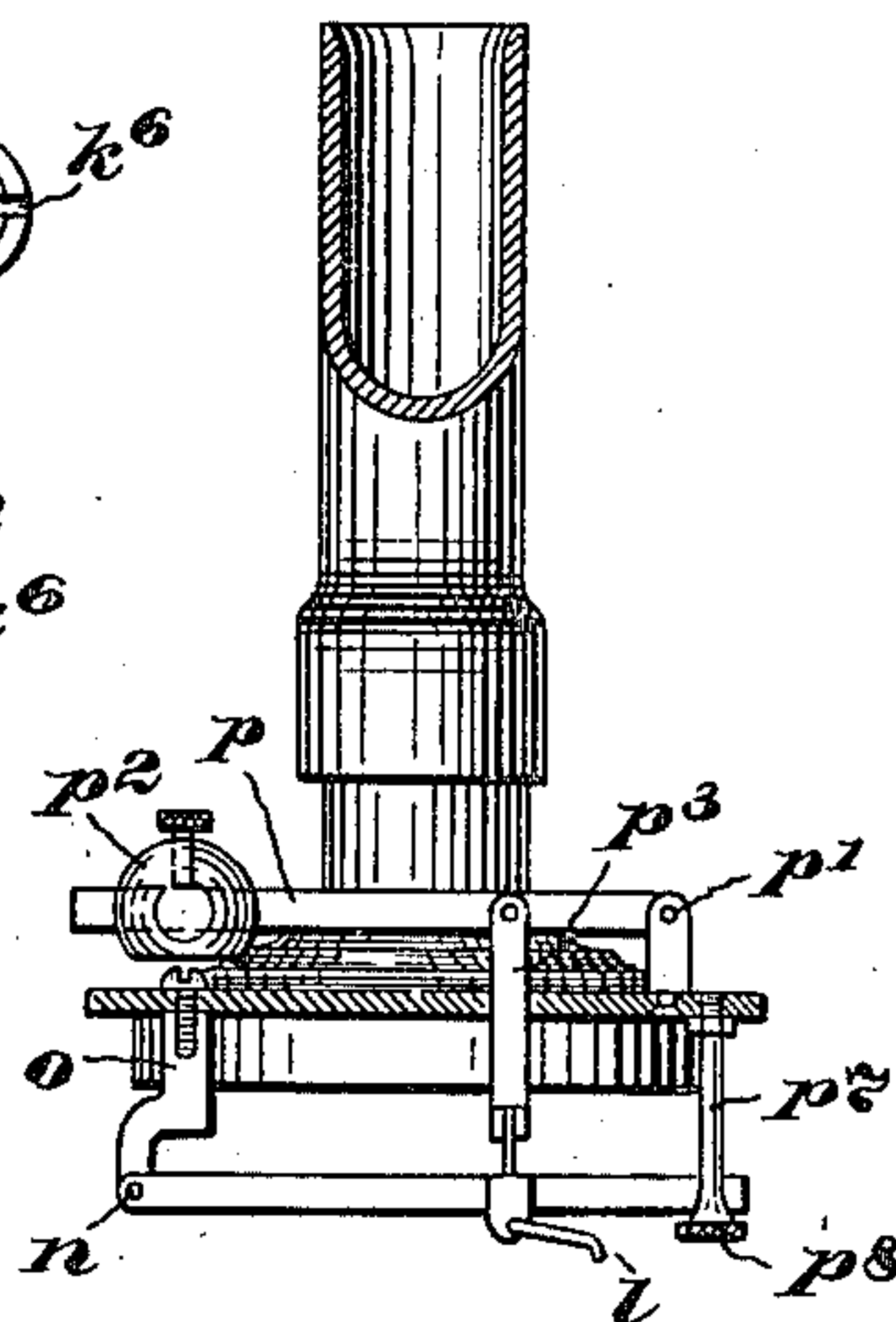
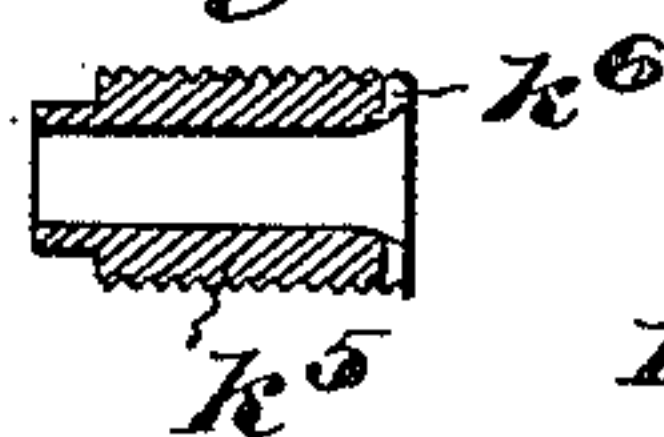


Fig. 22



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UNITED STATES PATENT OFFICE.

GEORGE H. UNDERHILL, OF BOSTON, MASSACHUSETTS.

SOUND-REPRODUCING OR SOUND-RECORDING MACHINE.

989,737.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed June 11, 1904. Serial No. 212,079.

To all whom it may concern:

Be it known that I, GEORGE H. UNDERHILL, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Sound-Reproducing or Sound-Recording Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to improvements in sound-reproducing and sound-recording machines. While applicable in many of its features to sound-reproducing machines of various types employing but a single record, it is directed more particularly in certain of its features to multiple record machines or those wherein there are employed a plurality of records adapted to be brought successively into reproducing or recording relation to suitable reproducing or recording mechanisms.

My invention will be best understood by reference to the following description, when taken in connection with the accompanying illustration of one specific embodiment thereof selected for illustrative purposes only; while its scope will be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is a side elevation of the embodiment of my invention selected for illustration, certain of the parts being broken away for clearness; Fig. 2 is a detail showing in section the swivel or jointed attachment of a record cylinder support; Fig. 3 is a detail of the tilting sound box rest; Fig. 4 is a front elevation partially broken away, of the machine illustrated in Fig. 1. Fig. 5 is a section, partially broken away, taken on the line 5—5 of Fig. 4, but shown on an enlarged scale. Fig. 6 is a plan view of the machine illustrated in Fig. 1. Fig. 7 is a detail of the feed screw gearing. Fig. 8 is a side elevation, and Fig. 9 a front elevation of the details of the device for locating and locking the record carrier. Figs. 10 and 11 are details of the feed mechanism for the sound box. Figs. 12 and 13 show the links or units of the endless record carrier respectively in elevation and plan. Fig. 14 shows a separate detail of the carrier locking device. Fig. 15 is a diagram of the electric circuits. Figs. 16 to 22 show details of my improved sound box.

Referring to the drawings, although many features of my invention are applicable to

machines other than multiple record machines, and to multiple record machines employing carriers widely different from that herein illustrated, by preference I employ a flexible, endless, multiple record carrier in the form of two chains, composed each of individual units or links, a , passing over suitable guiding means as the sprockets, b , and carrying between them the suitable supports, as the rods, c , upon which are secured the record supports, herein the cylinders, d .

Referring more particularly to Figs. 1, 4, 12 and 13, each individual unit or link is composed of two parallel link members, a' and a'' , provided with the washers a^3 , a^4 and a^5 , the washers, a^3 and a^5 , preferably acting as rolls, and washer, a^4 , as a rigid separating and binding member between the two links. Elongated and preferably rigid tie members a^6 extend from one chain to the other, thereby joining one link flexibly to another and acting to maintain in fixed relative position the corresponding units of the two chain carriers.

The sprockets, b , are suitably recessed to receive and firmly seat the washers, a^3 , a^4 , a^5 , each alternate recess being larger than the adjacent one to receive the washer, a^4 , which is of greater diameter than the washers, a^3 and a^5 . Adjacent links of the chain are connected together by dovetailed joints, each link of the chain being provided (Fig. 13) with end recesses, a^7 , to receive the projecting ears, a^8 , of the next adjacent link, the adjacent links being thus pivotally secured together by the tie-rods, a^6 , which pass through in each chain carrier the ends of the two links and the sprocket-engaging washer. The tie-rods, a^6 , are provided, (Fig. 4), with hexagonal or other suitably shaped heads, a^9 , by which the opposite threaded ends thereof are screwed against shoulders, a^{10} , bearing against the inside member of the opposite and corresponding link. The chain links are preferably provided with lugs, a^{11} , the lug of one link resting against the back of the next adjacent link when depending as shown in Fig. 1, thereby to maintain the depending portion of the endless carrier in a substantially vertical position.

Each link or record carrying unit is arched to substantially conform in shape with the periphery of the guiding sprocket, and, when in engagement therewith, and particularly when supporting its record in op-

erative position, receives support from its sprocket, not only through the washer, a^4 , co-axial with the cylinder and on each side thereof through the washers, a^3 and a^5 , co-axial with the tie-rods, a^6 ; but also through the intermediate, projecting, peripheral portions of the sprocket which enter between and engage with the inner walls of the separated links. The tie-rods, a^6 , hold the corresponding links in fixed relative position and form in effect a substantially rigid frame-work on which the record is supported and journaled, and this frame-work when its record is brought into operative position, by means of the effective interlocking engagement of each link with its sprocket, gives to the record a firm, unyielding and extended lateral support on either side of the axis of the record and at each end thereof.

The use of the flexible endless carrier described permits the utilization of any desired number of records without varying the dimensions or altering the proportions of the machine itself or the mechanism required to operate it, since the chains may be lengthened to accommodate any desired number of record cylinders, the cylinders out of engagement with the sprocket depending idly below the frame of the machine, an additional guiding device as the sprocket, b^x , being employed, if desired, at the farther end of their travel.

Referring more particularly to Figs. 4 and 5, each cylinder, d , is rigidly secured to rotate with its spindle support, c , the latter being supported between the two endless carriers during its entire travel. In order to permit a ready withdrawal of any record from its cylinder, I provide means temporarily for swinging one end of the cylinder away from its carrier, the opposite end thereof having a swinging or swivel support to permit this movement. This is effected by providing upon one of the carriers the cap, d' , suitably secured to the middle or crown of the link, a , said cap having a pocket containing the spring-pressed pin, d^2 , the head, d^3 , of which enters a suitable recess in the end of the cylinder spindle, c , thereby to provide a journal therefor. The end of the pin, d^2 , carries an exterior thumb piece, d^4 , by which the pin head, d^3 , may be withdrawn from the cylinder spindle against the pressure of the spring, and that end of the cylinder thereby left free to be swung outwardly as indicated in Figs. 2 and 6, for the withdrawal of the record. At the opposite end of the spindle, c , is rigidly secured the spherical bearing, d^5 , which rests in a socket formed by the outer member of the link, a , and the intermediate washer, a^4 , so as to permit of free rotation of the spindle, c , within the said socket, and also permit outward swinging movement of the cylinder

for the withdrawal of its record. As will more readily appear from Fig. 2, the inner member of the chain link is suitably slotted to receive the neck of the spindle immediately within the ball, d^5 , and to permit the outward swinging of the record-carrying cylinder whenever the pin, d^3 , is withdrawn from the spindle recess. To reduce the bearing friction to a minimum the inner end of the pin, d^3 , is suitably shaped to bear against a ball, d^6 , which is fixedly secured within the cup-shaped bottom of the spindle recess. Thus a record may be removed from its support at any desired point in the travel thereof by merely detaching its support from one point of attachment and swinging it about its point of swiveled attachment into a position where the record may be readily withdrawn.

The sprockets are rigidly secured to a carrier shaft, b' , suitably journaled in the frame of the machine, (Fig. 9), a spring, b^2 , or any other suitable means being employed for providing a constant rotative effect upon the sprocket shaft, b' , to cause movement of the record carriers into and out of operative relation with the recording and reproducing mechanism, which herein is located above the machine, the uppermost record being the one in operative position.

During recording or reproduction the cylinder, d , is rotated at uniform speed through any suitable, and preferably, electric motor (not shown), driving the pulley, e , secured to the sleeve, e' , the latter being journaled in the frame of the machine, A. Slidable within the sleeve, e' , is the cylinder drive shaft, e^2 , to the head, e^3 , of which is secured the collar, e^4 , by means of the pin, e^5 . The shaft, e^2 , and its head, e^3 , are normally spring-pressed inwardly toward the record carrier, the sleeve being slotted to receive the pin, e^5 , and permit relative movement between the sleeve and collar, e^4 , the latter moving inwardly and outwardly with the shaft. The inner end of the shaft e^2 is suitably shaped to enter a corresponding recess in the end of the alining cylinder spindle, c , suitable projections, e^6 , upon the shaft interlocking with corresponding recesses in the spindle to effect the driving movement.

During the rotation of the cylinder and the record carried thereby through the driving connections described, the sound box and stylus carrying mechanism, B, are progressively moved along the face of the record from one end thereof to the other. To effect this the sound box, B, is mounted in a yoke, f , slidably supported (Figs. 6 and 10) upon the shaft, f' and carrying (Fig. 1) at its opposite end the depending arm, f^2 , provided with the adjustable sliding support, f^3 , resting upon and slidable along the tilting rest, f^4 , (Fig. 1) hinged in the frame-work, A. During recording or reproduction, the rest, f^4 ,

is normally in the position shown in Fig. 1, and the finger, f^5 , (Figs. 1 and 10) secured to the yoke carrier f on the opposite side of its fulcrum support, f' , is thrown downwardly to cause the sectional nut, f^6 , held at the end of said finger, to maintain engagement with the fine threaded screw, f^7 . The latter is rotated through the gear, f^8 , in mesh with a gear, f^x , the latter engaging in turn with a gear, f^9 , (Fig. 5) upon the head of pulley, e , so that, during rotation of the record cylinder by said pulley, the said screw, f^7 , causes the travel of the nut, f^6 , and the yoke carrier, f , with the stylus lengthwise the record cylinder. When the end of the desired stylus travel has been reached, the sliding rest, f^3 , which is preferably provided with a bearing tip or point of electrically conductive metal, is caused to engage with two contacts, v , shown in diagram in Fig. 15 upon the tilting rest, f^4 , and make an electric circuit including a source of electromotive force, D , energizing the solenoid, f^{8x} . The armature of the latter is connected to a lever f^{9x} , to which is secured a cam, f^{10} , upon which the tilting rest, f^4 , is normally supported in the full line position shown, Fig. 4. Energization of the solenoid f^{8x} causes the withdrawal of the lever, f^{9x} , from the full line position shown in Fig. 4 to that shown in dotted lines, resulting in raising the tilting rest, f^4 , and the arm, f^2 , and the consequent withdrawal of the nut f^6 from engagement with the screw, f^7 , the pin or tooth, f^{11} , also carried by the finger, f^5 , immediately thereupon entering into engagement with the coarser threaded, reverse, feeding screw, f^{12} , rotated in a reverse direction from the screw, f^7 , by the gears, f^{13} and f^{14} , (see Fig. 7), thereby to effect the rapid return of the stylus-carrying mechanism to its initial position ready for engagement with a fresh record.

I have herein also provided means simultaneously with the return of the stylus-carrying mechanism for changing or shifting the records to permit automatically the presentation of a new record to the stylus and the repetition of the previously described movement of the latter with reference to the fresh record. To this end suitable locking devices are provided for locking the carriers against movement during the outward travel of the stylus, for releasing the carriers after the completion of said outward travel and for again locking the carriers when a succeeding record has been brought into alinement with the driving mechanism. When the sliding rest, f^3 , makes the circuit which reverses the movement of the stylus, it also effects energization of the solenoid, g , (Figs. 9 and 15), which operates to rock the lever, g' , about its fulcrum at, g^2 , the end of the lever, g' , being provided with a yoke, g^3 , having studs engaging a groove in the col-

lar, e^4 , whereby energization of the solenoid moves the collar, e^4 , to withdraw the pin, e^2 , from the recess in the cylinder spindle, c . The sprockets, b , and the carriers would now be free to move under the influence of the spring, b^2 , were it not for the additional locking and locating device, h , (Figs. 9 and 14), comprising a pin shaped similarly to the pin, e^2 , for entering the recess in the cylinder spindle and so located within a pocket on the frame, A , as to engage with the cylinder next adjacent the one in operative position. The locking or locating pin, h , is adapted to be thrown into or out of engagement with the cylinder spindle through movement of the pivoted frame, h' , yieldably connected to the head of the rod h through the sliding and downwardly spring pressed pin, h^2 . The head, h^3 , of the pin, h^2 , contacts with a cam shaped end of the arm, h^4 , adapted to be rocked about its fulcrum, h^5 , through the link, h^6 , connected to the rocking lever, g' . When the latter is moved by the solenoid, g , to withdraw the rod, e^2 , from the spindle, c , and release the same, the lever, h^4 , is also thrown laterally, and right-handedly as viewed in Fig. 14, to rock the frame, h' , about its fulcrum and throw the rod, h , backwardly out of engagement with its previously engaged spindle, the spring-pressed head, h^3 , of the pin, h^2 , yielding to permit the cam end of the lever, h^4 , to snap by the same into a position of rest. By this movement the record carriers are wholly released, and the sprockets start to revolve to move a fresh record into position. During the succeeding movement, however, the locating device, h , is spring-pressed against the outer faces of the chain links as the latter pass before the same, immediately snapping into the recess of the next spindle as the latter comes into alinement therewith, locating the new position of the record carriers and preventing further movement thereof. As soon as the solenoid, g , is de-energized by the withdrawal of the sliding rest, f^4 , from the contact pieces upon the tilting rest, the pin, e^2 , will also enter the recess of the spindle now in operative position, to rotate the latter and to cooperate with the stylus when the latter has been returned to its initial position. On the de-energization of the solenoid, g , and the return of the spring-pressed rod, e^2 , into the spindle recess, the cam lever, h^4 , is also returned to its normal position as shown in Fig. 14.

It may sometimes happen under a strong rotative influence upon the sprocket shaft, b' , as for example, when the spring, b^2 , is tightly wound up, that a considerable movement of the sprockets will take place and perhaps the full movement necessary to bring a fresh record into operative position, before the sound box and the sliding rest

have traveled far enough on reverse movement to break the electric circuit and de-energize the solenoid, g , thereby to free the drive shaft, e^2 , for reëntering the next spindle recess. The provision of the locating device, h , however, makes the relative movements of the carriers and the sound box immaterial, since the pin, h , is always in position after the carrier movement has once begun, to stop such movement at the proper time.

When the stylus reaches its initial position the sliding rest, f^3 , is caused to make a circuit through a third solenoid, f^{15} , (Figs. 4 and 15), causing the return of the cam, f^{10} , to the position shown in Fig. 4, and the lowering of the tilting rest, f^4 , thus throwing the nut, f^8 , again into engagement with the fine feed screw, f^7 , and repeating the outward travel of the stylus with the fresh cylinder.

Referring to Figs. 16 to 22, I have there shown one form of my improved sound box which I preferably employ. The sound tube, i , is preferably bifurcated, to provide the branches, j , and, k , into which may be slid and frictionally held the tubular portions, j' , and, k' , of the sound box. The latter is provided with a double set of recording and reproducing devices, and I have herein shown those of one set as substantially duplicated by those of the other set. This, it is to be understood however, is not essential to my invention as the diaphragm and other elements of the mechanism may for certain purposes be widely different. The sound box consists generally of a double head or casing, i' , and when in use is adapted to be frictionally held within the suitably shaped double yoke, f , already referred to.

The casing, i' , is provided with two cylindrical portions, i^2 , and, i^3 , that shown in, i^3 , for example (see Fig. 20), being provided with a diaphragm, k^2 , placed between two annular rings of yieldable packing material, such as rubber, and held against a shoulder in the casing by means of the back-piece, k^3 , screwed into the back of the casing i' , against the preferably metallic washer, k^4 . Within the tubular portion, k' , of the back-piece, k^3 , and preferably axially alined therewith and with the diaphragm, k^2 , I have provided the throat, k^5 , preferably threaded or otherwise constructed to provide adjustment thereof relatively to the face of the diaphragm, the end of the throat adjacent the diaphragm being suitably shaped for the most efficient effect, as by beveling the same, in the manner shown.

I have found that it is not only desirable to have the sound orifice of each throat adjustable relatively to the diaphragm, but that each particular class of sound requires a special sound orifice for its most effective

reproduction. For example I have found that the full harmony of a brass band will usually be best developed through the employment of a throat having the general form of that shown in Figs. 20 and 21, while the note of a violin is more faithfully reproduced by a differently shaped throat, as for example, that shown in section in Fig. 22. The provision of a plurality of such throats, each proportioned or formed with respect to a particular quality of sound, in the reproduction of which it is intended to be used, and replaceable one by another, forms an important feature of my invention. Referring to Figs. 20 and 21, I have provided the slot, k^6 , in the outer end of the throat member, which when the box is removed from the sound tube, may be conveniently engaged with a screw driver or other implement to adjust the mouth of the throat in any desired relative position to the diaphragm, or to remove the same entirely and replace it by another of different shape, size or proportion.

The two styluses are here employed, in order to provide a multiple effect, the production of which, however, is obviously not limited to the use merely of two. Each of two styluses, l and m , is connected to its respective diaphragm through the connecting body l' , m' , the links, l^x , and, m^x , and the rockshafts, l^2 , m^2 , so that, when in the operative position shown in Fig. 1 (see also Fig. 19), the point of the second stylus is caused to trail in the same record groove as the first stylus, but directly and immediately behind the latter, and also arranged so that the vibrations communicated to each stylus point are transmitted directly and efficiently to the corresponding diaphragm. The stylus points with their rockshafts are respectively supported and movable with the vibratable levers, l^3 , and m^3 , arranged side by side and hinged at, n , (Figs. 18 and 20) to permit the individual and relative movement of the said levers to and from the surface of the record, the hinged support, n , being, however, itself swingingly mounted upon the stud, o , Fig. 18, to permit a slight lateral movement common to each stylus movement when such movement is requisite. Thus, although free vibration is permitted the stylus points in the reproduction of the intended sound, they are compelled always to track one after the other, and the lateral movement of one no matter from what cause must be followed by a like movement of the other.

An equalized tension, tending normally to press the stylus points toward the face of the record, is maintained upon the two stylus points by means of the lever, p , fulcrumed at, p' , carrying the adjustable weight, p^2 , the latter acting through the bar, p^3 , equalizing rod, p^4 , and pressure points,

p^5 , p^6 , engaging respectively or connected with the backs of the levers, l^3 , and m^3 . Thus, when the sound box is adjusted relatively to the record, and the stylus point or points have found and entered the groove therein, the force pressing the same into the groove may be varied by adjustment of the weight, p^2 , along the lever p ; this force however, being distributed upon the two points by means of the equalizing bar, p^4 , thereby to maintain an individual tension upon each of the cooperating stylus points, such tension being proportioned to their individual requirements and the movement of one stylus point with its supporting lever in no way conflicting with simultaneous movement of the other point and its lever, whether such movements are similar or dissimilar. In order to relieve the diaphragm and its connections from the weight of the stylus parts, including the weight, p^2 , when the sound box has been lifted or withdrawn from the face of the record, I have provided the supporting pin with a cone-shaped enlarged head, p^3 , against which the suitably formed ends of the levers, m^3 , and, n^3 , rest when the stylus points are withdrawn from the record, but so located as to permit free vibration of the said levers, under the influence of the record, when the points are in contact therewith and moved under the influence of the record groove therein. The peculiar cone shaped head of the face, b^3 , and the correspondingly formed walls upon the two levers, permit repeated withdrawals of the points from the record groove with positive assurance, however, that the points will meet the record at exactly the same spot from which they were withdrawn, the record and the sound box, meanwhile, having undergone no relative movement.

I have found that the arrangement shown of multiple diaphragms, where they are grouped or clustered about a common position toward which their vibration mechanism is directed, provides a highly efficient, and in fact so far as I am aware the only practical, construction for obtaining a multiple effect. I have also found that the effectiveness of the machine is greatly increased by the inter-connection which exists between the vibration parts of each system through which there is maintained a constant tendency for the stylus points and diaphragms to move in conjunction and co-operation, each one with the other or others.

It will be understood that my invention is susceptible of embodiment in a great variety of forms and may be combined in various ways which I have not here attempted to illustrate, since the same are included within the scope of my invention as set forth.

Claims.

1. A multiple record phonograph having

a plurality of record supports adapted each to travel to bring its record into and out of operative relation to the machine, and means for rotating a record placed in operative position, said means being adapted for engagement with or disengagement from said successive records, said record supports being each individually detachable from its connection with the machine at one point to permit the withdrawal of its record while still maintaining connection with the machine at another point or points.

2. A multiple record phonograph having record rotating means, and a plurality of record supports, the records carried thereby being adapted for successive engagement with the rotating means, the record supports being individually movable about their points of attachment to the machine to permit the removal of their records when disengaged from the said rotating means.

3. A multiple record phonograph having a plurality of record holding members swingingly supported upon a common carrying device.

4. A multiple record phonograph having a linked carrier and a plurality of record holding members swingingly supported upon the links thereof.

5. A multiple record phonograph having a traveling carrier, a plurality of record supports attached each to said carrier at a plurality of points, record rotating means, means for moving said carrier to bring a record into operative position and for bringing the same into engagement with said rotating means, means for disengaging the record from said rotating means and moving said carrier to bring a fresh record into operative position, and an axially yieldable connection at one of the points of attachment of each record support to its carrier to permit withdrawal of a record when out of operative position.

6. A multiple record phonograph having a movable record carrier for carrying a plurality of records, said records having each a body movement with the carrier, a rotary movement upon its axis, and a swinging movement about a point of attachment to the carrier.

7. A sound reproducing or sound recording machine having a swingingly mounted record support, record rotating means therefor, and means for clutching said rotating means to and unclutching the same from said swinging support.

8. In a sound reproducing and sound recording machine, a rotary swingingly-mounted, record-supporting spindle, record rotating means, and a clutching device adapted to interlock with the end of said spindle and connect the same to said rotating means.

9. In a sound reproducing and sound re-

5 cording machine, a rotary hinged record support, record rotating means, and means for connecting said rotating means to, and disconnecting the same from the hinged end of said support.

10 10. In a multiple record phonograph a plurality of record supports, a linked carrying member, said supports being attached each to a link of said carrier by a hinged connection.

11. A multiple record phonograph having a plurality of linked record carrying members, and a plurality of record supports, said record supports being attached to the 15 links of said carriers by a hinged connection at one end and a yieldable connection at the other end.

12. A multiple record phonograph having a plurality of record supports, linked 20 carrying means therefor, and a toothed sprocket over which said linked carrying means travels, said carrying means having a plurality of links adapted to engage each at its opposite ends with the teeth of said 25 sprocket and providing an intermediate point of attachment for the record support.

13. A multiple record phonograph having a plurality of record supports, a linked 30 carrying member therefor, a toothed sprocket, said carrying member having a plurality of links adapted each to engage simultaneously with a plurality of sprocket teeth, and means for attaching said supports to said links.

14. A multiple record phonograph having a plurality of supports, a linked carrying member to which said supports are individually and removably attached, and a releasing member for each of said supports 40 movable in the direction of the axis of the record to release said support from the carrying member and permit the removal of its record.

15. A multiple record phonograph having a plurality of record supports, carrying 45 means therefor comprising a pair of linked carrying members between which records are carried, and guiding means for each of said linked carriers, the opposite links to which said record supports are attached engaging each with said record guiding means at their opposite ends.

16. A multiple phonograph having a plurality of record supports, carrying means 55 therefor comprising a plurality of linked carriers, and means between the records carried thereby connecting said carriers.

17. A multiple record phonograph having a plurality of record supports, carrying 60 means therefor comprising a plurality of articulated carriers between which the record supports are carried, and means to permit individual removal of the records from their supports.

65 18. In a sound-reproducing or sound-

recording machine employing a plurality of records, the combination of flexible record carrying means supporting said records at each end thereof and means for permitting withdrawal of an individual record. 70

19. A multiple-record machine of the class described having carrier guiding means, and flexible record-carrying means the individual record-carrying units of which are in interlocking engagement with carrier guiding means at a plurality of points. 75

20. A multiple-record machine of the class described having flexible carrier-means, comprising coöperating carrier-members to which the records are journaled and by 80 which they are caused to travel to and from their operative positions, and stiffening means between said members and intermediate the records carried thereby.

21. In a device of the class described, a 85 plurality of record-carrying chains, guiding means for each, and guide engaging means connecting the said chains intermediate the records.

22. In a sound-reproducing or sound-recording device, the combination with flexible 90 record-carrying means for supporting the record at each end thereof, of means for giving the record, when in operative position, an extended rigid lateral support on 95 either side of the axis thereof.

23. A sound-reproducing or sound-recording device having flexible record-carrying means employing an arched carrying unit.

24. In an apparatus of the class described 100 employing a plurality of records, the combination with electromotive devices and means automatically to act upon said electromotive devices on the completion of one record to bring a succeeding record into operative position. 105

25. In an apparatus of the class described employing a plurality of records, the combination with means automatically to advance the records one by one to playing position, electromotive devices, and means automatically to act upon said electromotive devices to cause the restoration of the recording and reproducing mechanism to its 115 initial position on completion of its travel throughout a record.

26. In an apparatus of the class described, the combination with a plurality of records of electrically controlled record-changing means therefor. 120

27. In an apparatus of the class described, the combination with a plurality of records, means for automatically advancing said records to present them one by one to the sound reproducing mechanism, and electrically controlled means for returning the reproducing or recording mechanism to its 125 initial position.

28. In an apparatus of the class described employing a plurality of records the combi- 130

nation with means for presenting the records in succession to the sound reproducing mechanism, means for restoring the reproducing mechanism to its initial position on completion of its travel throughout a record, of electromotive devices for actuating said means, and circuit changing means carried by the reproducing mechanism for setting in operation said electromotive devices.

10 29. In an apparatus of the class described employing a plurality of sound records, means automatically to bring the records into and out of operative position, means

automatically to restore the reproducing mechanism to its initial position upon each 15 change of record, and electrical contact means carried by the reproducing mechanism for setting in operation said record changing means.

In testimony whereof, I have signed my 20 name to this specification, in the presence of two subscribing witnesses.

GEORGE H. UNDERHILL.

Witnesses:

RALPH C. POWELL,
HORACE A. CROSSMAN.