

W. A. KERR.

Improvement in Combination-Locks.

No. 129,482.

Fig. 1.

Patented July 16, 1872.

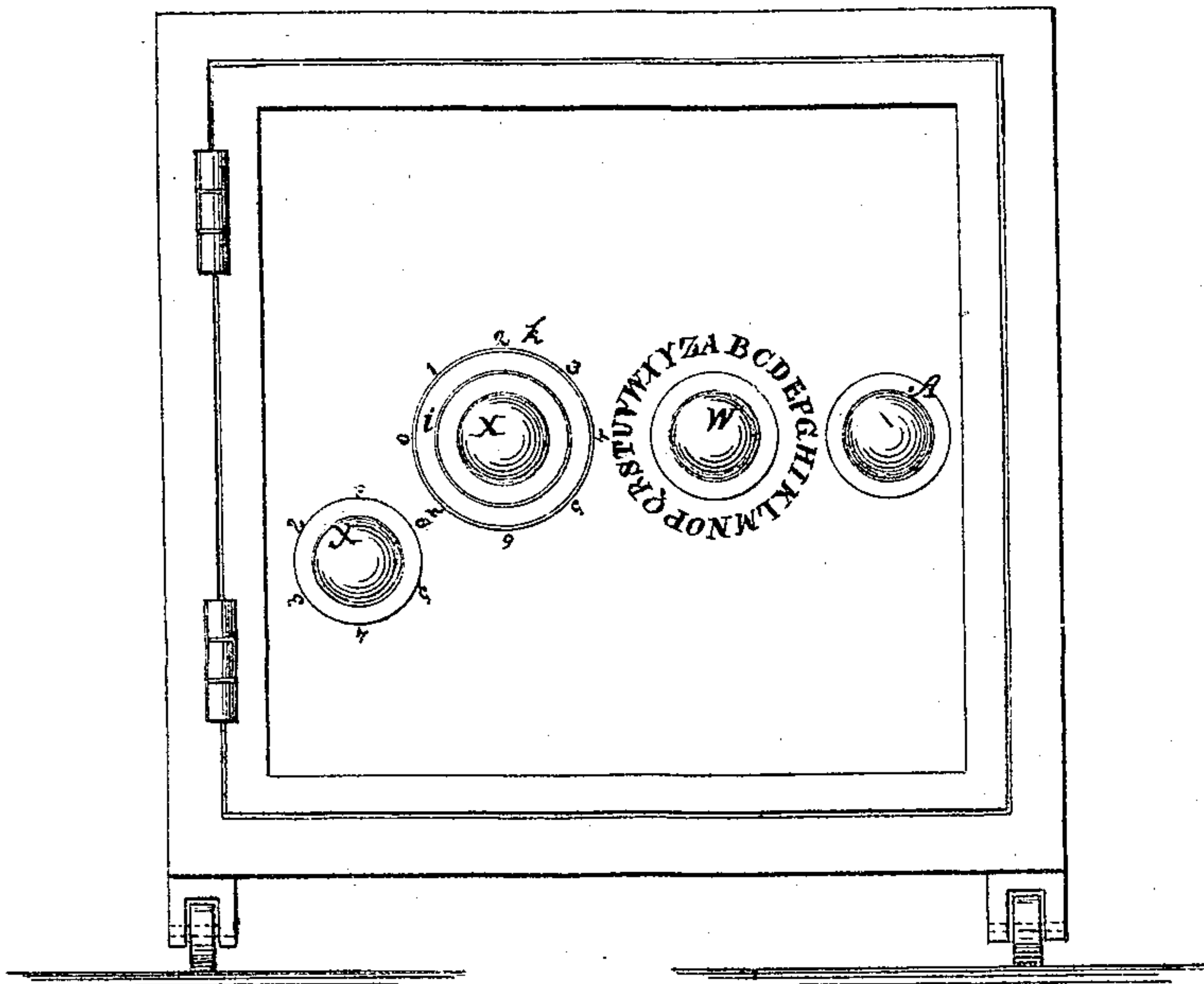
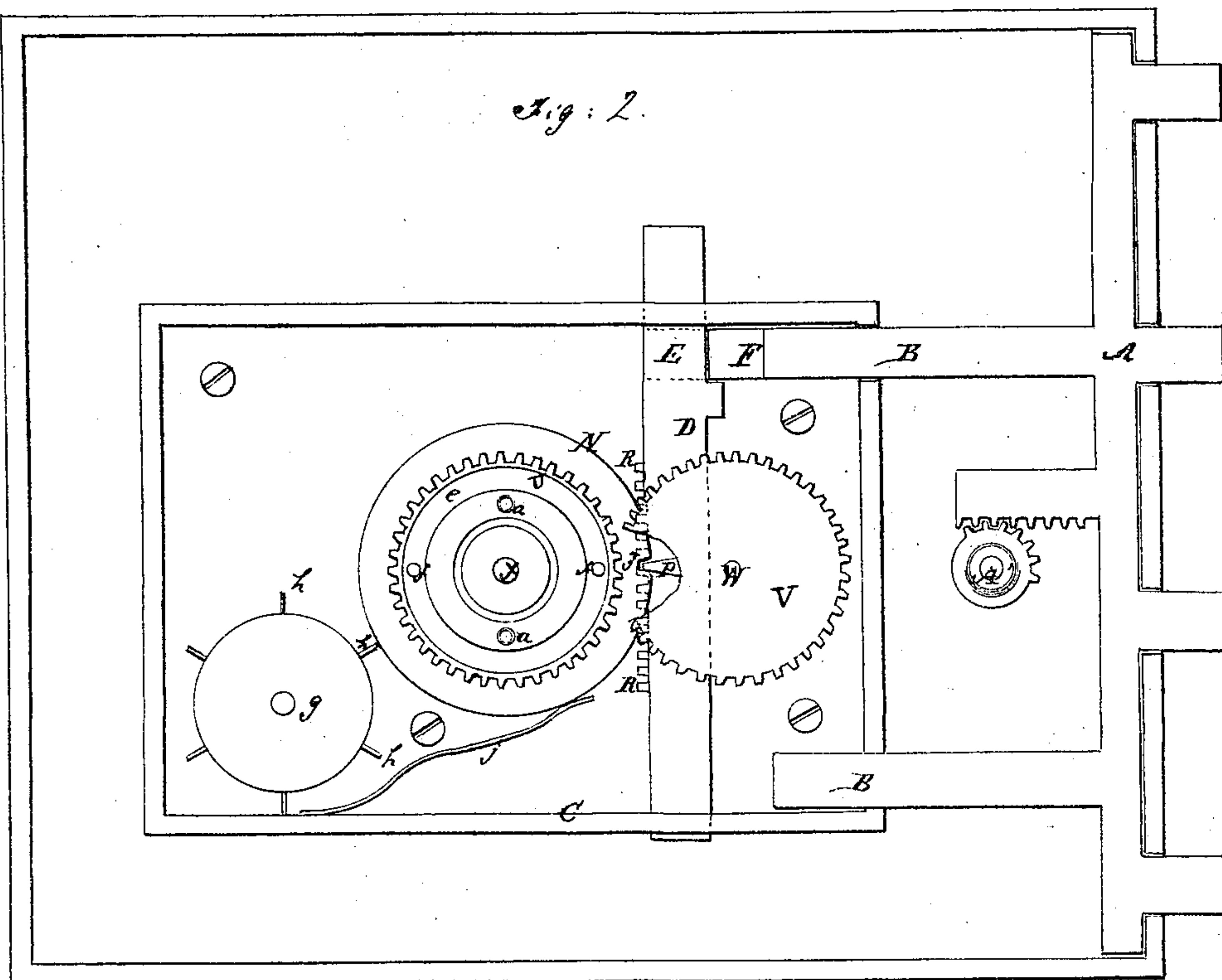


Fig. 2.



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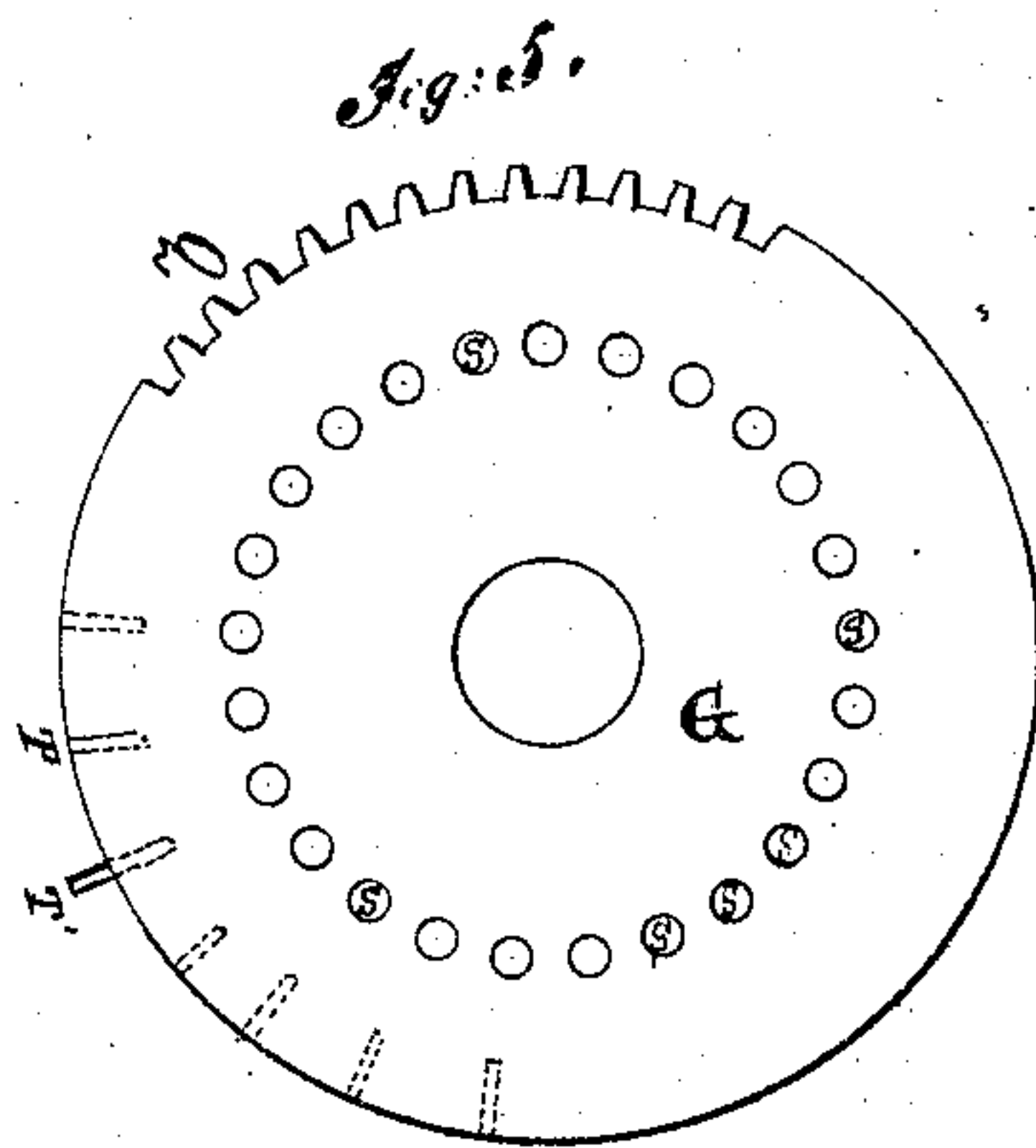
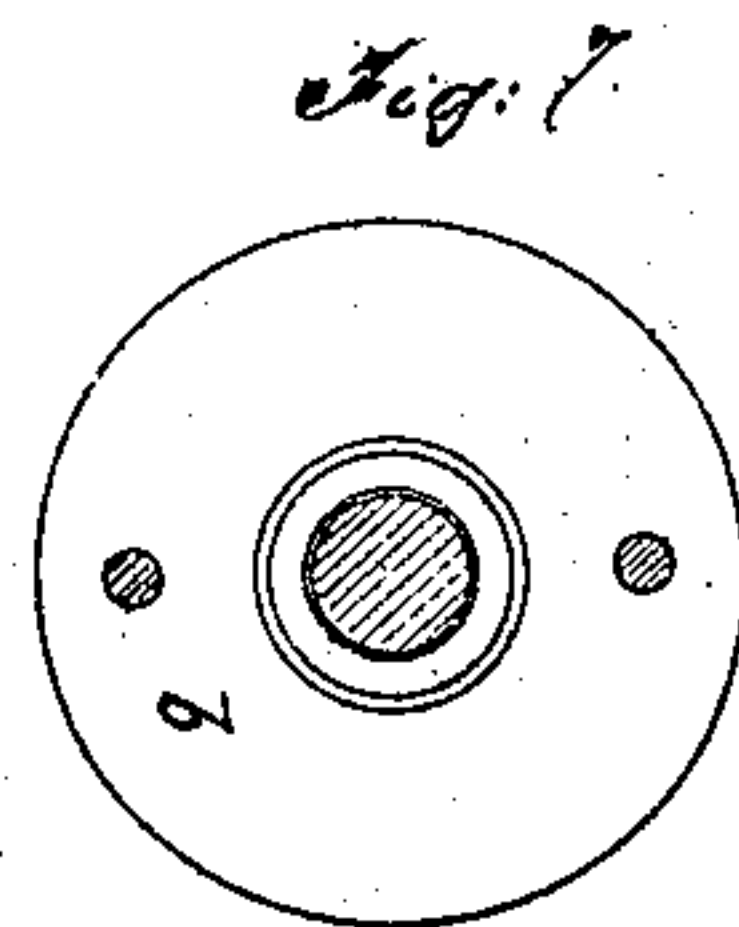
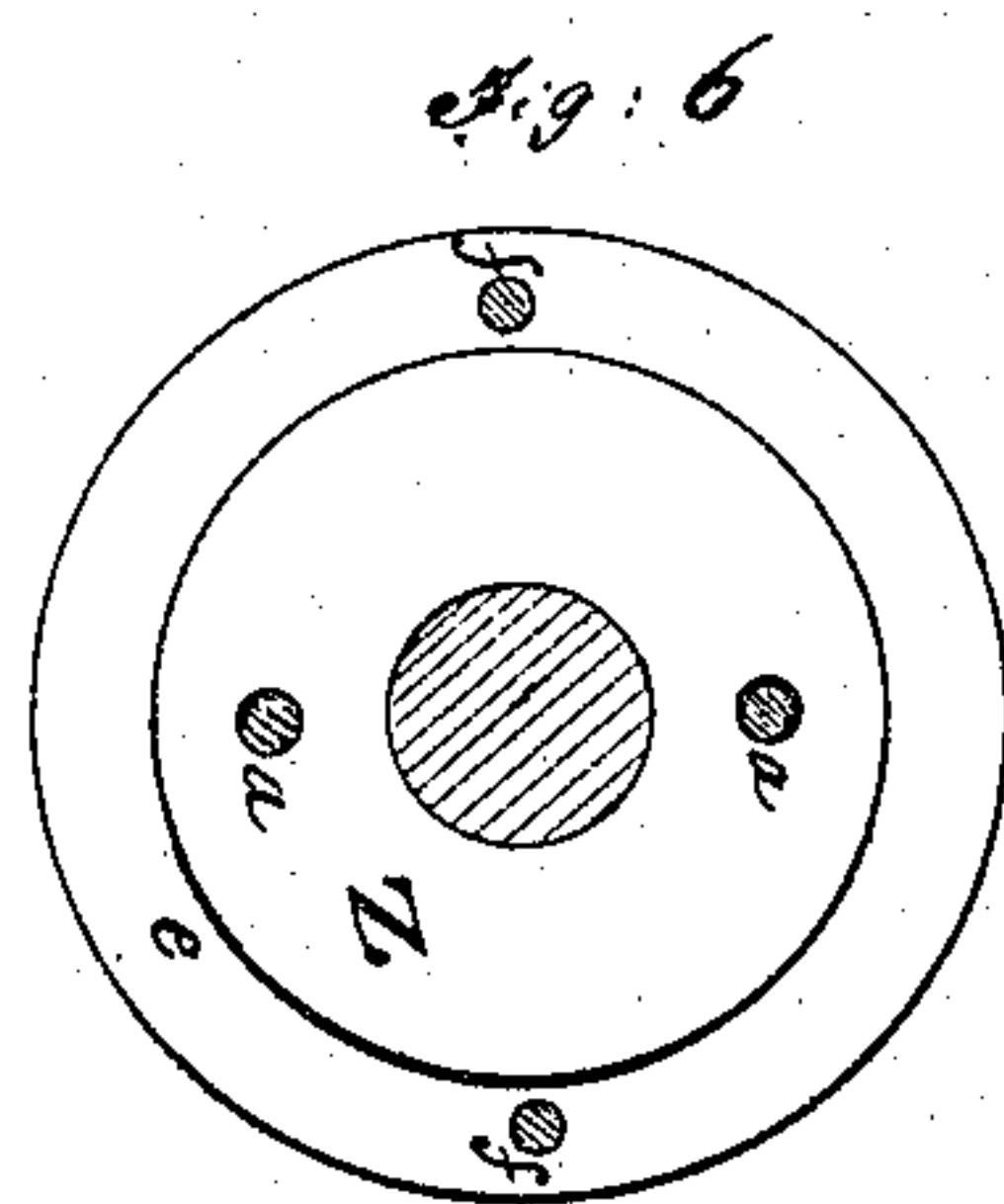
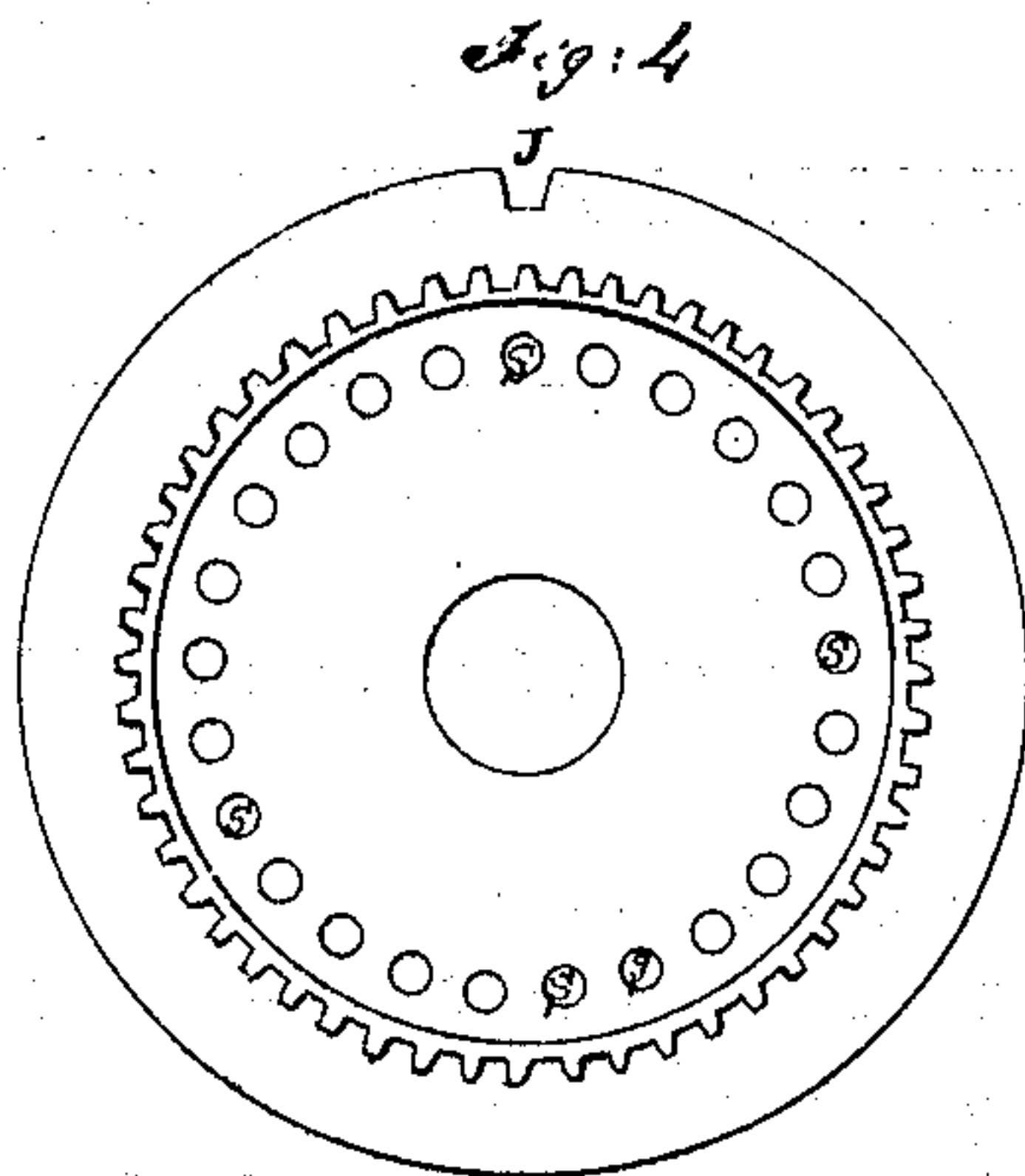
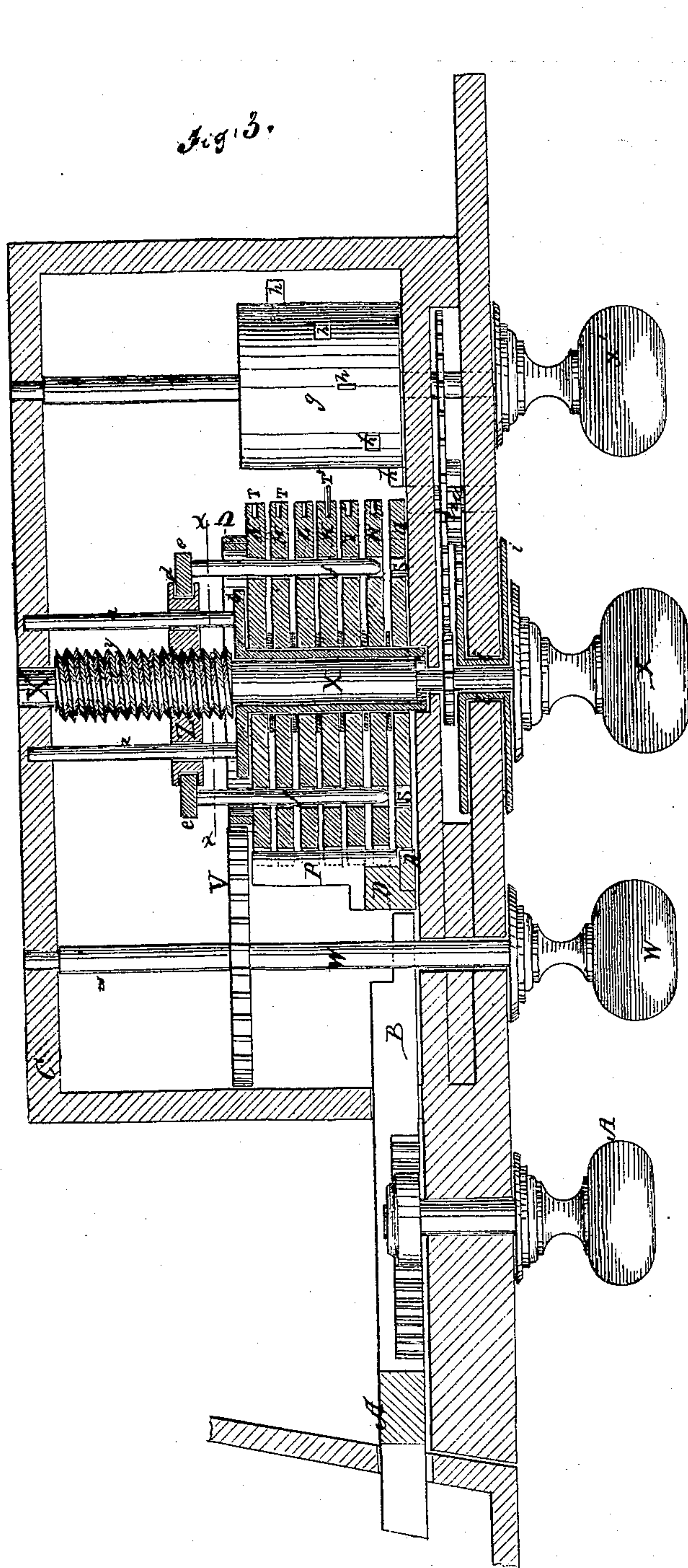
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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN COMBINATION LOCKS.

Specification forming part of Letters Patent No. 129,482, dated July 16, 1872.

*To all whom it may concern:*

Be it known that I, WILLIAM A. KERR, of Williamsport, in the county of Lycoming and State of Pennsylvania, have invented a new and Improved Combination Lock; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

This invention relates to improvements in combination locks; and it consists in a novel arrangement of adjusting apparatus for setting a set of combination disks for locking and preventing the withdrawal of the bolt after it has been shot. It also consists in an application to the disks of a readjusting apparatus for returning them to the true position if they are disarranged after being turned away from the locking position and left in positions indicated by the letters of the word representing the combination on which it is locked. Said readjusting apparatus is also applicable for use in changing the combination. The object is to produce a lock that cannot be picked or easily blown up by powder, and which, if blown up, will destroy the means of moving the bolt and leave it unmoved.

Figure 1 is a front view of the lock. Fig. 2 is an elevation with the rear plate removed. Fig. 3 is a horizontal section. Fig. 4 is a side view of one of the disks. Fig. 5 is a side view of another disk which gears with the secondary locking-bolt for moving it. Fig. 6 is a section on the line *xx* of Fig. 3, looking from the front of the lock; and Fig. 7 represents the parts seen in the opposite direction at the said section, except the disks.

Similar letters of reference indicate corresponding parts.

A is the main bolt, and B prongs thereof extending into the lock-case C, at top and bottom and at the front, to be locked by the vertically-moving bolt D, which has a notch or mortise, E, which must be brought in such relation with the end F of one of the prongs B, by raising it, as will allow the end to enter before the main bolt can be withdrawn. This bolt is raised and lowered by the combination disks G, H, I, K, L, M, and N, which are mounted on the fixed sleeve O, and have each,

except disk G, a notch, J, in the periphery which must coincide with the notches of all the others, and the broad tooth P on the bolt D must be received in the said notches before the disks can move the bolt D. The disk G has cog-teeth Q on its periphery for gearing with a toothed rack, R, on bolt D. These disks all have a series of holes, S, as many in number as the letters of the alphabet, through them at equal distances apart, in a circle around the axis, and they have a corresponding number of radial holes T in their peripheries, in which pins T' are placed detachably, and the disk N has a toothed rim, U, attached to its side, which gears with the toothed wheel V on the knob-spindle W, which is employed for turning the disks. The letters of the alphabet, or it may be any other characters, are arranged in a circle around this knob W, and the knob has a pointer which indicates the position of the disks. The knob-spindle X passes through the tube O to the wall of the case beyond, in which it has a bearing, and between the said bearing and the tube O it has an enlarged screw-threaded part, *y*, which screws through a disk, Z, which is held against turning by the rods *a* running through it from the wall of the case to the flange *b*, on the inner end of tube O, and supporting said tube at this end. The disk Z, which is free to move back and forth on the rods *a*, has an annular groove, *d*, in its periphery, in which a ring, *e*, is fitted so as to turn freely; said ring carries two prongs, *f*, one on each of two opposite sides, which are for locking the disks together when the notches J coincide, for turning them altogether for moving the bolt D. They are forced in for locking them by turning the knob-spindle X, so as to draw the disk Z toward them. *g* is a drum placed on a knob-spindle, X', parallel with the spindle X, and so that the studs or tappets *h*, of which it has one for each notched disk, will come in contact with pins set in the periphery of said disks when adjusted so as to point directly toward them. Said studs are arranged spirally around the drum, and numbers are placed on the front plate around the knob corresponding to the number of the disks, and so as to indicate by a pointer on the knob when each stud is pointing toward its disk. This drum is for readjusting the disks or altering the combination, as will presently appear.



To indicate when the prongs *f* have entered the holes *S* in each disk—as it requires several turns of the knob-spindle *X* to move them from one disk to another, so that it cannot be employed for the purpose—I have provided a plate, *i*, to turn around the spindle *X*, within a scale of numbers, *k*, on the front of the lock corresponding to the disks, so that a mark or pointer on the plate *i* will indicate the combination-disks penetrated by the prongs. The sleeve *l* of this plate *i* passes through the lock-case and is toothed to gear with the spindle *X* by means of the train-wheels *m*, so proportioned that the pointer on the plate *i* will move from one number to another when the prongs *f* pass through one disk, and the plate *i* will turn once around while the prongs are passing through all the disks. *j* represents springs bearing against the disks to hold them from turning when set according to the letters of the combination.

The operation for unlocking is as follows: Suppose the disks to be adjusted when the safe is locked so that the letters spelling the word Easton in the alphabet around knob *W* indicate their position; first turn the knob *W* or the pointer thereon to the letter *E*, when the notch *J* will be in line with the notch of disk *N*. Then turn knob *X'* till the plate *i* points to Fig. 1 in its table *k*; this will show that the prongs *f* have entered the disk *M* and made it fast with the disk *N*. Then the knob *W* is turned to the letter *A*, when the prongs *f* will take the disk *L*, as above. Then continue in like manner until all the disks except the last one, *G*, are made fast with their notches in line. Then turn knob *W* to the letter which indicates the position of *G*, whether it be the last letter in the word or any other, and make it fast with the rest by turning knob *X*, and then turn knob *W* one-half revolution, when the broad tooth *P* will enter the notches *J*, and the disks will raise bolt *D* so that the main bolt *A* may be drawn back by the knob *A'*, the shank of which gears with it.

The locking operation is exactly the reverse of the above unlocking process. If by tampering with the lock after it has been locked the combination disks are disarranged, of course no one can unlock it until they are restored to the position they were in, as indicated by the letters to which they were set. This is done by the tappet-drum *g* in the following manner: First, however, it should be stated that when a word or combination of letters is determined upon to which the disks are to be set—for instance, the word Easton—the pins *T'* are so adjusted in the disks that when the several disks stand as the letters of the word indicate the said pins will be in a straight line. By first engaging all the disks with the prongs *f* and turning the knob *X'* so that its pointer stands at 1, then when knob *W* is turned the pin *T'* of disk *G* will come in contact with the tappet. This disk is then disengaged from the prongs *f* and left in this position, and the knob *X'* turned to Fig. 2, and

the disk *H* turned by knob *W* till its pin touches the tappet for it on drum *g*, and said disk is disengaged, and so on till all the pins are brought again into a line. Then, by connecting all the disks together in this position by the prongs *f*, the lock will be in condition to be operated as before it was tampered with.

The combination can be changed without changing the pins in the edges of the disks. Although the pins are set to be in a straight line when the disks are set to the word Easton, it can be locked to any other word of six letters just as well, and unlocked without changing the pins at all, provided it is not tampered with in the mean time; for the pins are only used to facilitate the readjustment of the disks when they have been disarranged; but if, when set for one combination, it be locked on another, the readjustment will be more difficult.

This may, however, be done in the following way: First, the disks will be readjusted in the manner before described to the combination or word for which the pins are set—say Easton; then, by turning the disks forward or back (as the case may be) as many points as there are letters between the letter in the word Easton, for which the disks are set, and the corresponding word of the new combination, they will be readjusted to the latter. For example, if the new combination be France, the disks being first readjusted to the word Easton, then turn disk *G* forward one point, the difference between *E* and *F*; then turn disk *H* forward seventeen points, the difference between *a* and *r*; and so on throughout, and the readjustment will be established. Thus the disks can be arranged as often as required without changing the pins, if only the letters to which they are set be remembered. If, however, it be desirable to avoid this trouble, the pins can be changed each time the combination is changed, and then the readjustment is very simple. The number of letters in the word used in locking is of course determined by the number of disks, except when two or more are set to the same letter, in which case the plate *i* must be turned two or more points, or until the prongs are moved through all the disks set by that letter. All the operations are performed by turning knobs, and without any pulling out or pushing in, and the bolts are so situated that the blowing up of the whole inside arrangements will not open it, but, on the contrary, will only render it the more improbable that a burglar will be able to open it at all, for the bolts would still remain secure, and if the disks should be displaced by powder the bolts could not be moved at all, since it is by means of the disks that they are made to move.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the main bolt *A*, secondary bolt *D*, broad tooth *P*, the series of notched combination disks, and toothed disk



G, all the said disks gearing with bolt D, all substantially as specified.

2. The locking-prongs *f*, ring *e*, knob-spindle X *y*, disk Z, the disks G H I K L M N U, the knob-spindle W, and wheel V for turning the disks, all combined substantially in the manner described.

3. The combination, with the knob-spindle X, of the plate *i* and train-wheels *m* gearing it therewith, the said train-wheels being arranged

for turning plate *i* relatively to the movements of the prongs *f*, all substantially as specified.

4. The combination, with the disks and adjustable pins T' therein, of the tappet-drum *g* and knob-spindle X', the tappets being arranged relatively to the disks, all substantially as specified.

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