G. O. LEOPOLD.

BREAST DRILL.

APPLICATION FILED MAY 1, 1907.

917,319.

Patented Apr. 6, 1909.

2 SHEETS—SHEET 1.

Fig. 5.

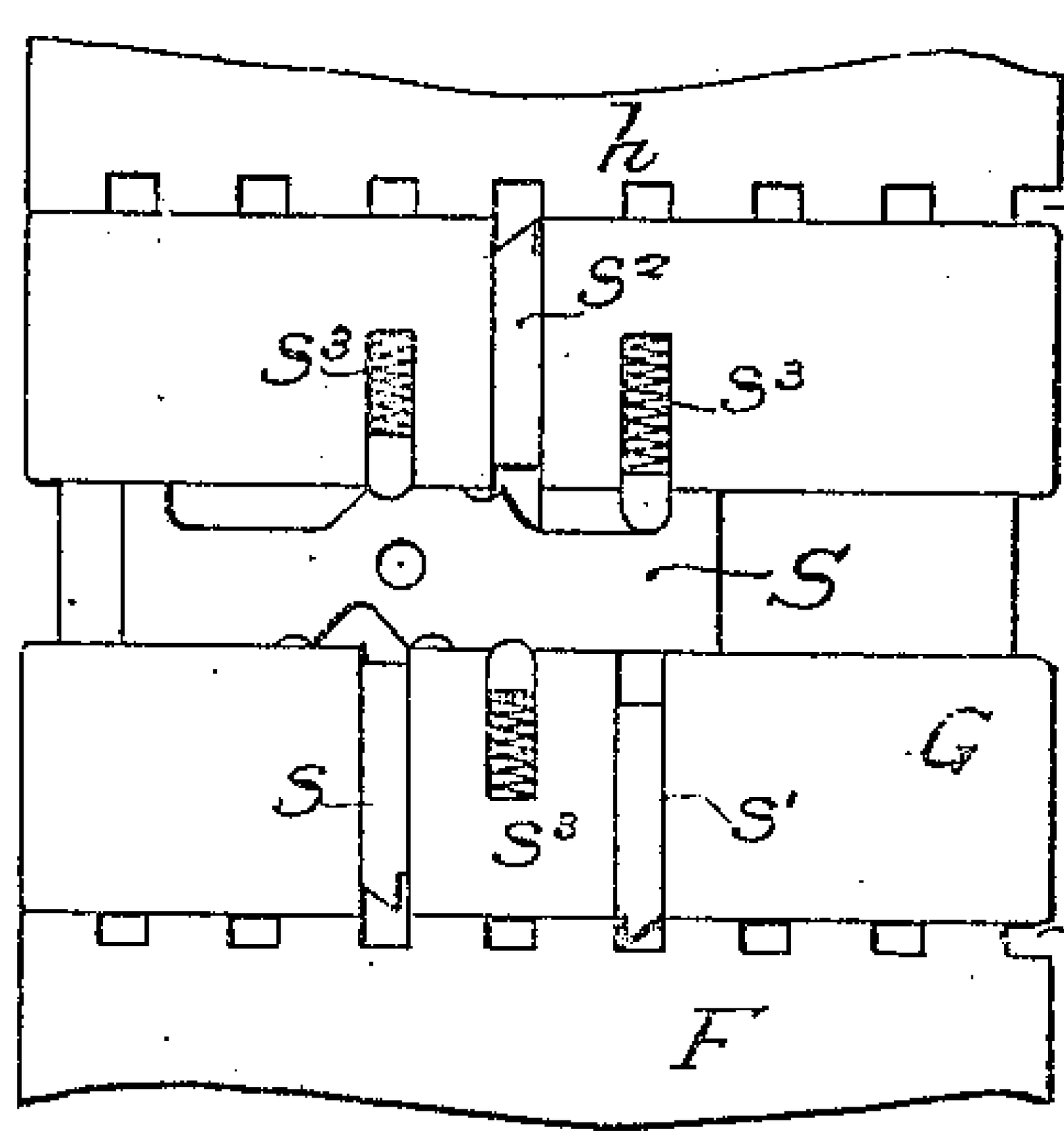


Fig. 6.

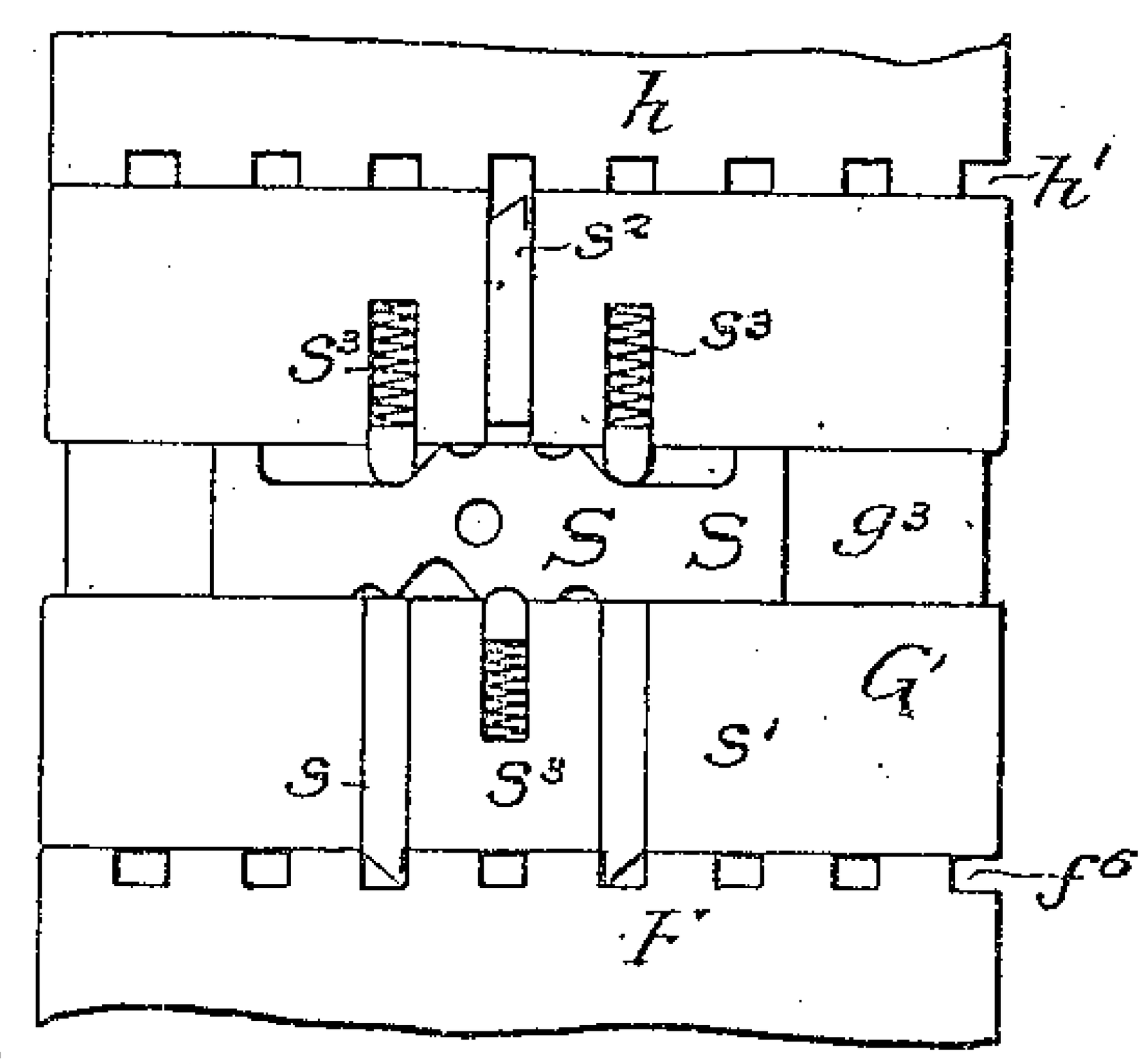


Fig. 1

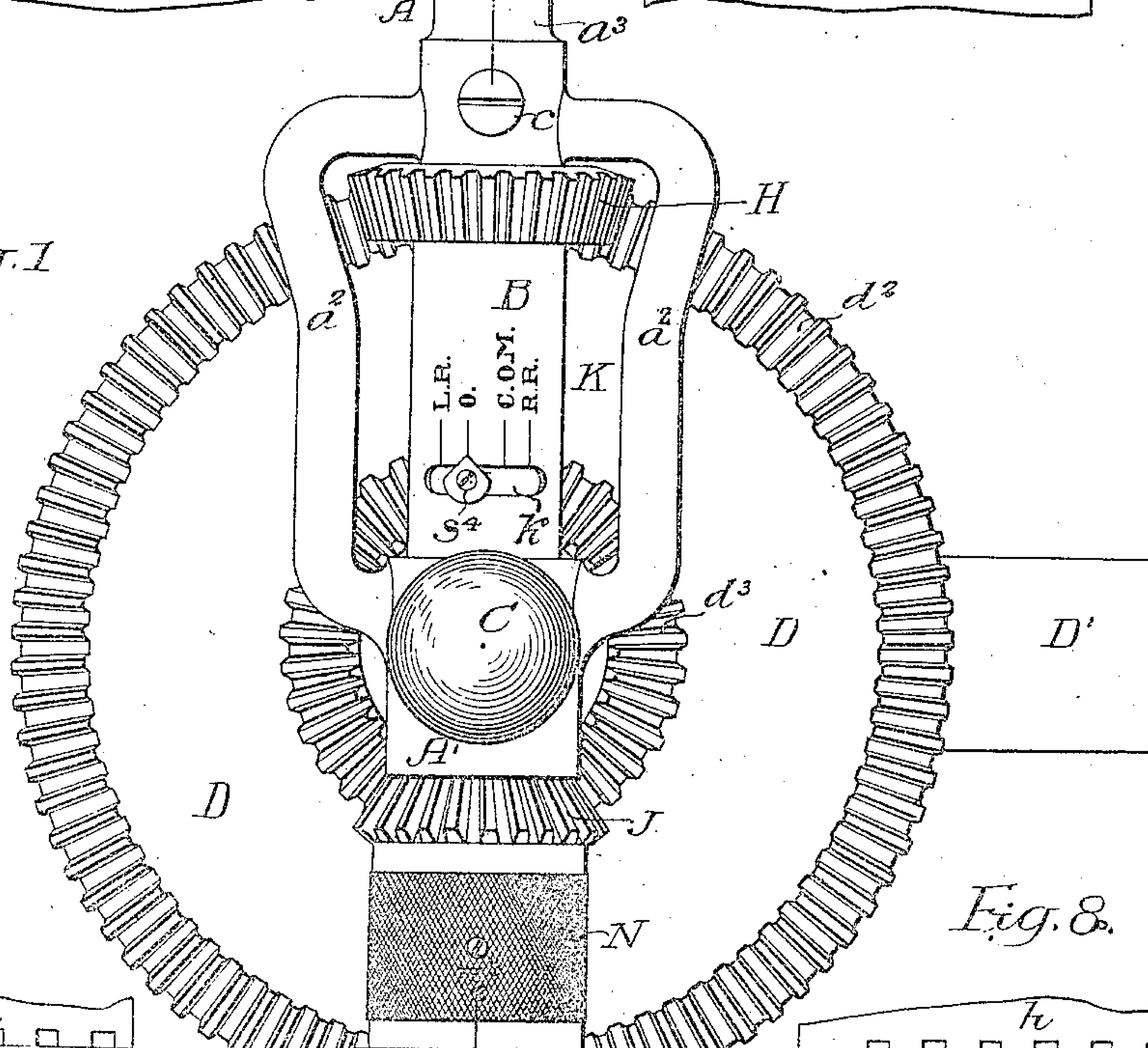


Fig. 7.

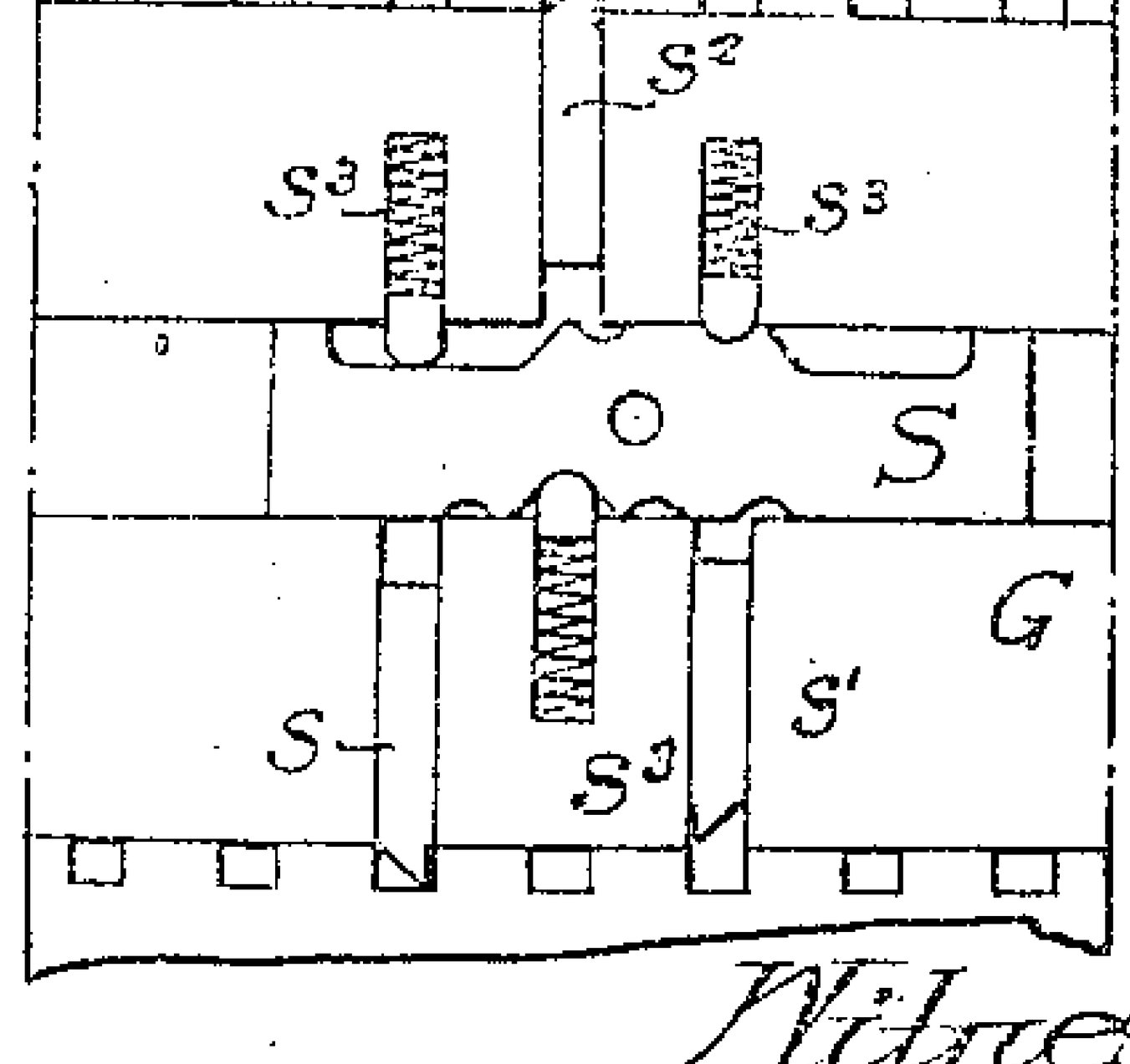
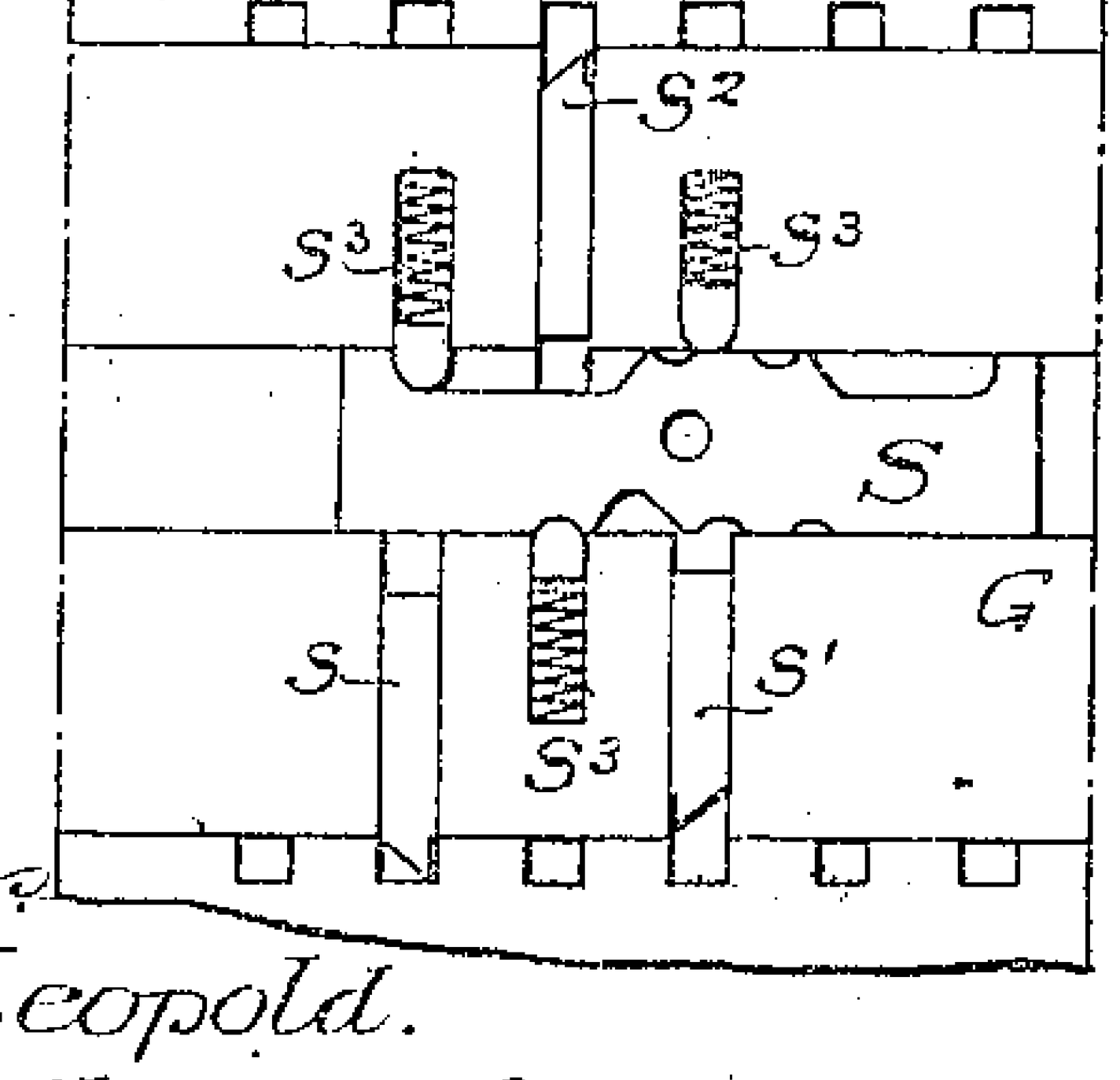


Fig. 8.



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2 SHEETS—SHEET 2.

Fig. 9.

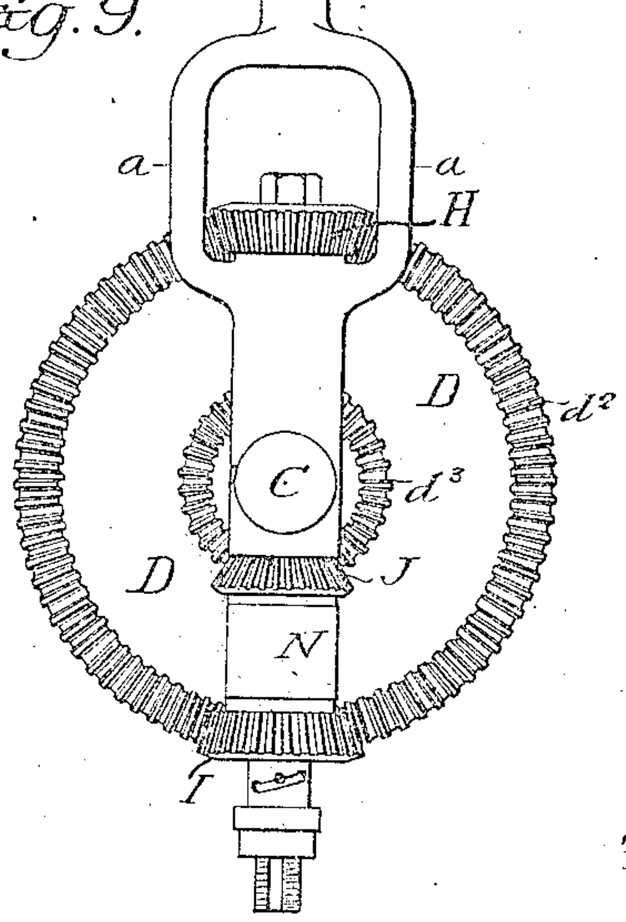

Fig. 10.

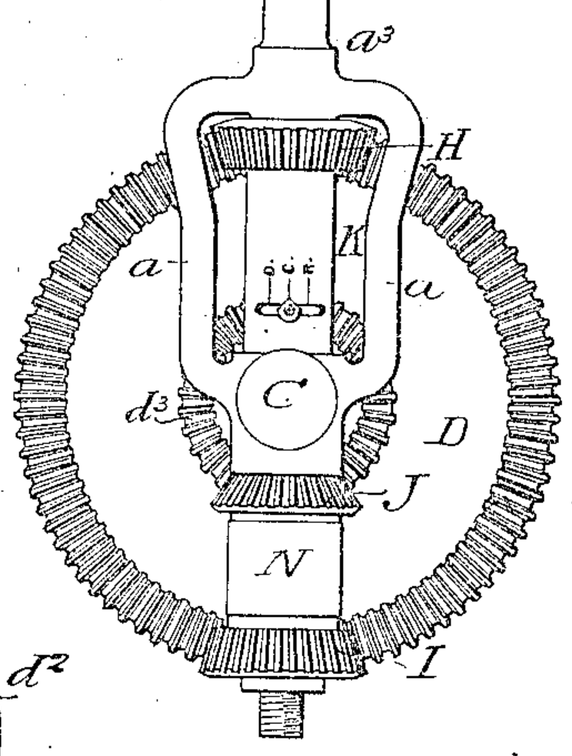

Fig. 2.

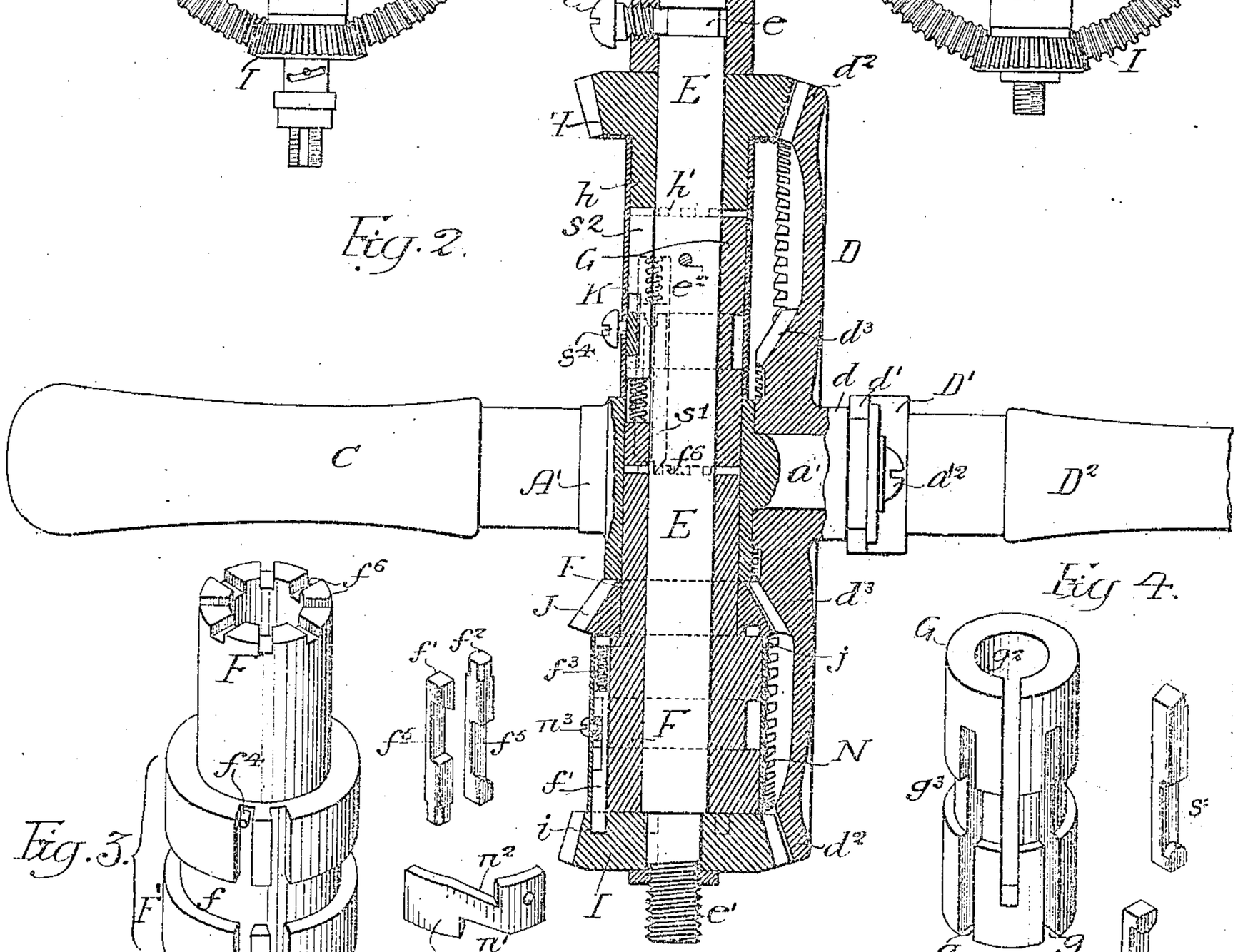

Fig. 3.

Fig 4.

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UNITED STATES PATENT OFFICE.

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BREAST-DRILL.

No. 917,319. Specification of Letters Patent. Patented April 6, 1909.

Application filed May 1, 1907. Serial No. 371,276.

To all whom it may concern:

Be it known that I, GEORGE O. LEOPOLD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Breast-Drills, of which the following is a specification.

The object of my invention is to provide a breast drill with means whereby the speed of the drill can be readily changed and the device employed at will as either a right or a left hand ratchet, or on reciprocating the driving mechanism, the driven spindle can be caused to have a continuous forward movement or can be locked to the driving element.

A further object of my invention is to so locate the mechanism for accomplishing the above noted results that the tool as a whole will be compact and convenient to use.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a face view of a breast drill illustrating my invention; Fig. 2, is a vertical section on the line 2—2, Fig. 1; Fig. 3, is a perspective view of the change speed mechanism; Fig. 4, is a perspective view of parts of the mechanism for changing the character of the movement imparted to the drill; Figs. 5, 6, 7 and 8, are diagrammatic views illustrating the pawls shifted to different positions, and Figs. 9 and 10, are elevations illustrating modifications of the invention.

In the above drawings, A is the frame of the breast drill, having a breast plate *a* and a bearing A'. This bearing has two arms a^2—a^2 between which is located the mechanism B for changing the character of the movement of the spindle. Projecting from one side of the bearing A' is a handle C and on the bearing itself is a spindle *a'* on which is mounted a beveled gear wheel D held in place by a screw a^{12}. In the present instance, the hub *d* of the gear wheel D is grooved for the reception of the forked portion *d'* of the crank arm D' which has a handle D^2, as is common in this type of drill.

The spindle of the drill is indicated at E as passing through the bearing A' and extending into a step bearing a^3 in the stock portion of the frame A; it being provided with a groove *e* into which extends a confining screw *c* so that said spindle is prevented from moving longitudinally in its bearings, while being however, free to rotate. Mounted on the spindle E are two sleeves F and G both snugly fitting the bearing A' and serving to reinforce while being fixed to said spindle.

A beveled pinion H having a hub *h*, is loosely mounted on the upper portion of the spindle E and meshes with the teeth d^2 at the periphery of the gear wheel D, while a second beveled pinion I is loosely mounted on the lower end of the spindle E, and also meshes with said teeth d^2 of the wheel D. A beveled pinion J loosely carried on the sleeve F meshes with a second set of teeth d^3 on the wheel D; these teeth being nearer the center of said wheel than the teeth d^2, as clearly shown in the drawings. Either of the pinions I and J can be thrown into and out of operative connection with the spindle E, thereby either disconnecting it from the driving mechanism or varying the speed of the spindle as desired.

Referring to Figs. 2 and 3, it will be noted that the sleeve F is enlarged at F' and has an annular groove *f* in the enlargement. Fitting in this groove is a shifting plate *n* beveled and notched at *n'* and n^2. Two bolts *f'* and f^2 are constructed to fit into suitable grooves in the part F' and at one end of each bolt is a spring f^3 acting between it and a pin f^4 in the groove in which such bolt is mounted. Each bolt is notched at f^5 for the reception of the plate *n* and has one wall beveled, as shown, so as to conform to the bevels *n'*, n^2 of the plate *n*.

The beveled pinion J, which is mounted on the hub of the sleeve F, has a series of openings *j* into which the bolt f^2 can be forced by its spring when the notched plate *n* is shifted into one position, and the beveled pinion I which is mounted on the spindle E at the end of the sleeve F, has a series of holes *i* into which can be projected the end of the bolt *f'*.

The plate *n* is held to a sleeve N by a screw n^3 and this sleeve is roughened so that it can be readily grasped and turned by hand. When the sleeve N with the plate *n* is turned to the extreme right position the bolt f^2 is projected under the action of its spring into one of the holes of the beveled pinion J and as this beveled pinion meshes with the teeth d^3 which are nearer the center of rotation of the wheel D, the sleeve F will be driven at a

slow speed. When the sleeve N and its plate n are moved to the left, then the bolt f^2 is withdrawn and the bolt f' is allowed to be projected into one of the holes i in the pinion I, and as this pinion meshes with the teeth d^2 on the periphery of the wheel D, the sleeve F will be driven at high speed.

It will be noticed that the sleeve F is loose upon the spindle E and is coupled to the spindle through mechanism for changing the character of the drive as illustrated in Figs. 4 to 8 inclusive.

The sleeve G is secured to the spindle E by a transverse pin e^3, Fig. 2, being placed between the pinion H and the sleeve F and having a number of longitudinal slots as shown in Fig. 4. On the end of the hub h of said pinion H are a series of teeth h', while on the upper end of the sleeve F are a second series of teeth f^6, there being pawls s and s' operating in the slots g and g' so as to be capable of engaging the teeth f^6 and a pawl s^2 in the slot g^2 capable of engaging the teeth h'. The two pawls s and s' are oppositely beveled while the pawl s^2 is also beveled as shown best in Fig. 4. In the sleeve G is an annular groove g^3 in which rests a slide plate S notched as shown in Fig. 4, and in the diagrams 5 to 8 inclusive, the pawls being grooved to receive this notched plate. In each one of the longitudinal grooves g, g', g^2 is a spring s^3 which acts upon its particular pawl so as to force it into engagement with its teeth when it is released by the plate S.

Inclosing the space between the bearing A' and the beveled pinion H is a casing K provided with a slot k through which projects a shifter s^4. This shifter is connected to the plate S so that when moved to either of its four positions, as indicated in Fig. 1, it moves said plate and shifts the pawls.

The marks indicated in Fig. 1 on the casing K, reading from left to right, are "L. R.", meaning left ratchet, which indicates that when the shifter is opposite it, the pawls are set so that the drill spindle will move to the left and will ratchet on its return. "O" indicates that the pawls are in such a position that the driven mechanism is positively geared or locked to the driving mechanism, so that the device operates as an ordinary breast drill. "C. O. M." means that the pawls are so set that on the reciprocation of the driving mechanism, the driven mechanism will be given two forward impulses in the same direction or will be given a "continuous onward movement." "R. R." means that the pawls are so set that the driven mechanism will move to the right and ratchet on the return.

Referring to Figs. 5 to 8 inclusive, which show the pawls in their different positions, Fig. 5 illustrates the plate S shifted to the extreme left hand position, the pawl s' being the only one projected, so that the driven spindle will be moved positively to the left, but will ratchet to the right. In Fig. 6, both pawls s and s' are projected and the pawl s^2 is retracted, so that the driven mechanism is locked to the driving mechanism and the driving mechanism is driven positively as in the ordinary breast drill.

In Fig. 7, is shown the plate S so shifted as to retract the pawl s' and allow the pawls s and s^2 to be projected, with the result that on the reciprocation of the driving mechanism, the driven mechanism is given a continuous forward movement. In Fig. 8, I have shown the plate moved to the extreme right hand position in which the pawl s is projected and the pawls s' and s^2 retracted, so that the driven spindle will be positively moved forward to the right and ratchet to the left. Thus, by manipulating the two shifting plates n and S, I am enabled to make practically four changes of movement with one speed and four changes of movement with another speed. Moreover, the arrangement is such as to produce a very compact breast drill, which will meet all the requirements, while being so simple in construction that it can be manufactured at a price within the means of an ordinary mechanic.

In some instances I may make a breast drill without using means for changing the character of the movement, and in this case I employ the speed change gear illustrated in Fig. 9. I may also make a breast drill, as shown in Fig. 10, with only three changes of speed instead of four, in such case leaving off either the right or left ratchet, as, in some instances, it may not be necessary to provide a pawl with all the change mechanism. I prefer however, if practicable, to use the mechanism illustrated in Fig. 1. Further, in some cases it may be desirable to make the drill without the change speed mechanism, and it is to be understood that such a structure would be included as one form of my invention.

It will be noticed that by the construction illustrated I am enabled to make a very practical tool, for the spindle, while being comparatively light, is suitably protected from side strains by the sleeves F and G which each have a portion mounted in the bearing A'. Moreover, with the construction described, I provide a very firm and rigid tool which at the same time is not cumbersome.

I claim:-

1. The combination in a breast drill, of a frame, a spindle mounted in the frame, a stud on the frame, a driving gear wheel mounted on the stud, speed change means, and means for altering the character of the movement of the driven element, both of said means being mounted on the spindle, with gearing between said means and the driving gear, substantially as described.

2. The combination in a breast drill, of a

frame having a breast plate at one end, a bearing at the other end, a spindle, a stud projecting from the bearing, a beveled driving gear mounted on the stud, a sleeve secured to the stud, a beveled pinion on the spindle between the sleeve and the body of the frame, said pinion meshing with the driving gear, a sleeve loose on the spindle and mounted below the fixed sleeve, a pinion on the hub of said sleeve and another pinion mounted on the spindle below the sleeve, both pinions meshing with the teeth on the driving gear, pawls carried by the sleeve secured to the spindle, means for operating the pawls, and bolts secured to the sleeve loose on the spindle, with means for operating the bolts, said parts being so arranged that by operating the bolts the speed of the drill can be changed, and by shifting the pawls the character of the movement of said drill can be altered, substantially as described.

3. The combination in a breast drill of a frame, a breast plate carried by the upper portion of the frame, a bearing mounted on the lower portion of the frame, a stud projecting from one side of the bearing, a beveled driving gear mounted on the stud, a handle for driving the gear, a spindle mounted in the body portion and extending from the bearing at right angles to the stud, a sleeve mounted in a part of the bearing and secured to the spindle, a second sleeve loose on the spindle and extending into the bearing, with gearing between the sleeve and the driving gear, pawls carried by the fixed sleeve and bolts carried by the loose sleeve, with means for shifting the pawls and bolts, substantially as described.

4. The combination in a breast drill of a main frame having a bearing, a stud projecting from one side of the bearing, a driving gear wheel on the stud, a spindle mounted in the main frame and extending through the bearing, said spindle being free to turn in the frame, a fixed sleeve on the spindle extending partly into the bearing, a loose sleeve on the spindle below the fixed sleeve, and also extending into the bearing, a beveled pinion on the spindle at the end of the loose sleeve, another beveled pinion loose on the hub of the loose sleeve, a beveled pinion between the main frame and the fixed sleeve, said pinions meshing with the teeth on the driving gear wheel, teeth on the hub of the loose sleeve and on the pinion between the fixed sleeve and the frame, pawls on the fixed sleeve arranged to engage either the teeth of the pinion or those of the sleeve, and bolts on the loose sleeve arranged to be shifted, the whole being constructed substantially as and for the purpose described.

5. The combination in a breast drill, of a frame having a bearing, a spindle mounted in the main portion of the frame and extending through the bearing, said spindle being free to rotate in the frame, a sleeve fixed to the spindle and mounted in the bearing, two pinions, a second sleeve loose on the spindle, a pawl, means for moving said pawl to lock the loose sleeve to the fixed sleeve, means for operatively connecting either pinion to the loose sleeve, and a driving gear meshing with said pinions.

6. The combination in a breast drill, of a frame, a bearing on the frame, a spindle mounted on the frame, and extending through the bearing so as to be free to turn therein, a sleeve secured to the spindle and entering the bearing, with three pawls on the sleeve, and mechanism coöperating with the pawls to vary both the speed and the direction of rotation of the drill.

7. The combination in a breast drill, of a main frame having a bearing, a handle projecting from one side of the bearing, a stud projecting from the other side of the bearing, a beveled driving gear mounted on the stud, a spindle situated in the main frame extending through the bearing, a sleeve secured to the spindle and entering the bearing, two driving devices, one above and one below the sleeve on the spindle, both of said driving devices gearing with the driving gear, and the latter including a sleeve loose on the spindle, two pinions, means for coupling either pinion to the said sleeve, and means for connecting either the first driving device or said loose sleeve to said sleeve secured to the shaft.

8. The combination in a breast drill, of a main frame having a bearing, a stud on the bearing, a beveled driving gear mounted on the stud, a spindle mounted to turn freely in the main frame and extending through the bearing, a sleeve secured to the spindle and entering the bearing, a second sleeve mounted below the fixed sleeve and having a portion also entering the bearing, means for retaining said latter sleeve in position, means for connecting said sleeve to the driving gear, pawls having beveled ends and mounted in the fixed sleeve, teeth on the loose sleeve, placed to be engaged by the pawls, springs for forcing the pawls outward, and a slide plate mounted in an annular recess in the fixed sleeve and notched so as to retract or allow the pawls to project, substantially as described.

9. The combination in a ratchet drill, of a frame, a spindle free to rotate in the frame, a sleeve loose on the spindle, a second sleeve fixed to the spindle and having three longitudinal grooves, a pawl in each groove, one of said pawls being arranged to be projected in one direction to couple said two sleeves and the other two pawls being arranged to be projected in the opposite direction, means co-acting with said two last pawls to change the character of the movement imparted to the spindle, a slide plate arranged to move in an annular groove in engagement with the pawls, and being notched to actuate the

same, with springs for moving the pawls in a direction opposite to that caused by the slide plate.

10. The combination in a breast drill, of a frame having a bearing, a stud projecting from one side of the bearing, a beveled driving gear mounted on the stud and having two sets of teeth, one within the other, a spindle mounted on the frame and extending through the bearing, two sleeves mounted on the spindle and entering the bearing, one of said sleeves being secured to the spindle and the other being loose thereon, a beveled pinion mounted between the fixed sleeve and the frame, a second pinion free to turn loosely on the loose sleeve, a third pinion mounted loosely on the spindle below the loose sleeve, the three pinions meshing with the teeth of the driving gear, pawls on the loose sleeve arranged to engage the two pinions on either end thereof, said sleeve having an annular recess, and a slide plate mounted in the recess and notched to actuate the pawls, so that either one or the other of the pawls is projected or both are withdrawn, pawls placed on the fixed sleeve, so as to be capable of engaging the upper pinion and the loose sleeve, and a slide plate for shifting said pawls.

11. A breast drill consisting of a frame, a spindle loosely mounted on the frame, a sleeve secured to the spindle, and having an annular groove and three longitudinal grooves therein, one groove being cut through one end of the sleeve and the other two cut through the other end thereof, a plate mounted in the annular grooves and having a series of notches on each side, a pawl mounted in each longitudinal groove, springs tending to force the pawls outward, reversing means and change speed mechanism capable of being connected to the sleeve and thence to the spindle through said pawls, with shifting means for the plate whereby the tool can be converted into a right hand ratchet, a locked drive, and a continuous forward feed ratchet, or a left hand ratchet.

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

GEORGE O. LEOPOLD.

Witnesses:
JOS. H. KLEIN,
WM. A. BARR.