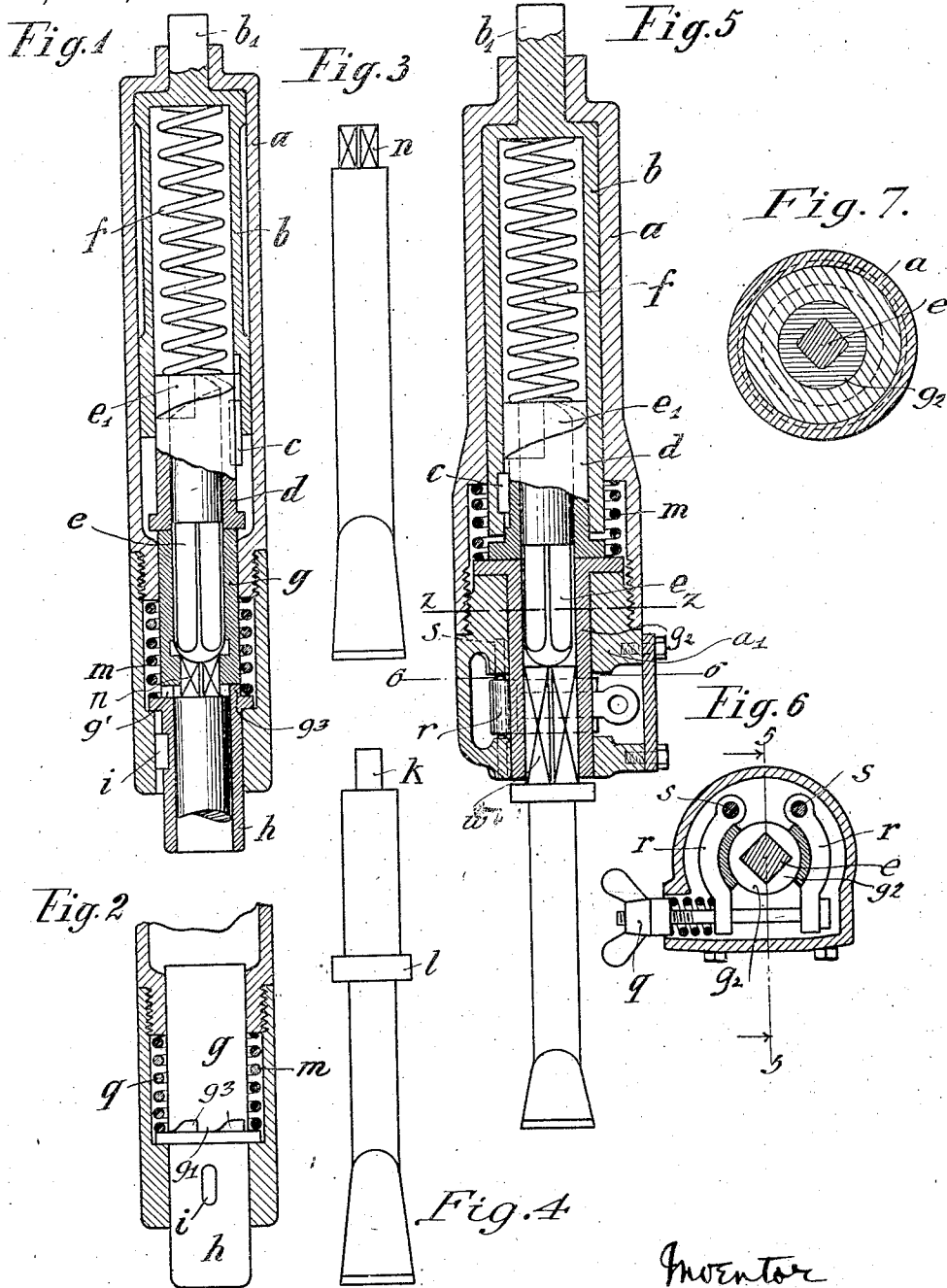


H. THIELE.
PERCUSSION TOOL.
APPLICATION FILED JULY 25, 1911.

Patented Dec. 7, 1915.

1,162,889.



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PERCUSSION-TOOL.

1,162,889.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HANS THIELE, a subject of the German Emperor, and residing at Friedenau, near Berlin, Germany, have invented certain new and useful Improvements in Percussion-Tools, of which the following is a specification.

My invention relates to percussion tools in which the operative tool is not only driven axially but also rotated about its longitudinal axis.

The object of my invention is to improve and simplify the rotating devices in tools of this character.

My invention is particularly applicable to those percussion tools which comprise a rotating driving member, and in which the percussion member formed as a cam acting on the operative tool is drawn backward by a rotating cam against the action of a spring and is then released to fly forward, the pressure of the cams one on another producing a torque which the one cam must resist if the percussion member is to be drawn backward, as is intended, by the rotatory motion.

Some illustrative embodiments of my invention are represented by way of example in the accompanying drawing, wherein:—

Figure 1 is a longitudinal section through one form of my improved percussion drill; Fig. 2 is a detail view showing parts of the same in elevation and parts in longitudinal section, and Figs. 3 and 4 show two forms of operative tools or cutters adapted to be used in the drill; Fig. 5 is a longitudinal section on line 5—5 in Fig. 6 showing a simplified form of drill, Fig. 6 is a transverse section on the line 6—6, Fig. 5, showing how the brake may be applied to the bushing to retard rotation of the tool, and Fig. 7 is a transverse section on the line Z—Z of Fig. 5.

Referring firstly to Figs. 1 and 2, a casing *a* contains the socket or sleeve *b* driven by means of its rod *b*, by an electric motor. The rotation of this socket is imparted by the key *c* to the cam *d* which drives the corresponding counter cam *e*, forming part of the percussion member *e* against the action of the spring *f*. After the one spiral cam has rotated a certain distance relatively to the other the cam constituting part of the percussion member is suddenly released by the other and is thrown forward onto the operative tool or cutter. When the one cam is rotated by the motor it exercises on the counter

cam a force which can be resolved into an axial and a tangential force. The latter was heretofore always taken up by suitable guides on the stationary parts of the tool; according to my invention I utilize it for directly rotating the operative tool, whereby the speed of the tool rotation is retarded over the speed of the rotating driving cam by means of a break action.

As the tool represented in Fig. 1 is to be used both with and without the turning movement, for the sake of clearness I will first explain how the rotatory motion of the operative tool is prevented. To this end, in the illustrative embodiment the percussion member *e* squared in front is guided in a bushing *g* having a suitable hole through it and simultaneously serving as abutment for the cam *d*. The bushing *g* is itself prevented from rotating in the casing *a* by teeth *g*₁ which engage with the teeth *g*₂ on the bushing *h* which, on its part, is axially displaceably but non-revolubly mounted in the head of the casing by means of the key *i*. A spring *m* presses the bushing *h* against its seat in the head of the casing, as clearly shown in Fig. 2. Now in order to use the tool without turning the operative tool, the latter is made as shown in Fig. 4 with a cylindrical projection *k* able to pass freely through the square hole in the bushing *g* to within reach of the percussion member *e*. The collar *l* then rests against the lower end of the bushing *h*. When the operative tool is driven it does not rotate because it contacts only with parts which are unable to rotate, and because the connection between the members *g* and *h* is never broken whether the bushing *h* is axially shifted more and more by pressure on the tool in order to tension the spring *f* more or less. If, on the contrary, the operative tool shown in Fig. 4 is replaced by that shown in Fig. 3 having no projecting collar and a square projection *n* corresponding to the square hole of the bushing *g*, and if the tool is now pressed axially, the toothed connection between the bushings *g* and *h* is disengaged because the former bushing moves backward, while the latter remains at rest, and the tangential force between the cams can now produce a rotation of the bushing *g* and also of the operative tool inserted therein. If the operative tool met with no resistance in the direction of rotation, it would soon rotate with

the velocity of the driving motor and the percussive motion would entirely cease. Owing to the resistance, however, which the operative tool or cutter experiences when it is pressed, owing to the friction on the work-piece, the rotatory motion is retarded so greatly that the percussive motion remains to the desired extent.

Whereas Figs. 1 and 2 show a percussion tool in which the essential device for obtaining automatic turning of the operative tool is connected with the known device for regulating the capacity by more or less severely compressing the spring *f*, Fig. 5 shows a somewhat simpler tool. Similar reference letters designate like parts of the tool. In this embodiment the bushings *g* and *h* are united, as it were, to form one single bushing *g*₂, and as its rotatory motion is not prevented ordinarily the operative tool is constantly rotated. The speed of rotation of the operative tool depends, of course, on the tangential force between the two cam-like members, and the resistance of the friction which the bushing *g*₂ experiences when rotating. The pressure of the spring *m* can now be proportioned so that the frictional moment produced by it is somewhat less than the torque imparted at the beginning of the stroke by the percussion member to the bushing. Consequently, a part of the rotatory motion of the cam *d* is imparted to the percussion member, to the bushing *g*₂ and also to the operative tool *w*. The back pressure of the spring *f* now acts directly on the upper edge of the bushing *g*₂ through the medium of the cam *d* axially displaceable in the socket *b*. At the beginning of the stroke this back pressure is small, but increases as the stroke increases, and finally increases the friction pressure constantly exercised on the bushing *g*₂ by the spring *m* that the bushing *g*₂ and with it the operative tool *w* is held before the stroke is terminated and the blow released. Thus the turning movement is suitably regulated.

Both in percussion tools according to Fig. 1 and in those according to Fig. 5 it may be desirable to be able readily to adjust the speed at which the operative tool turns. To this end, it is simplest to increase the friction between the bushing carrying the operative tool and the head of the casing, as is represented for instance in Figs. 5 and 6. As shown in these figures two lateral brake shoes *r* are disposed adjacent to bushing *g*₂, which may be more or less tightened against the bushing by means of thumb screw *q*, and thus the friction produced thereby and the speed of rotation may be retarded at will. Brake shoes *r* are disposed in an enlarged portion of the lower drill casing *a*₁, and pivotally held therein by pins *s* which may be inserted from the

outside through the lower end of the casing as shown in dotted lines in Fig. 5.

Obviously the details of the described device can be modified in various ways. Primarily, it is only essential that a torque produced when the percussion mass is drawn backward be utilized for turning the operative tool, while by means of additional arrangements, such as are shown in the drawings, auxiliary operations, such as cutting in and cutting out the turning motion, regulating the capacity, and the like, can be obtained.

I claim:—

1. In a percussion tool, the combination with a casing, a socket revoluble therein, a cam driven by the socket, and a spring-pressed percussion member having a squared portion and having a part formed as a counter cam in the socket co-acting with the former cam, of a bushing having a square hole and mounted in the end of the casing and containing the square portion of the percussion member, and an operative tool having a squared end in the bushing, said bushing adapted to be rotated by the percussion member.

2. In a percussion tool, the combination, with a casing, a socket revoluble therein, a cam rotated by the socket, and a spring-pressed percussion member having a squared portion and having a part formed as a counter cam in the socket co-acting with the former cam, of a spring-pressed bushing having a square hole mounted in the end of the casing and containing the square portion of the percussion member, and an operative tool having a squared end in the bushing adapted to be rotated by the percussion member.

3. In a percussion tool, the combination with a casing, a socket revoluble therein, a cam rotated by the socket, and a spring-pressed percussion member having a part formed as a counter cam in the socket co-acting with the former cam, of an operative tool, and means adapted to be rotated by the percussion member and to rotate the said tool, means connected with said former means for reducing the torque imparted by the percussion member to the tool, and a controllable brake for aiding said reducing means.

4. In a percussion tool, the combination, with a casing, a socket revoluble therein, a cam rotated by the socket, and a spring-pressed percussion member having a squared portion and having a part formed as a counter cam in the socket co-acting with the former cam, an operating tool, a bushing adapted to be rotated by the percussion member and to rotate the said tool, and a flange on said bushing in frictional engagement with the casing whereby the torque imparted by the counter cam to the tool is reduced.

5. In a percussion tool, the combination
with a casing, a socket revoluble therein, a
cam rotated by the socket, and a spring-
pressed percussion member having a squared
5 portion and having a part formed as a
counter cam in the socket co-acting with the
former cam, an operating tool, a bushing
adapted to be rotated by the percussion
member and to rotate said tool, and a flange
10 on said bushing in spring-pressed engage-

ment with the casing whereby the torque
imparted by the counter cam to the tool is
reduced.

In testimony whereof I have signed my
name in the presence of two witnesses.

HANS THIELE.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.