Feb. 19, 1946. R. TEMPLE 2,395,354

DRIVING TOOL

Filed Dec. 24, 1943

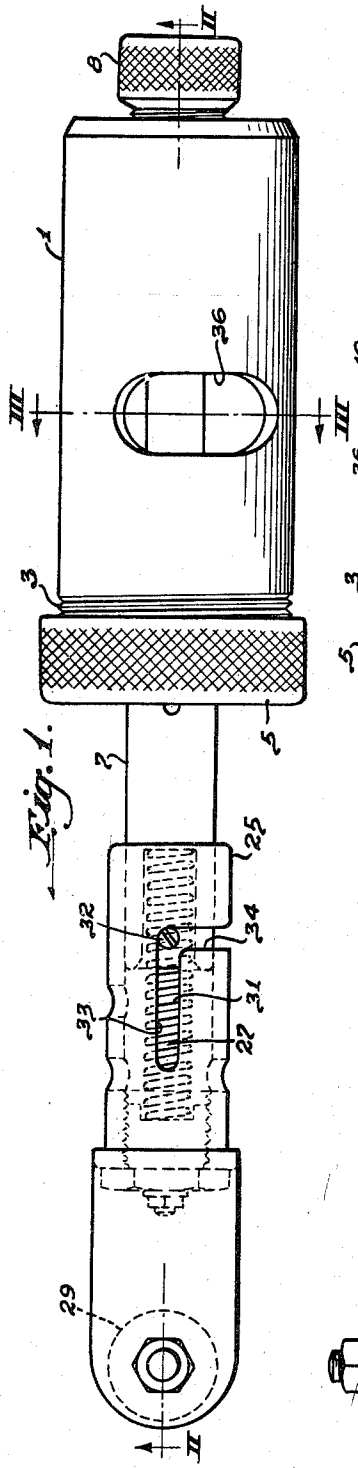


Fig. 1.

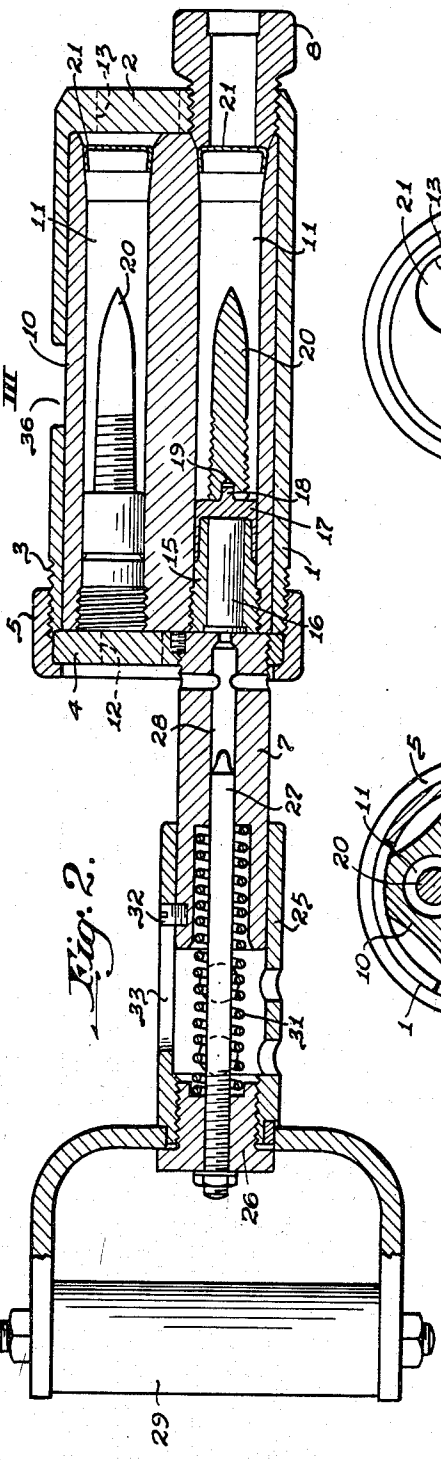


Fig. 2.

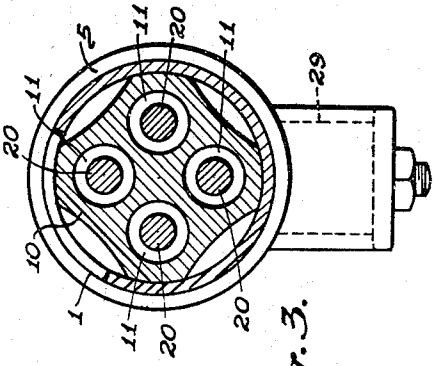


Fig. 3.

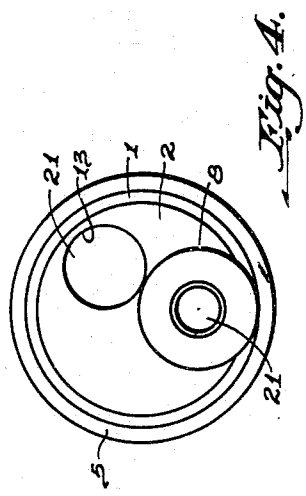


Fig. 4.

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2,395,354

DRIVING TOOL

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13 Claims. (Cl. 1—46)

This invention relates to explosively actuated tools, and more particularly to those by which working elements are driven out of the barrel of a tool.

In my Patent No. 2,213,435 a tool is shown by which a working element in the form of a pointed metal stud can be driven into a metal plate to secure it thereto. The driving force for the stud is obtained by firing an explosive charge behind it. This tool operates satisfactorily, but every time a new stud is driven the tool has to be reloaded. This, of course, slows down the driving process and materially limits the number of studs that can be driven in any given period of time.

It is among the objects of this invention to provide such a driving tool which contains a plurality of working elements that can be driven in succession without intermediate reloading, which is easy to operate, which can readily be reloaded after all of the working elements have been expelled, and which is strong and durable.

To accomplish these and other objects a barrel provided with a plurality of parallel bores extending longitudinally of it is rotatably mounted in a hollow cylinder. Outside of the cylinder at the rear end of one of the bores a firing pin is located for detonating a cartridge in the bore. Each of the bores is provided with one of these cartridges, and after one has been fired the barrel is indexed to bring the next cartridge into line with the firing pin. Each successive bore is temporarily held in proper firing position by means of a tubular positioning member that is adjustable axially to project it into the front end of the bore. The working elements are fired through this member. Preferably, each working element is provided at its rear end with a socket that frictionally receives a boss on the front end of a cup-like member that is frictionally supported on the front end of a cartridge-supporting member in the barrel so that pressure can build up behind the working element before it shoots forward.

The preferred embodiment of this invention is illustrated in the accompanying drawing in which Fig. 1 is a plan view of the tool; Fig. 2 is a longitudinal section taken on the line II—II of Fig. 1; Fig. 3 is a transverse section taken on the line III—III of Fig. 1; and Fig. 4 is a view of the front or muzzle end of the tool.

Referring to the drawing, a hollow metal cylinder 1 is provided at its front end with an integral end wall 2 and at its rear end with external screw threads 3. The rear end wall of the cylinder is formed by a circular plate 4 that is tightly clamped against the end of the cylinder by a knurled clamping ring 5 screwed onto cylinder threads 3. End plate 4 is provided at one side of its center with a threaded opening in which the front end of a rod 7 is screwed and about which more will be said later. The front end of the cylinder is provided with a threaded opening in axial alignment with the one through the rear end plate and in which a tubular positioning screw 8 is screwed.

Rotatably mounted inside of the cylinder is a barrel 10 that is provided with several parallel bores 11 extending through it from end to end and equally spaced from its axis. Four are shown in the drawing. These bores are so located that, by indexing the barrel, each can be located in succession in axial alignment with the above-mentioned openings through the end walls of the cylinder. The cylinder end walls are also provided with a pair of loading openings 12 and 13 located about half way between two of the bores so that no bore is in alignment with them when the barrel is in operating position. This location of the loading openings prevents anything from falling out of the barrel through them. To lock the barrel against rotation when it is desired that one of the bores should be aligned with rod 7 and screw 8, the latter is screwed into the cylinder until its tapered inner end seats in the flared front end of the adjacent bore. The screw therefore not only locks the barrel, but also properly positions it in the cylinder relative to the end wall openings.

Screwed into the rear end of each bore 11 is a sleeve 15 for removably receiving an explosive cartridge 16, as shown in Fig. 2. The outside of the front end of the sleeve is tapered toward the front of the bore. Fitting over and frictionally engaging the tapered end of each sleeve is a piston-like cup 17 provided with a forwardly projecting boss 18. This boss projects into a socket 19 in the rear end of a stud 20 which it frictionally engages for supporting the stud in the center of the bore. The stud is pointed at its front end, and its rear end is threaded so that nuts or the like can be screwed onto it after it has been driven into position in a plate or other support.

To keep water out of the barrel when this tool is used under water, such as for driving studs into a ship hull, a thin metal sealing cap 21 is inserted in the front end of each bore. This cap has an inwardly tapered annular flange that frictionally engages the tapered wall of the bore to hold the cap in place. Due to this tapered fit, water pressure forces the cap tightly into the end of

the bore to seal it. The cartridge and sleeve 15 seal the opposite end of the bore.

In order to detonate the cartridge, a sleeve 25 is slidably mounted on rod 7 from which the sleeve projects rearwardly. Screwed into the rear end of the sleeve is an exteriorly threaded nut 26 in which the threaded rear end of a firing pin 27 is screwed. This pin extends through the sleeve and into an axial passage 28 through rod 7. Also mounted on the rear end of the sleeve is an actuating handle 29. The firing pin normally is spaced from the cartridge in front of it by means of a coil spring 31 encircling the pin and compressed between the rod and the nut in the outer end of the sleeve. Outward movement of the sleeve on the rod is limited by a stop screw 32 projecting from the rod into a longitudinal slot 33 in the sleeve. The front end of this slot is provided with a lateral extension 34, as shown in Fig. 1, so that when the sleeve is turned to the left, the screw will enter this extension and thereby prevent the sleeve and firing pin from accidentally being pushed inwardly relative to the rod. A "safety" is thus provided.

When it is desired to fire the cartridge, handle 29 is turned to the right until screw 32 enters the longitudinal slot in sleeve 25, and then the handle is pushed ahead to cause the pin to strike and explode the cartridge. When this occurs, the force of the explosion builds up between the front end of the cartridge and the inside of the cup on the surrounding sleeve until the force is sufficient to blow the cup off the sleeve. The cup shoots forward in the barrel, carrying the attached stud with it, until it is stopped by positioning screw 8 which acts as an arresting block. The inertia of the stud causes it to leave the cup and the barrel and to penetrate the metal plate or other object against which the positioning screw is held. On its way out of the barrel, the stud pierces the sealing cap 21 in the end of the bore. Stopping of the cup before it can project from the end of the barrel prevents the cup from interfering with rotation of the barrel in cylinder 1. The cup also prevents the gas due to the explosion from being suddenly exhausted from the end of the barrel. This is important with these tools.

In order to drive another stud without reloading the barrel, screw 8 is unscrewed from the cylinder far enough to remove its inner end from engagement with the barrel so that the barrel can be rotated in the cylinder to move a loaded bore into alignment with the firing pin. The positioning screw is then screwed into the cylinder again to correctly locate the barrel and to lock it in place. The barrel is indexed by inserting the thumb in a hole 36 in the side of the cylinder and engaging the barrel in one of a plurality of recesses 37 extending lengthwise of it.

After all of the studs have been discharged from the barrel, the empty cartridges are removed through the opening in the rear end wall of the cylinder and are replaced by new cartridges, and new studs are inserted through the opening in the front end of the cylinder and pressed onto the cups in the different bores. It will therefore be seen that instead of having to reload this driver after driving each stud, several studs can be driven in quick succession without loading between.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood, that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A driving tool comprising a rotatable barrel provided with a plurality of working element receiving bores extending through it parallel to and equidistant from its axis, said bores being formed at their rear ends for receiving explosive charges for driving working elements out of the barrel, firing means behind the barrel, means supporting the barrel and firing means and having a wall in front of the barrel with a threaded opening through it, and a hollow screw screwed in said opening and adapted to be projected into the front end of any of said bores for selectively locating each bore and its explosive charge in operative position in front of said firing means.

2. A driving tool comprising a rotatable barrel provided with a plurality of working element receiving bores extending through it parallel to and equidistant from its axis, said bores being formed at their rear ends for receiving explosive charges for driving working elements out of the barrel, firing means behind the barrel, means supporting the barrel and firing means, and a hollow member carried by said supporting means in front of the barrel and adapted to be moved into engagement with the barrel for selectively locating the bores in operative position in front of said firing means.

3. A driving tool comprising a rotatable barrel provided with a plurality of working element receiving bores extending through it parallel to and equidistant from its axis, said bores being formed at their rear ends for receiving explosive charges for driving working elements out of the barrel, firing means behind the barrel, means supporting the barrel and firing means and having a wall in front of the barrel with a threaded opening through it in line with said firing means, and a hollow screw screwed in said opening and having a tapered end adapted to be projected into the front end of any of said bores for selectively locating them in operative position in front of said firing means, said screw projecting forward from said wall.

4. A driving tool comprising a rotatable barrel provided with a plurality of working element receiving bores extending through it parallel to and equidistant from its axis, said bores being formed at their rear ends for receiving explosive charges for driving working elements out of the barrel, the front ends of the bores being flared, firing means behind the barrel, means supporting the barrel and firing means and having a wall in front of the barrel with a threaded opening through it, and a hollow screw screwed in said opening and having a tapered inner end adapted to be projected into engagement with the flared front end of any of said bores for selectively locating them in operative position in front of said firing means.

5. A tool for driving pointed studs, comprising a rotatable barrel provided with a plurality of stud-receiving bores extending through it parallel to and equidistant from its axis, a cartridge-receiving member mounted in the rear end of each bore, a cup frictionally mounted on the front end of each cartridge-receiving member and provided with a forwardly projecting boss adapted

to project into a socket in the rear end of a stud in front of it for frictionally engaging the stud to support it in operative position in the barrel, firing means behind the barrel, means supporting the barrel and firing means, and means for selectively locating each bore and its cartridge in operative position in front of said firing means.

6. A tool for driving pointed studs, comprising a rotatable barrel provided with a plurality of stud-receiving bores extending through it parallel to and equidistant from its axis, a cartridge-receiving member mounted in the rear end of each bore, a cup frictionally mounted on the front end of each cartridge-receiving member and provided with a forwardly projecting boss adapted to project into a socket in the rear end of a stud in front of it for frictionally engaging the stud to support it in operative position in the barrel, firing means behind the barrel, means supporting the barrel and firing means, and an axially movable annular member carried by said supporting means in front of the barrel and adapted to be moved into the front end of any of said bores for selectively locating them in operative position in front of said firing means.

7. A driving tool comprising a rotatable barrel provided with a plurality of working element receiving bores extending through it parallel to and equidistant from its axis, said bores being formed at their rear ends for receiving explosive charges for driving studs out of the barrel, firing means behind the barrel, means supporting the barrel and firing means and having walls at opposite ends of the barrel provided with openings in axial alignment with one of said bores, and a tubular member adjustable axially in the front wall opening for projection into the front end of the adjacent bore to hold the barrel stationary.

8. A driving tool, comprising a hollow cylinder having end walls provided with axially aligned openings through them, a barrel rotatably mounted in the cylinder and provided with a plurality of bores extending through it parallel to its axis and equidistant therefrom, means carried by and extending through an end wall of the cylinder for selectively positioning each bore in axial alignment with said openings, said bores being formed at their rear ends to receive explosive charges and also working elements to be driven out of the barrel when said charges are exploded, and means operable through the cylinder opening at the rear end of the barrel for exploding the charge in the adjoining bore.

9. A driving tool, comprising a hollow cylinder having end walls provided with axially aligned openings through them, a barrel rotatably mounted in the cylinder and provided with a plurality of bores extending through it parallel to its axis and equidistant therefrom, the front ends of said bores being enlarged, a tubular member extending through the cylinder opening at the front of the barrel and adjustable axially therein for projection into the enlarged front end of any of the bores to selectively position a bore in axial alignment with said openings, said bores being formed at their rear ends to receive explosive charges and also working elements to be driven out of the barrel when said charges are exploded, and means operable through the cylinder opening at the rear end of the barrel for exploding the charge in the adjoining bore.

10. A driving tool, comprising a hollow cylinder having end walls provided with axially aligned openings through them, a barrel rotatably mounted in the cylinder and provided with a plurality of bores extending through it parallel to its axis and equidistant therefrom, means for selectively positioning each bore in axial alignment with said openings, said bores being formed at their rear ends to receive explosive charges and also working elements to be driven out of the barrel when said charges are exploded, and means operable through the cylinder opening at the rear end of the barrel for exploding the charge in the adjoining bore, the end walls of the cylinder having additional openings therethrough for loading of said bores.

11. A driving tool, comprising a hollow cylinder having end walls provided with axially aligned openings through them, a barrel rotatably mounted in the cylinder and provided with a plurality of bores extending through it parallel to its axis and equidistant therefrom, means for selectively positioning each bore in axial alignment with said openings, said bores being formed at their rear ends to receive explosive charges and also working elements to be driven out of the barrel when said charges are exploded, and means operable through the cylinder opening at the rear end of the barrel for exploding the charge in the adjoining bore, the end walls of the cylinder having additional openings therethrough for loading of said bores, said additional openings being located between a pair of said bores when said barrel is in operating position in said cylinder.

12. A driving tool comprising a rotatable barrel provided with a plurality of bores extending through it parallel to and equidistant from its axis, a cartridge-receiving member mounted in the rear end of each bore, a working element supporting member in front of each cartridge-receiving member and normally frictionally connected to it, firing means behind the barrel, means supporting the barrel and firing means, and means for selectively locating each bore and its cartridge in operative position in front of said firing means, said locating means projecting into a bore in operative position for arresting forward movement of the supporting member in that bore.

13. A driving tool comprising a rotatable barrel provided with a plurality of working element receiving bores extending through it parallel to and equidistant from its axis and having flared front ends, the flared front wall of each bore being adapted to be frictionally engaged by the inwardly tapered annular flange of a sealing cap disposed in the front end of the bore, said bores being formed at their rear ends for receiving explosive charges for driving working elements out of the barrel, firing means behind the barrel, means supporting the barrel and firing means, and means for selectively locating each bore and its explosive charge in operative position in front of said firing means.

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