J. HOCKING.

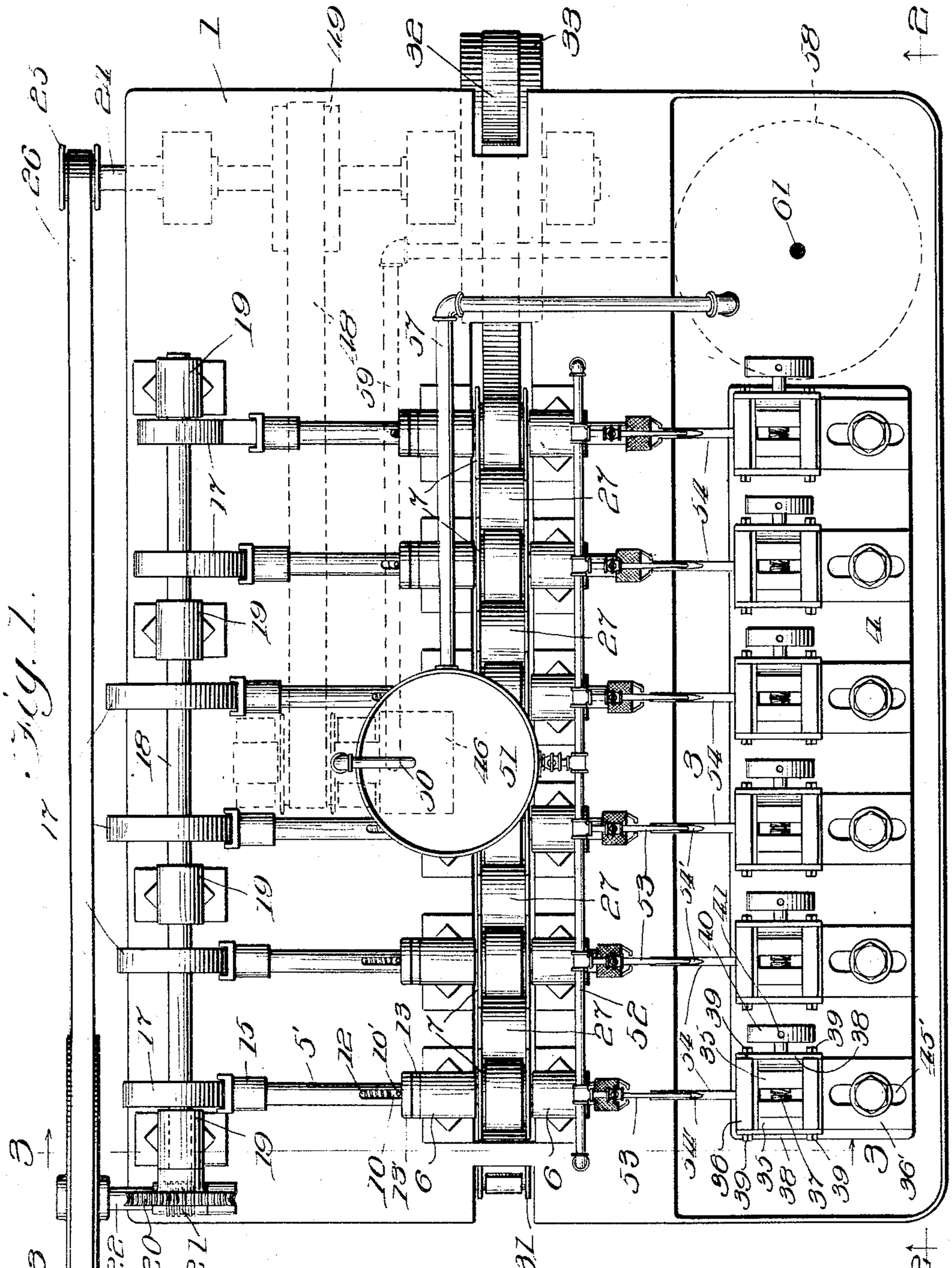
STAY BOLT DRILLING MACHINE.

APPLICATION FILED APR. 11, 1906.

931,119.

Patented Aug. 17, 1909.

4 SHEETS—SHEET 1.



Witnesses:

H. S. Gaither

W. A. Riddle

Inventor:

James Hocking

by Wm. V. Bell

Atty

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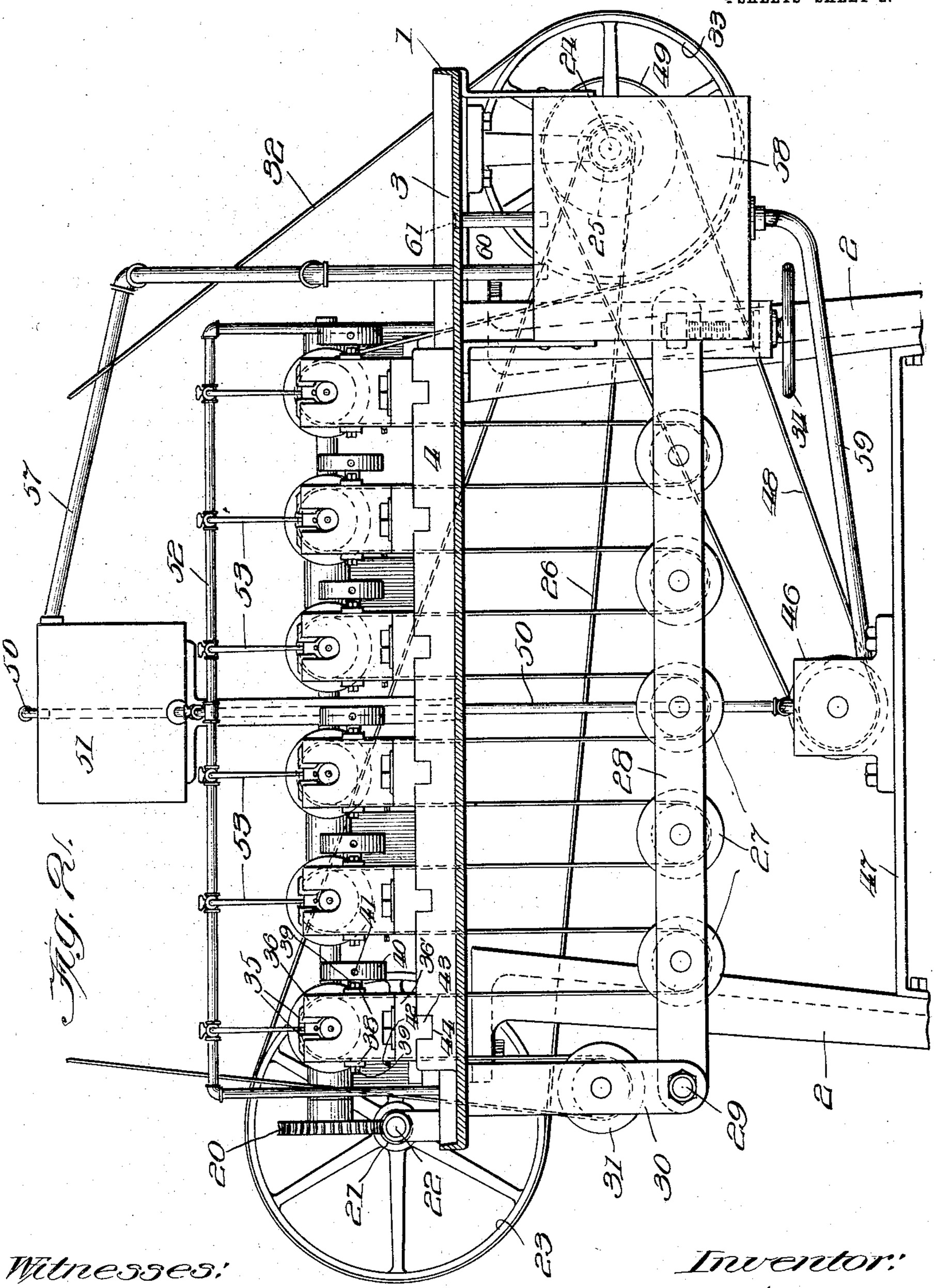

Fig. 2.

Witnesses:

H. S. Gaither.

M. A. Riddell

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by Wm. F. Bell

Atty

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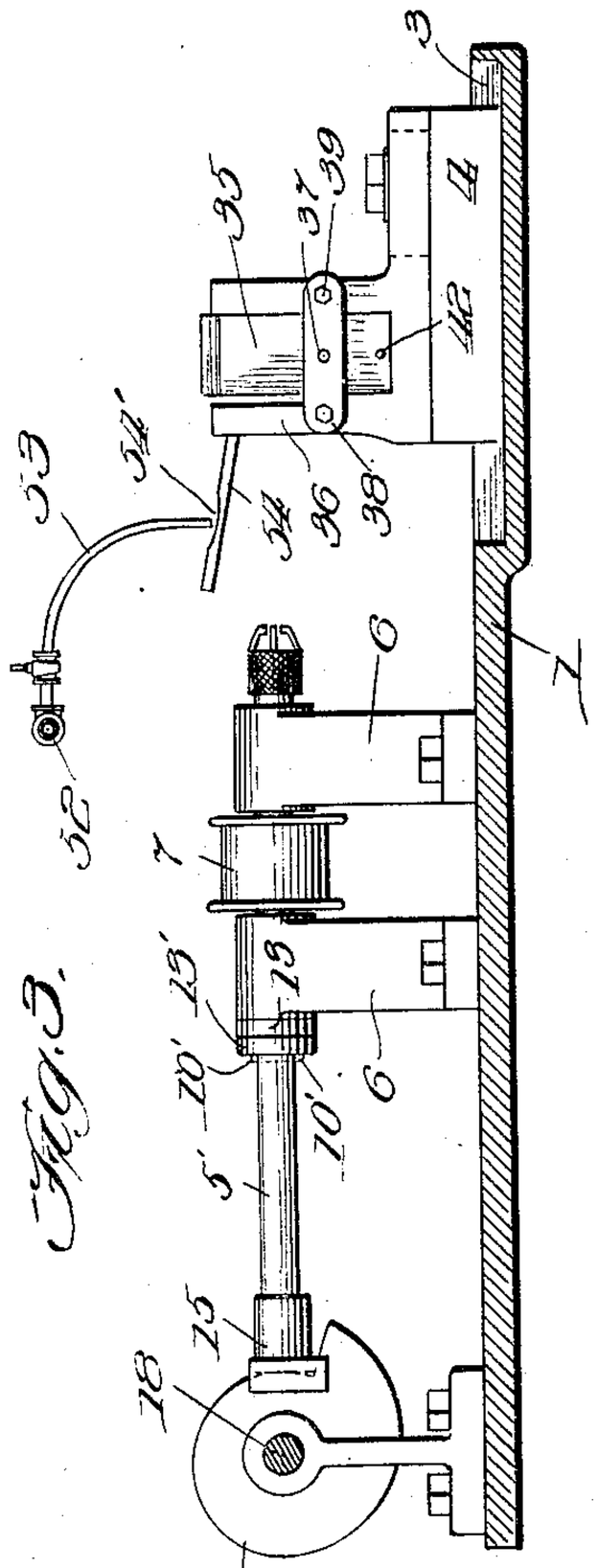

Fig. 3.

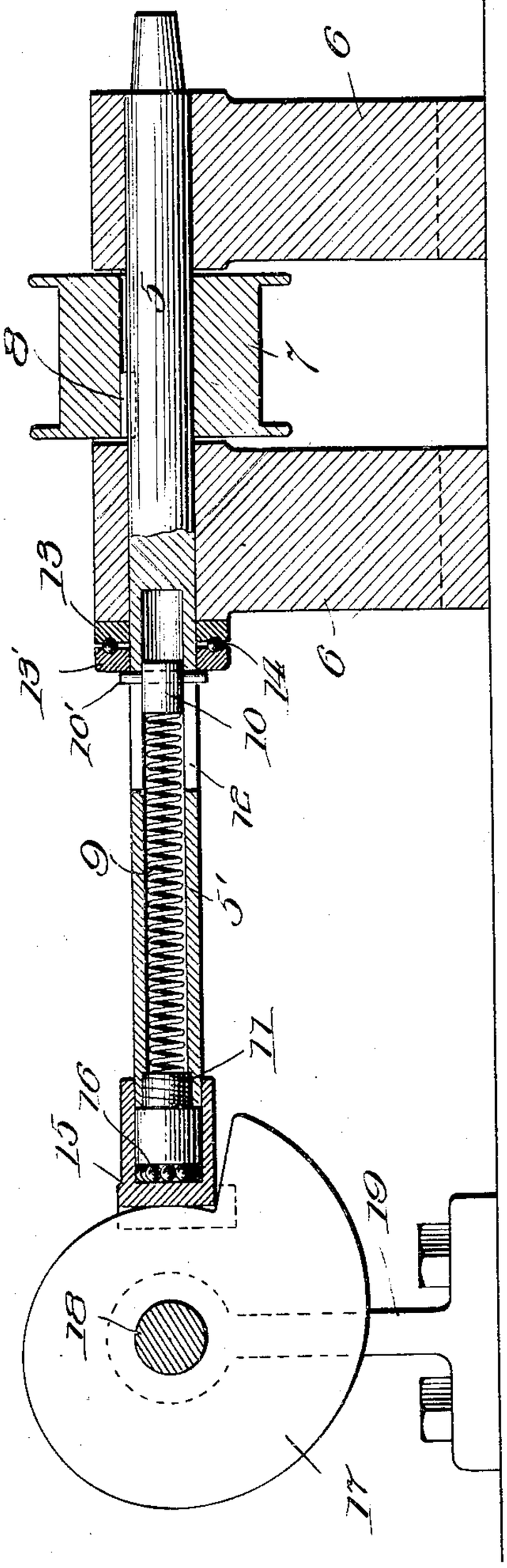

Fig. 4.

Witnesses:

H. S. Gaither

M. A. Riddell

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by Wm. V. Bell

Atty

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Fig. 4.

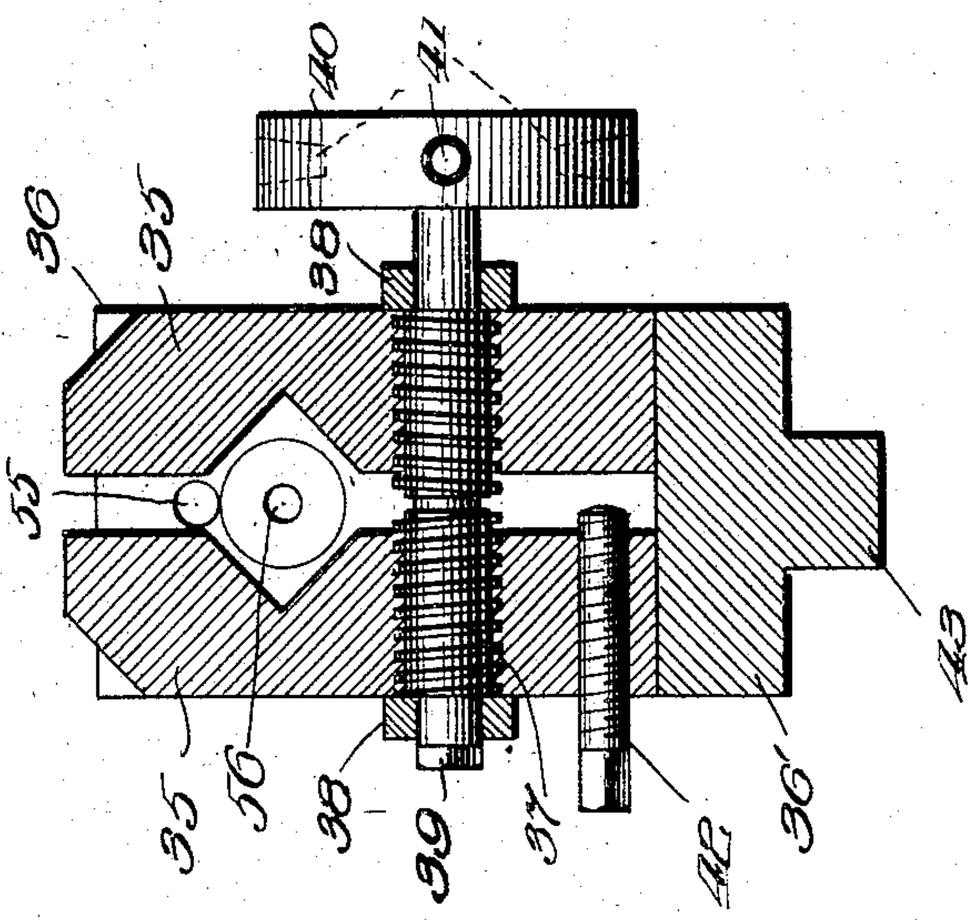


Fig. 5.

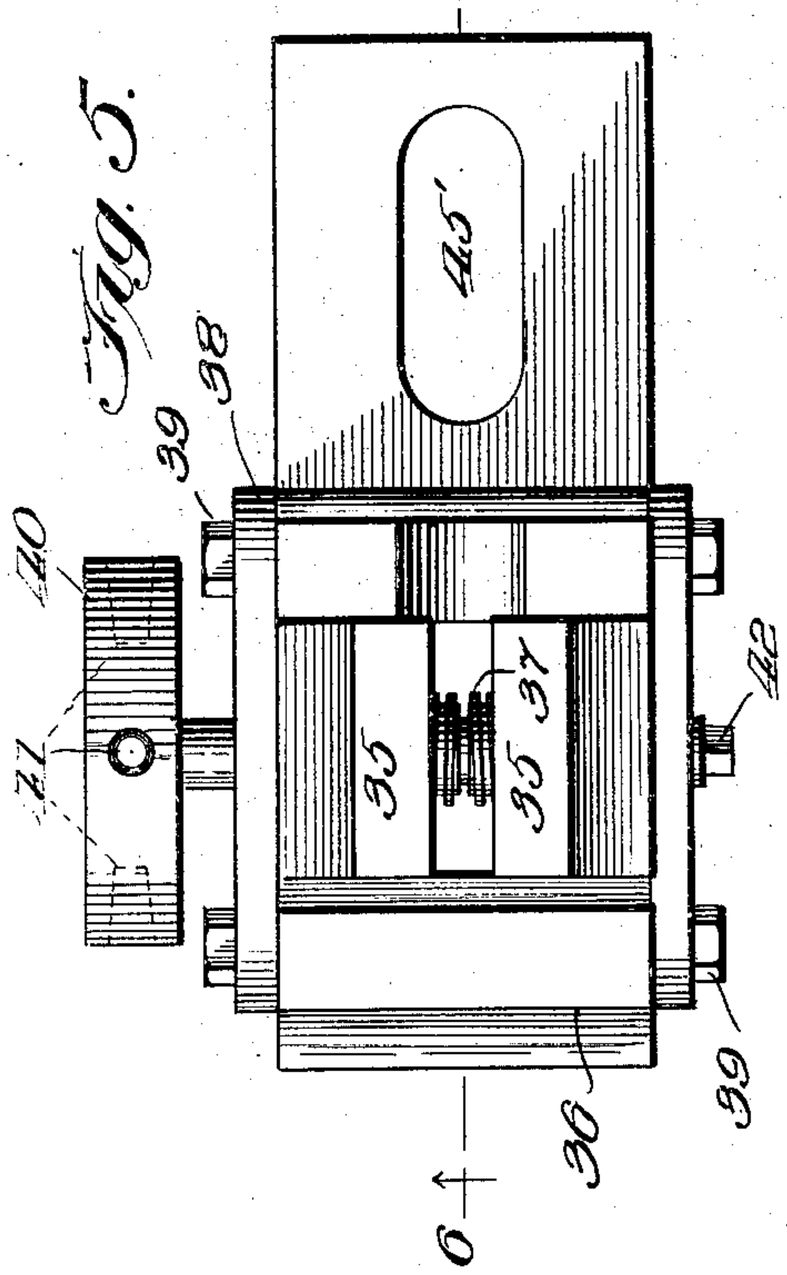
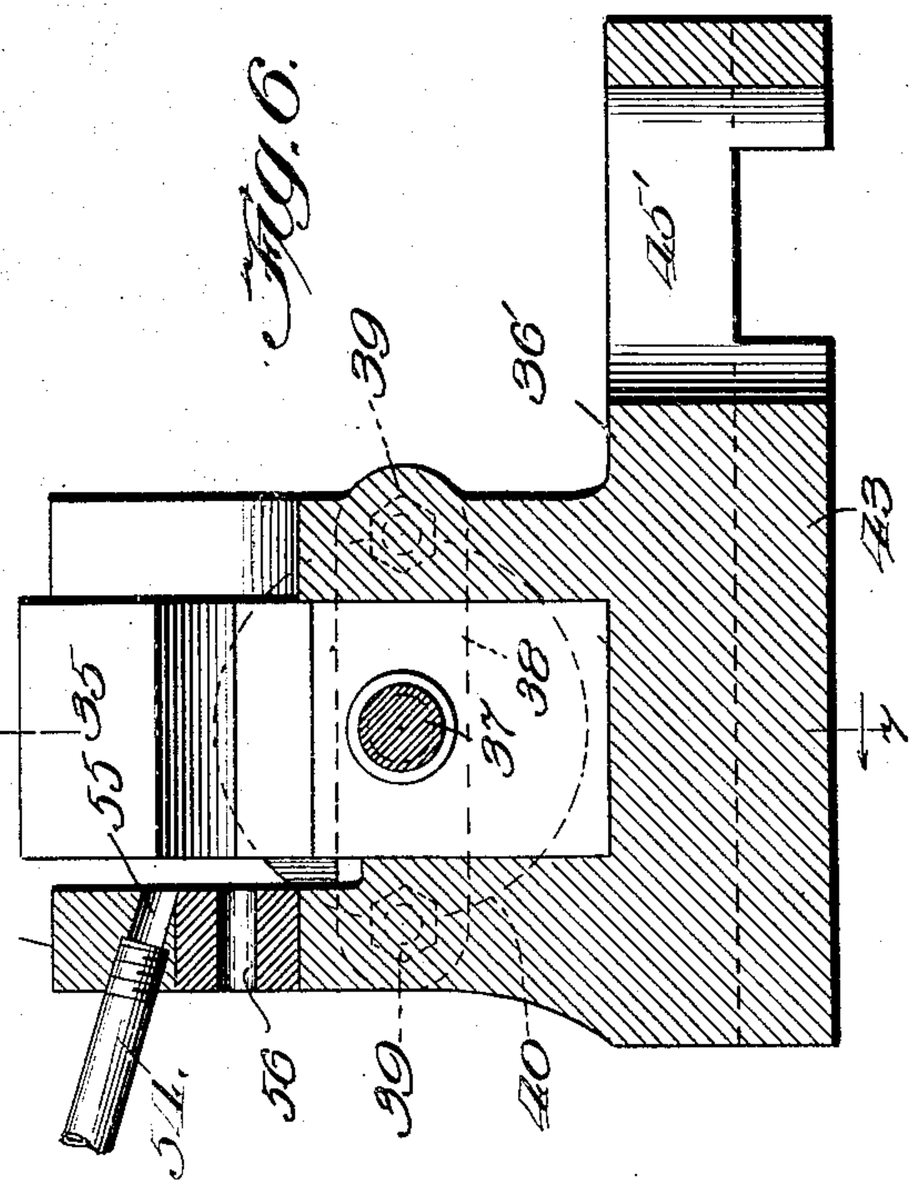


Fig. 6.



Witnesses:

H. S. Gaither

M. A. Riddle

Inventor:

James Hocking

by Wm. P. Belt

Atty

UNITED STATES PATENT OFFICE.

JAMES HOCKING, OF NORWOOD, MASSACHUSETTS, ASSIGNOR TO GEORGE L. BOURNE, OF NEW YORK, N. Y.

STAY-BOLT-DRILLING MACHINE.

No. 931,119. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed April 11, 1906. Serial No. 311,128.

To all whom it may concern:

Be it known that I, JAMES HOCKING, a citizen of the United States, residing at Norwood, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Stay-Bolt-Drilling Machines, of which the following is a specification.

Locomotive fire boxes are usually made with an outer sheet 5/8″ thick and an inner sheet 3/8″ thick and these sheets are braced by a large number of stay-bolts located at 4″ intervals and passing transversely through the sheets and the space therebetween. The stay-bolts are usually screwed into both sheets and riveted at their ends on the sheets. Owing to the high degree of heat to which the inner sheet is subjected and the consequent expansion and contraction of this sheet which takes place the bolts are subjected to a sort of shearing action and the result is that many bolts are fractured adjacent to the inner side of the outer sheet for the reason that the bolt is held rigidly by the outer sheet owing to its thickness and its rigidity as compared to the inner sheet. When one stay-bolt is fractured in this way the stability of the fire box is impaired and the adjacent stay-bolts are subjected to greater strain and of course these adjacent stay-bolts are more liable to fracture than before. It is frequently found in practice that after one stay-bolt is fractured a number of adjacent stay-bolts will fracture very soon and some times the stay-bolts in a considerable area will fracture greatly weakening the sheets and increasing the liability of explosion. For this reason it is a matter of vital importance to discover at once when the stay-bolt has been broken so that it can be replaced and in practice it is generally customary, as a matter of precaution, to replace the four adjacent bolts around each fractured bolt even if they have not been fractured. Therefore stay-bolts have heretofore been provided at their outer ends with a tell-tale hole extending centrally and longitudinally of the bolt, sometimes entirely through the bolt but more generally from the outer end for a short distance only to reach beyond the inner side of the outer sheet. When the stay-bolt fractures the steam escaping through the fracture and the tell-tale hole at once gives notice of the fracture.

The object of my invention is to provide an automatic and continuously operating machine for boring tell-tale holes in a plurality of stay-bolts at one time and which requires no other attention on the part of the operator except to lock the bolts in the machine and remove them.

In the accompanying drawings I have shown one manner of embodying my invention and referring thereto Figure 1 is a top plan view. Fig. 2 is a sectional view on the line 2—2 of Fig. 1. Fig. 3 is a detail sectional view on the line 3—3 of Fig. 1. Fig. 4 is an enlarged detail sectional view showing one of the spindles and its cam. Fig. 5 is a top plan view of one chuck. Fig. 6 is a sectional view on the line 6—6 of Fig. 5. Fig. 7 is a sectional view on the line 7—7 of Fig. 6.

The machine comprises a table 1 supported on legs 2 or in any other suitable manner and having a depressed part 3 and a chuck bed or support 4 in said depressed part. A plurality of drill spindles 5 are mounted on the table in standards 6 which are spaced apart to accommodate the pulleys 7 carried by the spindles and fastened to revolve therewith by feathers 8. Opposite each spindle is a chuck to hold the stay-bolt and as all the spindles and all the chucks are made alike I will describe one pair only in detail.

Referring to Fig. 4 the spindle projects rearward beyond the standards and this projecting part 5′ is tubular to accommodate a spring 9 which is held in place between the block 10 and the plug 11. The block is loosely arranged in the tubular part of the spindle and carries arms 10′ which project outward through slots 12 in the spindle. A step bearing is mounted on the spindle between the arms 10′ and the adjacent standard and this bearing comprises a member 13 which will remain stationary by frictional engagement with the standard and a member 13′ which revolves with the spindle by reason of frictional engagement

with the arms 10′, there being a plurality of balls 14 suitably located between the two members of the bearing. The plug 11 is screwed into the outer end of the tubular part of the spindle. A shoe 15 is arranged on the outer end of the spindle and it holds in place a plurality of balls 16 between itself and the end of the spindle so that the spindle may revolve without turning the shoe. A cam 17 is carried by a cam shaft 18 supported on standards 19 on the table and this cam operates against the shoe which is held in engagement with the cam at all times by the spring because the tension of the spring is constantly exerted to project the spindle rearward. The cam shaft carries a gear 20 which meshes with a worm 21 on the worm shaft 22 (Fig. 2) and this worm shaft carries a belt pulley 23. A main shaft 24 supported beneath the table carries a pulley 25 and a belt 26 travels on the pulleys 25 and 23 to operate the worm shaft. A plurality of idler pulleys 27 are carried by a support 28 which is pivoted at one end 29 to an arm 30 depending from the table and this arm carries a pulley 31. A main driving belt 32 operated from a line shaft travels on a pulley 33 on the main shaft and on all of the spindle pulleys and idler pulleys alternately in pairs and finally on the pulley 31. A belt tightener 34 of any suitable description operates on the free end of the idler pulley support 28 to adjust said support and thereby tighten or loosen the main driving belt as may be required. The stay-bolt to be drilled is carried by a chuck, illustrated in Figs. 5–7, and referring thereto 35 designates the jaws of the chuck which are arranged in a housing 36. A right and left threaded screw bolt 37 is supported in plates 38 fastened by bolts 39 to the housing and this bolt operates in correspondingly threaded openings in the jaws. The bolt may be provided with any suitable operating handle and I have shown a disk 40 on the bolt provided with peripheral openings 41 to receive a bar for turning the screw bolt to tighten the jaws on the stay-bolt. I prefer to provide one of the jaws with a screw 42 below the screw bolt which can be adjusted to prevent the jaws from buckling below the stay-bolt under the strain which may be applied by means of the screw bolt. The housing comprises a base 36′ having on its bottom a guide 43 which is arranged to fit in a groove 44 in the bed 4 and the chuck is secured in place in adjusted position on the bed by bolts 45, the base of the chuck housing having an elongated slot 45′ to receive the bolt which permits the adjustment of the chuck on the bed.

A pump 46 is mounted on a plate 47 fastened to the legs 2 and this pump is driven by a belt 48 operating on a pulley 49 on the main shaft 24. The pump forces oil through the pipe 50 into a tank 51 supported above the spindles and a distributing pipe 52 is suitably connected to the oil tank and carries a valved spout 53 for each chuck (Figs. 2, 3). This spout discharges into a receiving pipe 54 which delivers the oil through a passage 55 (Fig. 6) in the housing to the drill (not shown) which projects through the opening 56. The pipe 54 has an elongated hole 54′ into which the spout distributes and this hole will be located beneath the spout in any adjustment of the spout. The oil tank 51 is provided with an overflow pipe 57 which discharges into a supply tank 58 suspended beneath the table and having its discharge pipe 59 connected to the pump (Fig. 2). The depressed part 3 of the table 1, which receives the oil drippings from the drills, has a discharge tube 60 which discharges into the supply tank and this tube is provided with a strainer 61.

The machine is simple in construction and although I have shown it made to operate six drills simultaneously it can of course be constructed to operate a greater or less number as desired. The actuating cams are preferably arranged on the shaft so that the drills, although turning constantly, will commence to work in rotation for this will permit a single operator to run the machine and keep it supplied with work without delay and without requiring especial skill. Thus one machine with a single operator can drill a great many stay-bolts in a given time for the machine is entirely automatic in its action and just as soon as one hole is drilled the operator can put in a new bolt without interrupting the machine for the other drills continue in operation.

What I claim and desire to secure by Letters Patent is:

1. In a machine of the character described, the combination of a table, standards on the table, a longitudinally movable drill spindle mounted in said standards, a pulley keyed on said spindle between the standards, a cam at one end of the spindle, means for revolving the spindle and cam, said spindle having a tubular portion between the standards and cam and slots communicating with said tubular portion, a block within said tubular portion, a step bearing on the spindle engaging one of said standards, arms carried by said block and projecting through said slots to engage said step bearing, a plug in the rear end of the spindle, a spring inclosed within said tubular portion and confined between said plug and block to retract the spindle from the work, and a shoe swiveled on the spindle to engage the cam.

2. In a machine of the character described, the combination of a table, an adjustable chuck for carrying the work mounted on the table and provided with an oil passage, a tube tapped into said oil passage in the chuck and provided with an elongated opening, an oil tank supported above the chuck, and a spout connected to the tank to discharge oil into said elongated opening.

JAMES HOCKING.

Witnesses:
MICHAEL D. CILLY,
S. W. RUSSELL.