944,561.

J. J. W. KENAN.

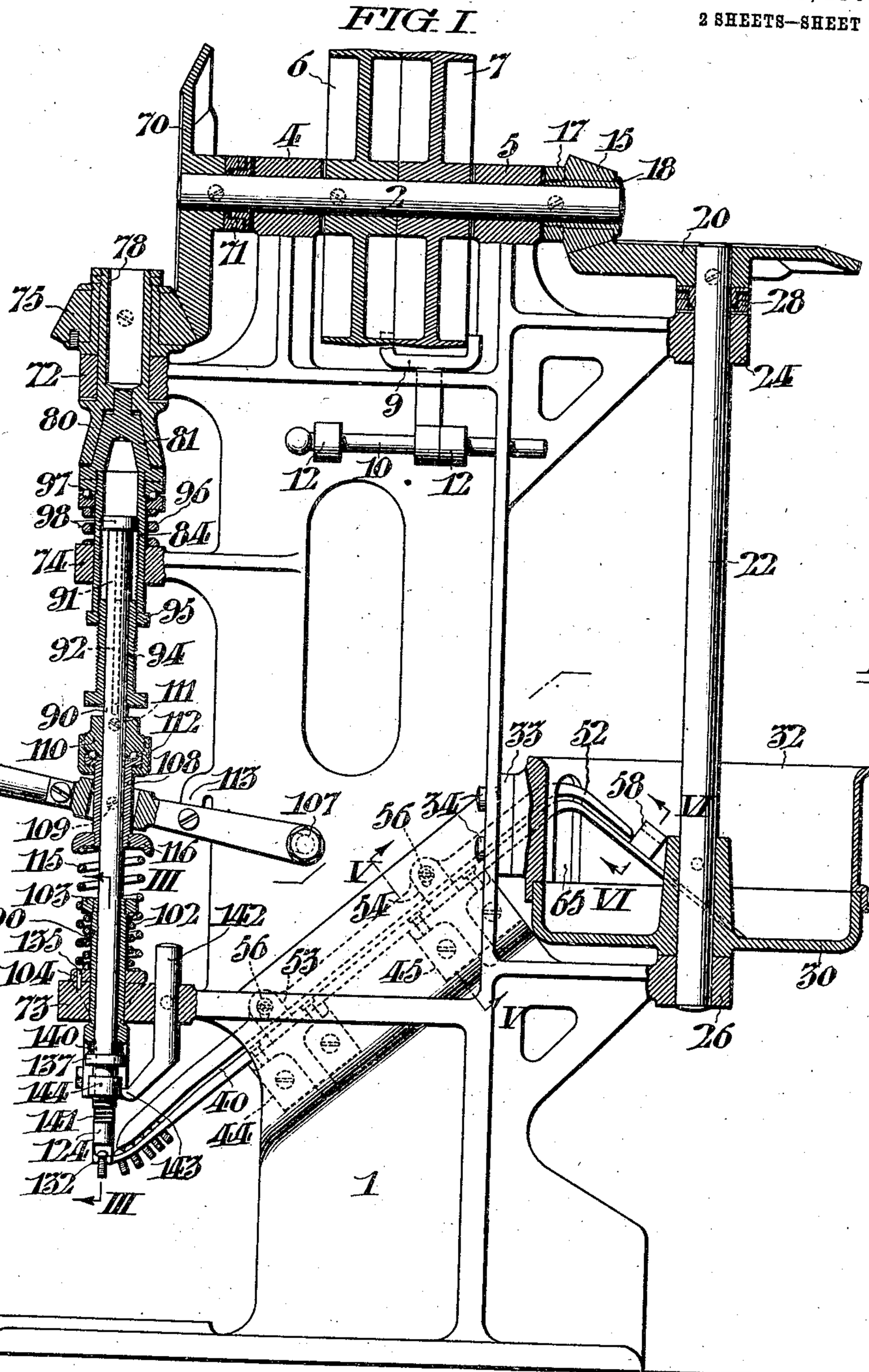
SCREW DRIVING MACHINE.

APPLICATION FILED APR. 9, 1908.

Patented Dec. 28, 1909.

2 SHEETS—SHEET 1.

FIG. I.



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2 SHEETS—SHEET 2.

FIG. II.

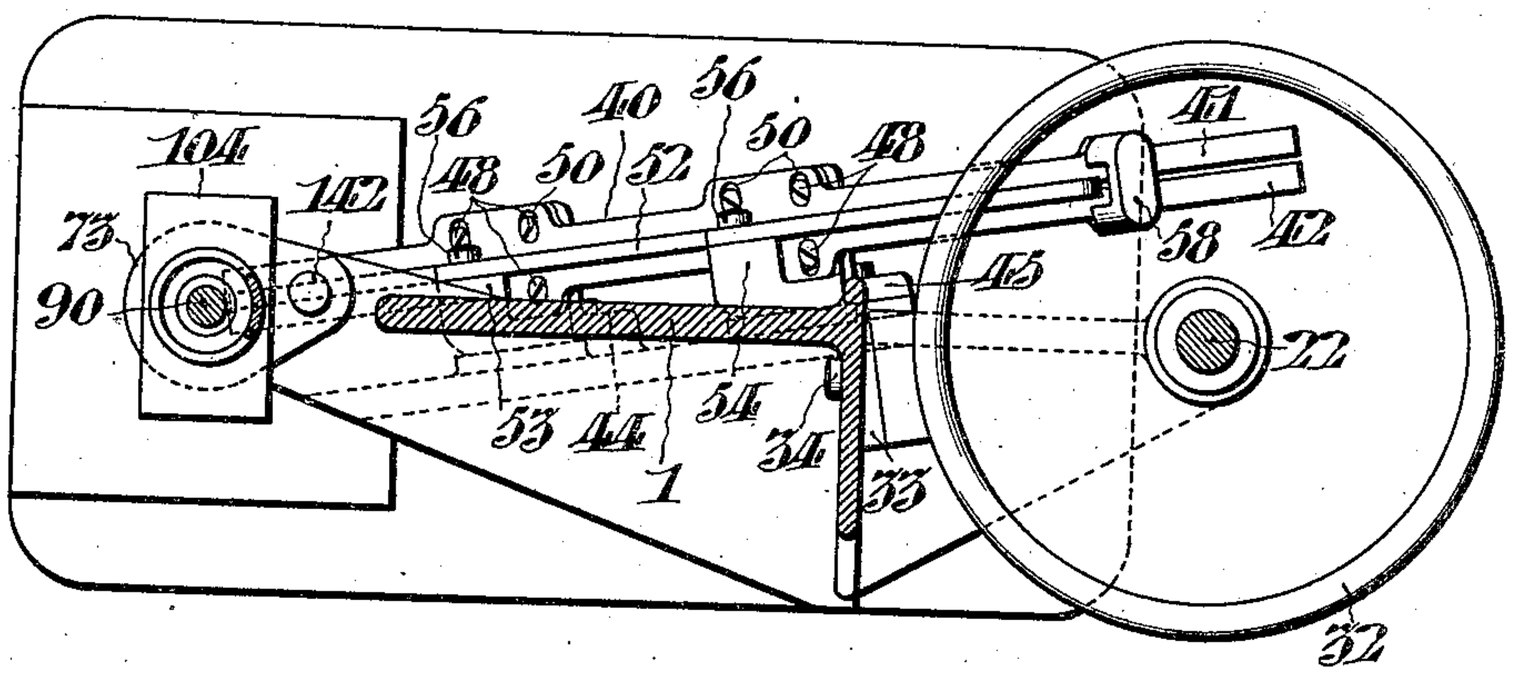


FIG. IV.

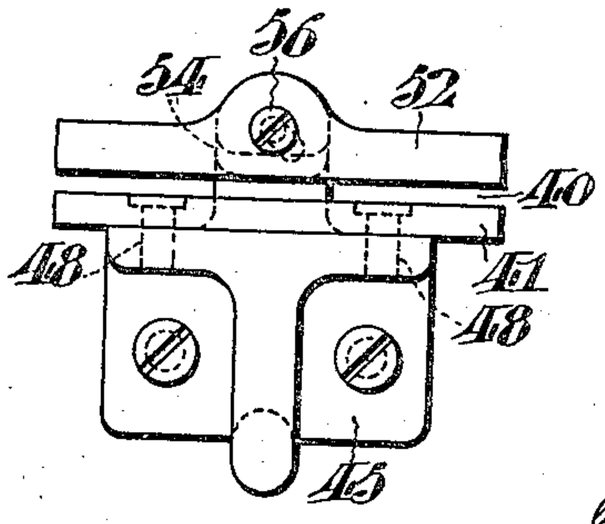


FIG. III.

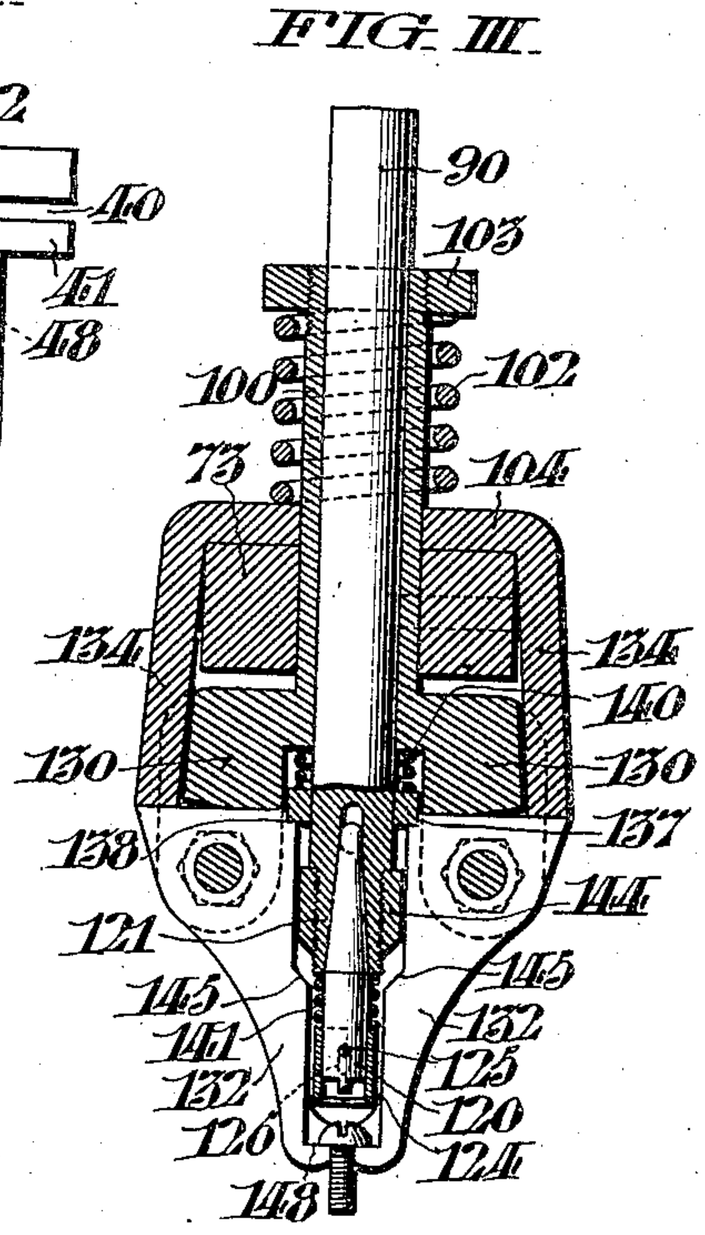


FIG. V.

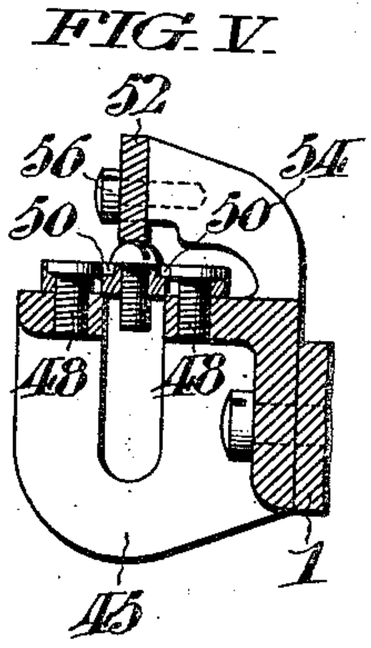
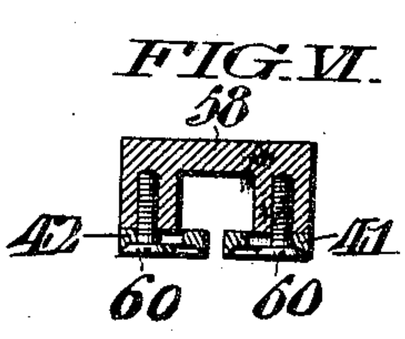


FIG. VI.



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UNITED STATES PATENT OFFICE.

JOHN J. W. KENAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF THREE-FOURTHS TO THOMAS W. JENKINS, OF PHILADELPHIA, PENNSYLVANIA, AND ONE-FOURTH TO RALPH BUFFETT, OF COLWYN, PENNSYLVANIA, AND HOWARD A. GRAY, OF MILLVILLE, NEW JERSEY.

SCREW-DRIVING MACHINE.

944,561. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed April 9, 1908. Serial No. 425,978.

To all whom it may concern:

Be it known that I, JOHN J. W. KENAN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Screw-Driving Machines, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to a screw driving machine for use in assembling the parts of electric devices, hardware, &c., and its object is to provide for the rapid and economical insertion of screws in such parts.

To this end the invention comprises means for automatically feeding screws to the driving mechanism; means for guiding and supporting the screws to insure proper manipulation thereof; means for automatically cutting off the power from the driving means when a screw has reached the proper predetermined depth; and various other features which will be more fully set forth in the specification and particularly pointed out in the claims.

In the accompanying drawings, Figure I, is a sectional elevation showing the complete machine. Fig. II, is a sectional view on the line II, II, in Fig. I, showing in plan the direction of the race-way or chute. Fig. III, is a vertical section taken on the line III, III, in Fig. I, showing the details of the driver and screw holding jaws. Fig. IV, is a fragmentary side elevation showing the means of supporting the race-way and the guard of the chute. Fig. V, is a section on the line V, V, in Fig. I. Fig. VI, is a section along the line VI, VI, in Fig. I.

In said drawings,—the frame 1, may be mounted upon a suitable pedestal, or upon a bench or other support as desired. At the upper end of the frame 1, the driving shaft 2, is journaled in bearings 4, and 5. Upon this shaft are mounted the tight pulley 6, and the loose pulley 7, adapted to be driven by a belt which may be moved by the shipper 9, secured to the rod 10, slidably mounted in lugs 12, cast upon the frame of the machine. At the right hand end of the shaft 2, a beveled friction pinion 15, is secured by means of a threaded collar 17, engaging the sleeve 18, which is fast to said shaft. The wheel 15, is beveled to co-act with the friction wheel 20, secured to the vertical shaft 22, journaled in bearings 24, and 26, upon the frame of the machine. Between the wheel 20, and the bearing 24, is a thrust bearing 28, which may be of any well known construction.

To the lower end of the vertical shaft 22, is fastened a horizontal circular hopper 30, having a surrounding guard 32, secured in stationary position against a bracket 33, held in position by screws 34. For feeding the screws from the hopper to the point where they are to be driven into the work, a chute 40, is provided which is composed of two parallel strips 41, 42, mounted upon brackets 44, 45, secured to the frame of the machine. These strips are adjustably held by means of screws 48, passing through elongated slots 50, formed in said strips. This construction allows the strips to be separated the required distance to accommodate the various sizes of screws intended to be used with the machine.

In order to prevent the screws from choking the race-way or overlapping each other, the guard 52, is provided which is supported from brackets 53, 54, by means of screws 56, passing through elongated slots in said guard. This construction allows the guard to be moved vertically to accommodate screws with various sized heads as clearly seen in Fig. V. As a further means of preventing the race-way of the chute from spreading, the U-shaped block 58, is fastened to the upper side of the strips 41, and 42, by means of the screws 60, passing through elongated slots in said strips.

The right hand end of the chute rests near the bottom of the pan or hopper 30, near its outer periphery, and is inclined upwardly a sufficient height to allow the largest sized screws to pass along the race-way through the slot 65, in the guard 32, and clear the top edge of the rotating pan. The chute is then bent downwardly and extends to a point adjacent to the driver, as clearly seen in Fig. I.

To the left hand end of the driving shaft 2, is secured the frictional wheel 70, having between it and the bearing 4, a suitable thrust bearing 71. The driving spindle of the machine is maintained in bearings 72, 73, and 74, formed upon the frame 1. For driving said spindle the friction pinion 75, is mounted upon a sleeve 78, journaled in bear-

ing 72, said pinion being of the proper bevel to co-act with the wheel 70. Upon the inside of the lower end of the sleeve 78, is formed a conical depression 80, within which fits the corresponding conical projection 81. Said conical projection 81, is secured to the upper end of a sleeve 84, which is rotatably mounted in the bearing 74, on the frame 1. The driving spindle 90, is provided with a key-way 91, within which the key 92, may slide, said key being secured to the inside of a threaded sleeve 94, which may be screwed into and out of the sleeve 84, and locked in position by means of the lock nut 95.

In order to maintain the friction cones 80, and 81, in engagement, the coiled spring 96, is provided which surrounds the sleeve 84, and bears at its lower end against the upper face of the bearing 74, and at its upper end against a ball bearing 97, one member of said ball bearing being secured to said sleeve 84. The purpcse of the threaded sleeve 94, is to adjust the depth to which the driver on the spindle 90, will drive the screw as will be hereinafter explained.

The lower end of the spindle 90, passes through the sleeve 100, slidably mounted in the bearing 73. Said sleeve is normally maintained in its upper position as shown in Fig. I, by means of a coiled spring 102, acting between a collar 103, upon the upper end of said sleeve and a plate 104, resting upon the upper face of the bearing 73. For moving the spindle downwardly, to drive the screw, a handle 106, is provided, and pivoted at 107, to the frame 1. Said handle is enlarged at its central portion to surround the sleeve 108, said sleeve being connected to said enlarged portion by means of a screw or pin 109. For maintaining the sleeve 108, in proper relation with the spindle 90, the upper member 110, of a ball bearing is made fast to said spindle by the screw 111, and the sleeve 112, surrounds the upper end of the sleeve 108, and is threaded upon the member 110. This allows the spindle 90, to be rotated without rotating the sleeve 108. For maintaining the handle 106, in its elevated position against the stop 113, the coiled spring 115, is provided which surrounds the spring 102, and bears at its upper end against a collar 116, secured to the lower end of the sleeve 108, and at its lower end against the plate 104.

The driver 120, is tapered at its upper end to fit the corresponding tapered socket 121, formed in the lower end of the driving spindle 90. Surrounding the lower end of the driver is a sleeve 124, slidably mounted thereon, and prevented from separating from said driver by means of a pin 125 passing through the slot 126, in said sleeve. In order to maintain the proper relation of the sleeve 124, with relation to the end of the driver, the coiled spring 141, surrounds the driver bearing against the upper face of said sleeve and against the lower end of the spindle 90.

Projecting from the lower end of the sleeve 100, are two lugs 130, to the lower ends of which are pivotally attached the screw holding jaws 132. In order to maintain the lower ends of the jaws 132, in position to engage the shank of the screw a pair of depending arms 134, are provided which engage the upper ends of said jaws, said arms being formed integrally with the plate 104, which is maintained from rotating by means of a pin 135, entering a hole in the upper face of the bearing 73.

In order to prevent the jaws from opening except at a predetermined time a washer or collar 137, is slidably mounted upon the spindle 90, and rests in notches 138, formed upon the upper inner corners of said holding jaws 132. Said collar 137, is pressed downwardly by means of the coiled spring 140, bearing against the under side of the sleeve 100, and against the upper side of said collar.

In order to remove the collar 137, from the notches 138, an adjustable hooked finger 142, is mounted in the bearing lug 73, as clearly shown in Fig. I.

For opening the jaws under predetermined conditions the beveled sleeve 144, is threaded upon the lower end of the spindle 90, and engages the bevels 145, upon the inside of said jaws. The lower ends of the jaws are separated upon their inner faces to form a continuation of the slot of the race-way but are closed upon their outer faces to form an abutment for the screw, the head of said screw resting upon the horizontal faces 148, as shown in Fig. III.

The operation of the device is as follows:—The threaded sleeve 94, is adjusted to the proper height within the sleeve 84, so that when the screw has been driven the predetermined distance the head or enlarged upper end 98, of the spindle 90, will engage the upper end of the sleeve 94. When the handle 106, is moved downwardly the spindle 90, together with the driver 120, and sleeve 124, move downwardly until said sleeve engages and centers the head of the screw, whereupon the driver enters the slot of the screw and the spring 141, above the sleeve 124, is slightly compressed. At this point the beveled sleeve 144, engages the bevels 145, on the jaws 132, thus moving the jaws and the sleeve 100, downwardly until the collar 137, engages the hook on the finger 142. The said collar 137 is thereby disengaged from the notch 138, whereupon the jaws are released. The downward movement of the jaws together with the sleeve 100, compresses the spring 102, so that as soon as the jaws are released by the collar

137 engaging the hook on the finger 142, said spring at once lifts the sleeve 100 and the beveled sleeve 144 coöperating with the bevels 145 on the jaws, separates the said jaws and the same are quickly moved to their extreme upper position. The downward movement of the spindle 90, will continue until the head 98, on said spindle engages the sleeve 94, whereupon, the conical surfaces 80, and 81, will be separated thereby breaking the friction drive and stopping the rotation of the spindle.

By the construction set forth the shank of a screw may be supported while it is being driven until a predetermined point is reached, whereupon, the jaws are opened, thus removing the support, and when the screw has been driven a sufficient distance the driving means is automatically rendered ineffective so that a large number of screws may all be driven into the work an equal predetermined distance.

Owing to the rapid rotation of the hopper 30, the screws are driven up the inclined chute to its top whereupon they descend by gravity to the point where they are taken one by one upon the jaws.

It will be understood that in place of the friction driving wheels and pinions, gears may be substituted, and various other features are merely to be considered as illustrative of an embodiment of my invention.

Having thus described my invention, I claim:—

1. A screw driving machine, including in combination a driver, means for rotating the driver and for moving the same longitudinally, a screw holder, means for moving said screw holder with said screw driver, means for holding said screw holder closed, means put under tension by the downward movement of the screw driver for lifting the screw holder and opening the same, and means for releasing said holder at a predetermined point in the longitudinal movement of the driver.

2. A screw driving machine including in combination a driver, means for rotating said driver and for moving the same longitudinally, screw holding jaws arranged to underlie the head and guide the screw, means for holding said jaws closed, means put under tension by the downward movement of the driver for opening said jaws, and means for releasing said jaws at a predetermined point in the longitudinal movement of the driver.

3. A screw driving machine including in combination a driver, means for rotating said driver, means for moving the driver longitudinally, a sleeve, screw holding jaws carried by said sleeve, a spring normally holding said jaws and said sleeve raised, means for holding said jaws closed, means carried by said driver for engaging and moving said jaws with the driver, and means for releasing the jaws, whereby they may be separated and raised by said spring.

4. A screw driving machine including in combination, a driver, means for rotating said driver, means for moving said driver longitudinally, a sleeve, screw holding jaws carried by said sleeve, a spring for normally holding said sleeve raised, means for holding said jaws closed when in raised position, means for locking said jaws closed, means for moving said sleeve and said jaws downward with the driver and means for releasing said jaws whereby they may be separated and lifted by said spring.

5. A screw driving machine including in combination a driver, means for rotating the driver, means for moving the driver longitudinally, a spring pressed sleeve carried by said driver for centering the screw, screw holding jaws, a sleeve carrying said screw holding jaws, a spring for holding said jaws and sleeve in raised position, means carried by the driver for engaging the jaws and moving the same downward, means for holding the jaws closed, and means for releasing the jaws at a predetermined point in the longitudinal movement of the driver.

6. A screw driving machine including in combination, a driver, means for rotating the driver, means for moving the same longitudinally, screw holding jaws, a sleeve to which said jaws are pivoted, means tending to hold said sleeve in its raised position, means for moving said jaws downward with said driver, means for holding said jaws in closed position, means for releasing said jaws, and coöperating cam shoulders carried by said means for moving the jaws downward and by said jaws for separating said jaws when the same are released and moved upward.

7. A screw driving machine comprising a rotary and reciprocating screw driver for engaging and driving the screw; a screw holder comprising two pivoted jaws for underlying the head of a screw and guiding it through any desired predetermined distance; means for positively holding the jaws from being opened; and means for opening said jaws at a predetermined point in the travel of said driver.

8. A screw driving machine comprising a rotary and reciprocating screw driver for engaging and driving the screw; a screw holder comprising two pivoted jaws for underlying the head of a screw and guiding it through a predetermined distance; means placed between said jaws whereby they are positively held from opening; adjustable means for engaging and releasing said holding means for thereupon opening said jaws.

9. A screw driving machine comprising a rotary and reciprocating screw driver for

engaging and driving the screw; a screw holder comprising two pivoted jaws for underlying the head of a screw and guiding it through a predetermined distance; means placed between said jaws whereby they are prevented from opening; adjustable means for engaging and releasing said holding means; means for raising said jaws, and means for separating the same.

10. A screw driving machine comprising a rotary and reciprocating screw driver for engaging and driving the screw; a screw holder comprising two pivoted jaws for underlying the head of a screw and guiding it through a predetermined distance; means moving with said jaws and positively holding them from being opened; stationary means arranged to be engaged by said holding means; means for raising said jaws, and means connected with the driver for opening said jaws.

11. In a screw driving machine the combination of a sleeve; a screw holder comprising two pivoted jaws carried by said sleeve; a collar for positively holding said jaws from being separated; means for moving said sleeve; and means for freeing said jaws from said collar.

12. In a screw driving machine the combination of a rotary and reciprocating driver for engaging and driving the screw; means for rotating said driver; and means for automatically rendering said rotating means ineffective when the driver has been moved longitudinally a predetermined distance.

13. In a screw driving machine the combination of a rotary and reciprocating driver for engaging and driving the screw; a pair of coöperating members for rotating said driver; and means for separating said members when the driver has been moved longitudinally a predetermined distance.

14. In a screw driving machine the combination of a rotary and reciprocating driver for engaging and driving the screw; a pair of friction members for rotating said driver; and means for separating said friction members when the driver has been moved longitudinally a predetermined distance.

15. In a screw driving machine the combination of a rotary and reciprocating driver for engaging and driving the screw; a sleeve surrounding the spindle of said driver; a lever connected to said sleeve; means for connecting said sleeve to said spindle to allow the latter to rotate yet move longitudinally with said sleeve; means for driving said spindle; and means for automatically rendering said driving means ineffective when the driver has been moved longitudinally a predetermined distance.

16. In a screw driving machine the combination of a rotary and reciprocating spindle; a screw driver secured to said spindle; a sleeve surrounding said spindle; a pair of jaws pivotally mounted upon said sleeve; a collar surrounding said spindle and preventing said jaws from being opened; means for engaging said collar when said spindle and jaws have descended a predetermined distance whereby said jaws are free to be opened; and means on said spindle for opening said jaws.

17. In a screw driving machine the combination of a rotary and reciprocating spindle; a screw driver secured to said spindle; a sleeve surrounding said spindle; a pair of jaws pivotally mounted upon said sleeve; means tending to keep said jaws pressed together; means for positively holding said jaws from being opened; means arranged to remove said holding means when the spindle has been moved longitudinally a predetermined distance; and means for opening said jaws.

In testimony whereof, I have hereunto signed my name, at Philadelphia, Pennsylvania, this third day of April 1908.

JOHN J. W. KENAN.

Witnesses:
JAMES H. BELL,
E. L. FULLERTON.