(No Model.) 3 Sheets—Sheet 1.

V. & G. JETLEY.

COMBINED MULTIPLE BORING OR DRILLING MACHINE WITH MEANS FOR DRIVING RODS, BARS, OR TUBES INTO HOLES DRILLED.

No. 586,603. Patented July 20, 1897.

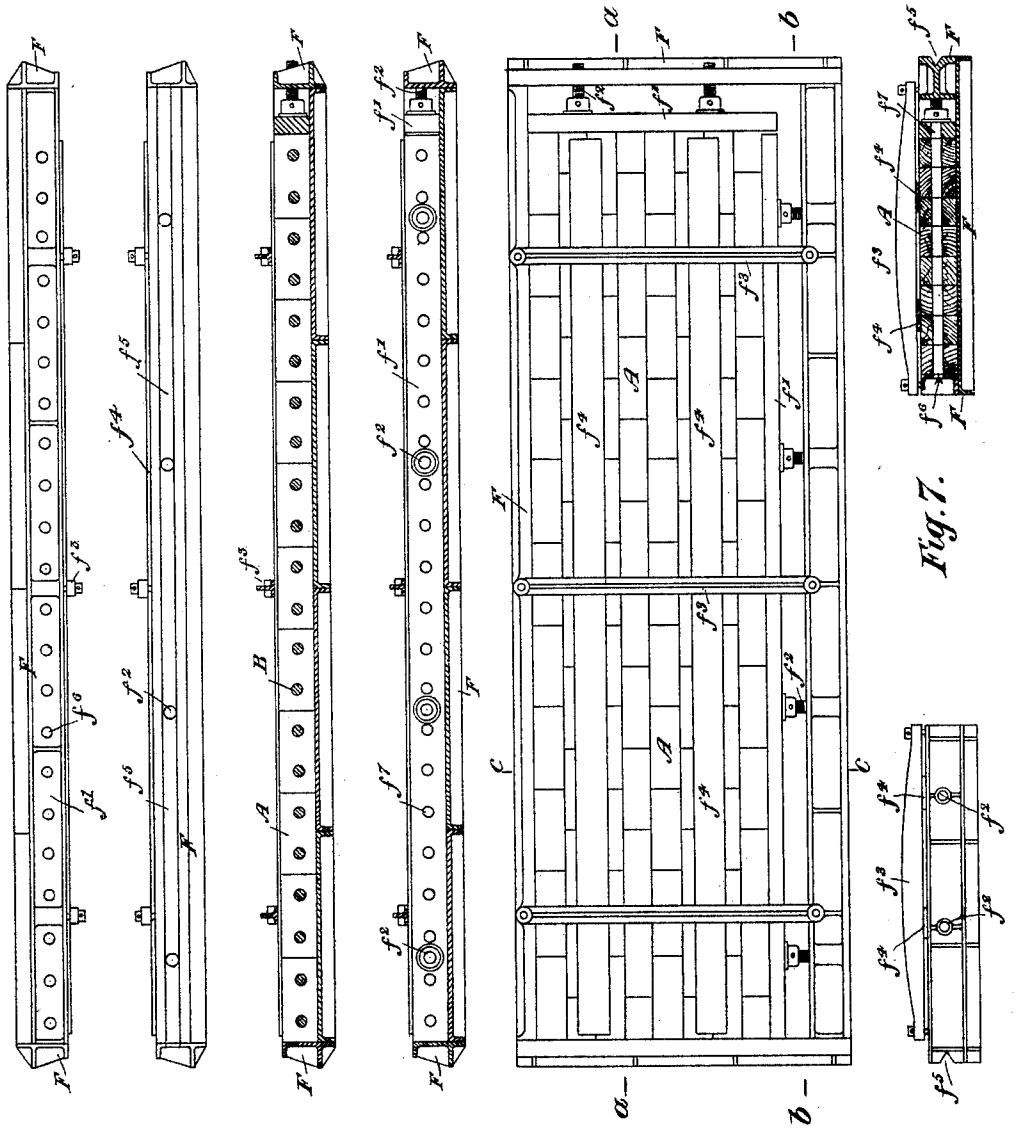

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

Witnesses
D. S. Ober.
M. J. L. Higgins.

Inventors
Victor Jetley
Gustave Jetley
By Munn & Co
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

V. & G. JETLEY.

COMBINED MULTIPLE BORING OR DRILLING MACHINE WITH MEANS FOR DRIVING RODS, BARS, OR TUBES INTO HOLES DRILLED.

No. 586,603. Patented July 20, 1897.

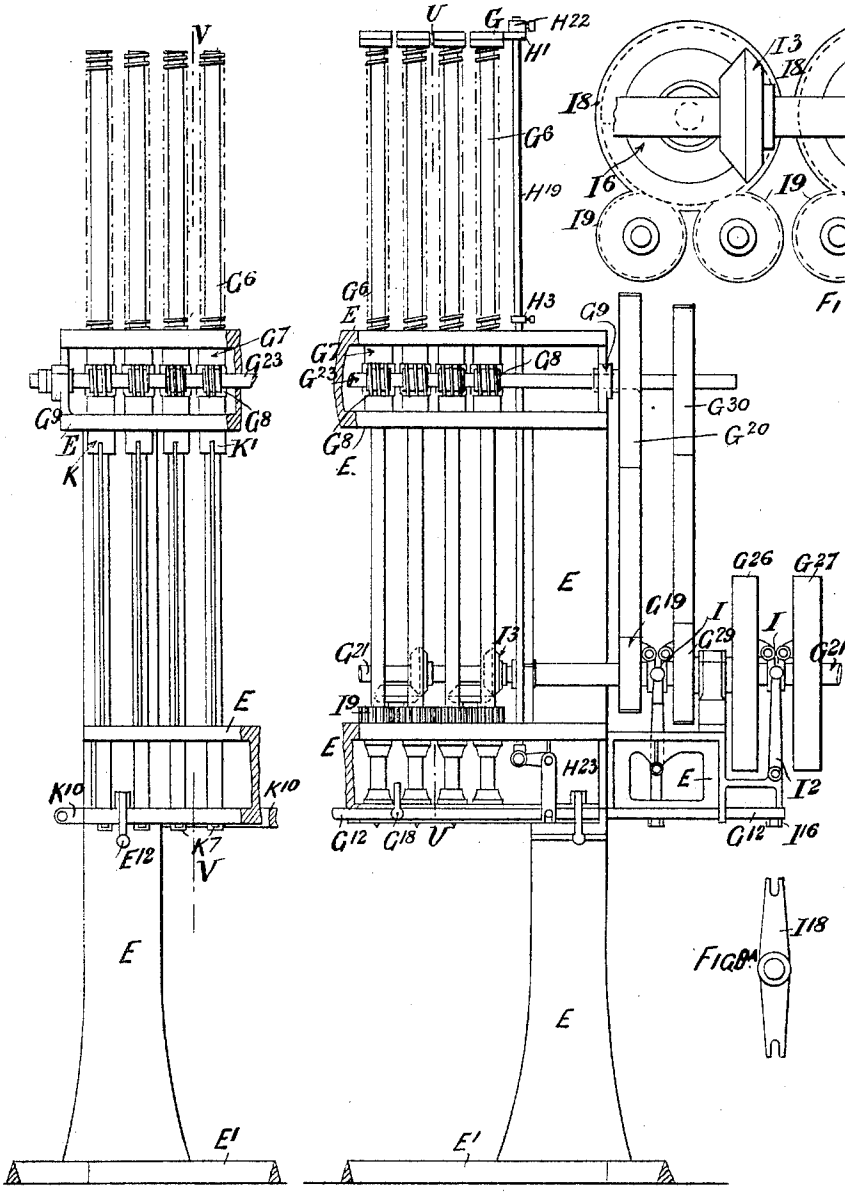

FIG. 8.

FIG. 9.

Witnesses:
B. J. Oker.
Henry Orth & Co.

Inventors
Victor Jetley
Gustave Jetley.
Henry Orth & Co.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

V. & G. JETLEY.

COMBINED MULTIPLE BORING OR DRILLING MACHINE WITH MEANS FOR DRIVING RODS, BARS, OR TUBES INTO HOLES DRILLED.

No. 586,603. Patented July 20, 1897.

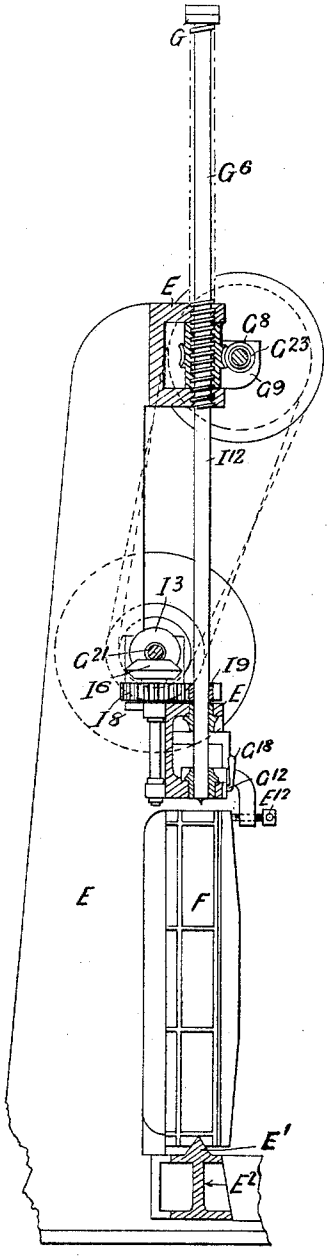

FIG. 10.

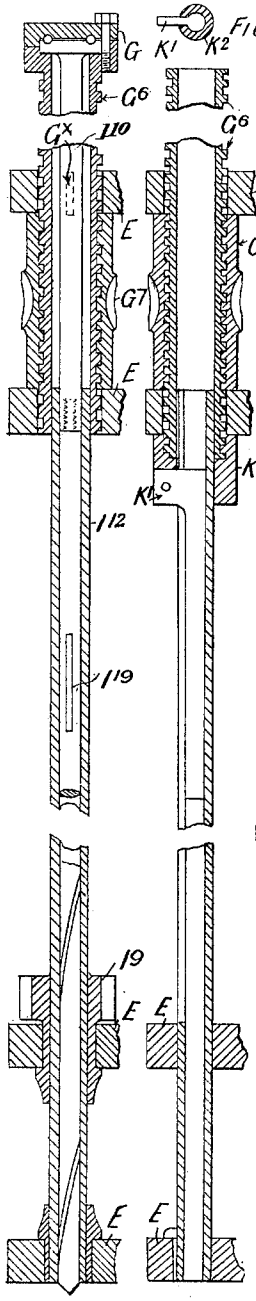

FIG. 11.

FIG. 13A.

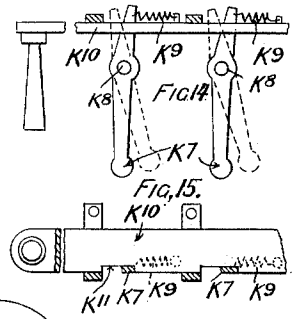

FIG. 14.

FIG. 15.

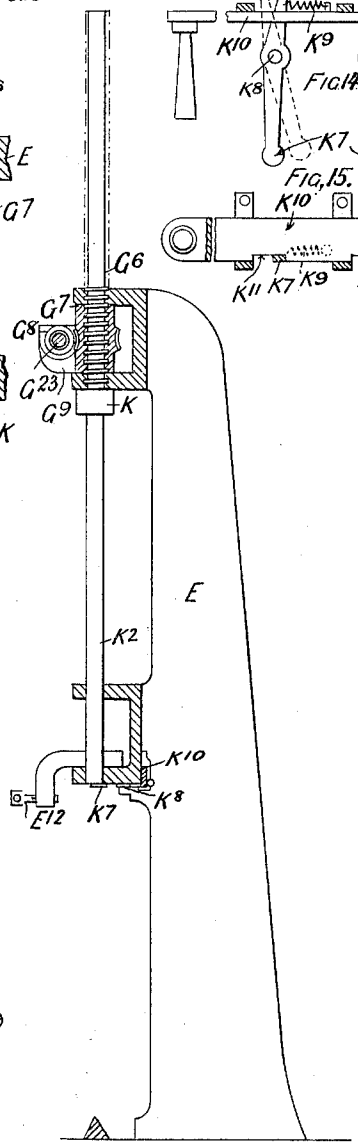

FIG. 12.

FIG. 13.

Witnesses:
B. J. Over.
Henry Orth Jr.

Inventors:
Victor Jetley.
Gustave Jetley
Henry Orth & Co.
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

VICTOR JETLEY AND GUSTAVE JETLEY, OF LONDON, ENGLAND.

COMBINED MULTIPLE BORING OR DRILLING MACHINE WITH MEANS FOR DRIVING RODS, BARS, OR TUBES INTO HOLES DRILLED.

SPECIFICATION forming part of Letters Patent No. 586,603, dated July 20, 1897.

Application filed October 15, 1895. Serial No. 565,755. (No model.) Patented in England October 29, 1894, No. 20,698; in France September 28, 1895, No. 250,603; in Belgium September 28, 1895, No. 117,659; in Germany October 11, 1895, No. 90,283; in Hungary December 9, 1895, No. 4,810; in Canada July 18, 1896, No. 52,951, and in Austria October 21, 1896, No. 20,651.

To all whom it may concern:

Be it known that we, VICTOR JETLEY and GUSTAVE JETLEY, subjects of the Queen of Great Britain, residing at No. 8 North Audley Street, London, in the county of Middlesex, England, have invented a new and useful Combined Multiple Boring or Drilling Machine, with Means for Driving Rods, Bars, or Tubes into the Holes Drilled, (for which Letters Patent have been obtained in the following countries, to wit: Great Britain, No. 20,698, dated October 29, 1894; France, No. 250,603, dated September 28, 1895; Belgium, No. 117,659, dated September 28, 1895; Germany, No. 90,283, dated October 11, 1895; Hungary, No. 4,810, dated December 9, 1895; Canada, No. 52,951, dated July 18, 1896, and Austria, No. 20,651, dated October 21, 1896,) of which the following is a specification.

Our invention relates to machines for drilling or boring holes, particularly long holes, and for driving rods, tubes, or bars through such holes when bored, in which the operating parts are automatically controlled.

In the accompanying drawings, Figure 1 represents the work-holder in plan. Fig. 2 is a plan of the under side of the work-holder. Fig. 3 is a cross-section of the work-holder on the line *a a*, Fig. 5. Fig. 4 is a cross-section of the work-holder on the line *b b*, Fig. 5. Fig. 5 is a front elevation of the work-holder. Fig. 6 is an end view showing the clamping-screws. Fig. 7 is a cross-section on the line *c c*, Fig. 5, and through one of the holes drilled. Fig. 8 is a broken front elevation of the machine. Fig. 8ª is a detail view in plan. Fig. 9 is a detail view showing a convenient mode of driving the drills. Fig. 10 is a transverse section on the line U U, Fig. 8. Fig. 11 is a detail view, in part section, on the center line of one of the drills. Fig. 12 is a transverse section on the line V V, Fig. 8. Fig. 13 is a detail view, in part section, on the center line of one of the rams or rod-drivers; and Fig. 13ª shows a rod-driver in plan and guide-tube therefor in section. Fig. 14 is a detail view in plan of part of the gear for closing and opening the mouths of the guide-tubes in which the rods or bars are guided before and during their entrance into the holes drilled, and Fig. 15 is a sectional elevation thereof.

The work-holder F may be of any suitable material or construction, provided there are means for clamping the work at the side or sides and the bottom or top, or both—such as shown, for instance, in Figs. 1 to 7 as the clamping-bars or platens f' and clamping-screws f^2, having capstan or other suitable heads with a large bearing-surface. The work is prevented from bulging, on being clamped or drilled, by cross-bearers f^3, held in position on the sides of the frame by capstan-screws passing through suitable holes, said bearers resting on longitudinal strips f^4, placed preferably across the joints, or by other similar or suitable means. In the bottom of the work-holder is a groove f^5 to fit on a guide-rail, upon which the work-holder may be moved from place to place. Holes f^6 are provided in the top of the work-holder and holes f^7 in the bottom clamping-bar f' to enable the drills to pass through.

The blocks A, of wood or any desirable material or materials, may be of any length, provided such length be a multiple of the pitch of the holes to be drilled, and the said blocks may be of similar or varying breadth, but of equal depth, and are placed in the work-holder in such a manner as to break joint in alternate rows or series of rows and are clamped tight longitudinally transversely and from the top, so that on the rods, bars, or tubes B being inserted in the holes drilled the blocks become a homogeneous slab.

Referring to Figs. 8 to 15, the machine is provided with a frame E, on which is mounted a platform E^2, Fig. 10, Sheet 3, having a horizontal rail E'. The work-holder F, containing the blocks A, is moved forward along the horizontal rail E' under the drills I^{10} for the purpose of drilling the holes and may conveniently be fixed above by set-screws E^{12} on bent arms made in one with or fixed to the frame E. Sliding and suitably guided in a part of the frame E is a number of guide and

feed screws which carry the spindles, to which are fixed the drills or other tools. The drilling and rod-driving operations take place in line with and parallel to each other—that is to say, the right-hand side of the machine is devoted to drilling, while the left-hand side is for driving the aforesaid rods B. There are two pulleys G^{26} and G^{27} loose on the main driving-shaft G^{21}, one of which is driven in one direction, while the other is, for instance, by a crossed belt driven in the other direction. Midway between the two loose pulleys G^{26} and G^{27} is placed a double friction-clutch (indicated by the letter I) of any suitable construction, which is operated by means of a forked lever I^2, pivoted as shown, the lower part of which takes in between a fork of a double-armed lever I^{18} at the back of the frame E. This lever I^{18} (also shown in plan in Fig. 8^a) is pivoted in the middle to the under side of the frame E. This lever I^{18} is by its fork in front connected to a pin on a striking-bar G^{12}, supported and capable of sliding in bearings on the frame E and having a handle G^{18}. On the main shaft G^{21} are mounted miter-wheels I^3, which gear with miter-wheels I^6. On each of the same spindles which carry the miter-wheels I^6 is mounted a spur-wheel I^8, each of which gears with two pinions I^9. These pinions I^9 are each keyed to the guide or steadying tubes I^{12}, as shown in Figs. 8, 9, 10, and 11. In order to cause the drills I^{11} to revolve with the guide-tubes I^{12}, the latter are provided with longitudinal feather-ways, and the drills have feathers I^{19}, Fig. 11. The guide-tubes I^{12}, as to their lower ends, revolve in bearings in the frame E. The upper ends of the guide-tubes revolve inside guide and feed screws G^6, which are supported in the frame E. These feed-screws G^6 are hollow in order to pass down outside of the guide-tubes I^{12}, and their upper ends are closed by flanges G, which carry the upper ends of the drill-spindles I^{10} and are provided, if desired, with ball-bearings, as shown, which work on the top side of the flanges on the top of the drill-spindles I^{10}. The drill-spindles I^{10} are screwed or otherwise securely fastened to the drills I^{11}. The feed-screws G^6 do not revolve by reason of their having longitudinal feather-ways into which take feathers G^{29}, Fig. 11. The feed-screws G^6 are screwed up and down by motion being applied in one direction or the other to the worm-wheels G^7, which are screwed internally, and thus form nuts. These worm-wheels are prevented from moving up or down by the frame E. The worm-wheels G^7 are driven by worms G^8, mounted on the shaft G^{23}, mounted in brackets G^9 on the frame E. The shaft G^{23} is driven by the pulley G^{20} with a strap from the pulley G^{19} on the main shaft G^{21}.

In Fig. 8 is shown a second set of pulleys G^{29} and G^{30} to give a higher rate of speed on the return stroke. The pulleys G^{19} and G^{29} are connected to the main shaft by the friction-gearing, (indicated by the letter I,) which is operated from the striking-bar G^{12} in the same manner and at the same time as has already been described with reference to the pulleys G^{26} and G^{27} and the main shaft G^{21}, so that when the main shaft is stopped or the direction of its motion changed, as described, the shaft G^{23} is similarly affected. The rods B aforesaid are inserted in the slotted guide-tubes K^2, the lower ends of which are keyed or otherwise secured to the frame E, while the upper ends are inserted in the hollow screws G^6, which are supported in the frame E. On the lower ends of the screws G^6 are screwed caps K, to which are secured the rams K′ by means of the webs which project through the slots in the tubes K^2. (See detail view, Fig. 13^a.) The screws G^6 are driven by the worm-wheels G^7 and worms G^8 on the shaft G^{23}, as already described.

The rods B aforesaid are inserted in the guide-tubes K^2 one by one by opening the bottom of the guide-tubes, which are normally closed by levers K^8, Figs. 12, 14, and 15, and the left-hand half of Fig. 8. These levers K^7 are pivoted at K^3 to the frame E underneath, and the springs K^9 normally hold the other ends of the levers over the mouths of the guide-tubes. The springs are fastened to a sliding bar K^{10} behind the frame E, and this bar has a handle for easy manipulation.

When the guide-tubes K^2 are filled with the rods aforesaid and the work-holder F has been moved after the holes have been drilled underneath the rod-driving mechanism, Fig. 10, the handle on the sliding bar K^{10} is pulled out, and the levers K^7 are consequently pulled clear of the mouths of the tubes, as shown in dotted lines, Fig. 14. When the rods have been driven into the work, the handle on the bar K^{10} is pushed in, thus closing the mouths of the tubes again. In inserting the rods one by one the slots K^{11} in the sliding-bar K^{10} allow sufficient movement to the levers K^7 to insert the rods, and when the levers are released the springs K^9 bring them back to cover the mouths of the tubes, as aforesaid. If this machine be mounted horizontally, it is evident that the levers K^7 and the additional parts just enumerated will not be required. In order to stop the travel of the tools I^{11} and K′ when the top or bottom of their travel is reached, there is provided a stop H′, secured to one of the flanges G, which moves up and down a rod H^{19}, to which are secured two adjustable stops H^{22} and H^3. The rod H^{19} is supported in frame E and at its lower end is connected to the bell-crank lever H^{23}, the lower end of which is forked and engages the striking-bar G^{12} by means of a pin thereon. When the feed-screws G^6 descend to the bottom of their travel, the stop H′ encounters the stop H^3, and the rod H^{19} is moved down sufficiently to actuate the striking-gear, which disengages the pulleys G^{19} and G^{26} from the friction-clutches, (indicated by the letter I.) To reverse the motion and to cause the feed-screws G^6 to ascend, the striking-bar G^{12} is ac-

tuated by hand still farther in the same direction, causing the clutches indicated by the letter I to engage with the pulleys G^{27} and G^{29}, whereby the drills are started revolving in the opposite direction and the feed-screws G^6 ascend until the stop H′ encounters the stop H^{23}, when the machine is again automatically stopped, and the farther movement of the striking-gear by hand again starts the machine in the direction to perform its functions.

Having thus described our invention and the manner in which the same is to be performed, we declare that what we claim is—

1. In a machine for boring holes and driving rods or tubes into said holes, the combination of a gang of tubular drill-guides, drills revolved by and having endwise motion in their respective guides, a corresponding gang of tubular ram-guides, and rams having endwise motion in their respective guides, of mechanisms for simultaneously revolving the drill-guides and for imparting endwise motion to the drills and rams, for the purpose set forth.

2. In a machine for boring holes and driving rods or tubes into said holes, the combination of a gang of tubular drill-guides, drills revolved by and having endwise motion in their respective guides, a corresponding gang of tubular ram-guides, rams having endwise motion in their respective guides, mechanism for simultaneously revolving the drill-guides in one or the other direction, and mechanism for simultaneously imparting to the drills and rams endwise motion in one or the other direction, of a track and a work-holder shiftable on such track from the gang of drills to the gang of rams, for the purpose set forth.

3. In a machine for threading rows of blocks on rods or tubes, a row of tubular drill-guides, drills revolved by and having endwise motion in their respective guides, a corresponding adjacent row of tubular ram-guides, rod or tube driving rams having endwise motion in their respective guides, and mechanisms for simultaneously revolving the drill-guides and imparting endwise motion to the drills and rams in one or the other direction, in combination with a track, a work-holder shiftable on said track from the gang of drill-guides to the gang of ram-guides, and means for clamping the blocks in rows in said holder.

4. In a machine for threading rows of blocks on rods or tubes, a row of tubular drill-guides, drills revolved by and having endwise motion in their respective guides, a corresponding adjacent row of tubular ram-guides, rod or tube driving rams adapted to contain the tubes or rods on which the blocks are to be strung, and having endwise motion in their respective guides, and mechanisms for simultaneously revolving the drill-guides and imparting endwise motion to the drills and rams in one or the other direction, in combination with a track, a work-holder shiftable on said track from the gang of drill-guides to the gang of ram-guides, and means for clamping the blocks in rows in said holder.

5. In a machine for threading rows of blocks on rods or tubes, a row of revoluble tubular drill-guides, drills revolved by and having endwise motion in their respective guides, a corresponding adjacent row of tubular ram-guides adapted to receive the rods or tubes on which the blocks are to be threaded, rams having endwise motion in their respective guides, and mechanism for simultaneously revolving said drill-guides and for imparting endwise motion to the drills and rams, in combination with a work-holder, clamping devices to clamp said blocks against displacement, and a track on which the holder is movable from the drill-guides to the ram-guides, for the purpose set forth.

6. In a machine for boring holes and driving rods into said holes, a gang of revoluble tubular vertical drill-guides, drills revolved by and having endwise motion in their respective guides, a corresponding gang of tubular vertical ram-guides, rams having endwise motion in their respective guides and adapted to contain the rods or tubes to be driven, and means for covering and uncovering the lower ends of said guides after such rods or tubes are inserted, in combination with a track and a work-holder shiftable on said track from the drill-guides to the ram-guides, substantially as set forth.

7. In a machine for boring holes and driving rods or tubes into such holes, the combination with a gang of drills, a corresponding gang of rod or tube driving rams, and mechanism for simultaneously revolving the drills in one or the other direction and for imparting at the same time endwise motion to said drills and to the rams in one or the other direction, of a stop mechanism operating automatically and periodically to stop the rotation and endwise movement of the drills and the endwise movement of the rams, and means for reversing the direction of motion of the drills and rams, for the purpose set forth.

VICTOR JETLEY.
GUSTAVE JETLEY.

Witnesses:
C. A. JENSEN,
JOSEPH LAKE.