A. H. ADAMS.

THREAD ROLLING MACHINE.

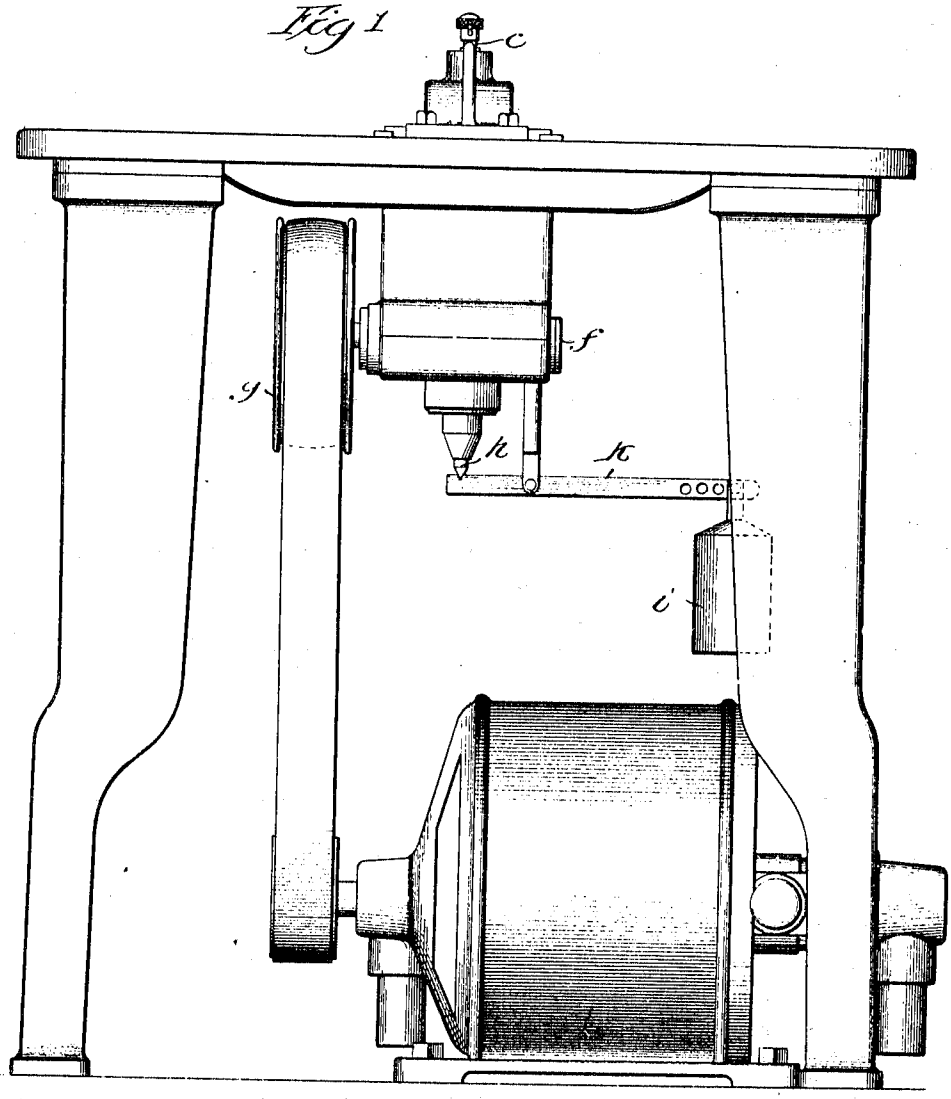
APPLICATION FILED JAN. 29, 1910.

1,040,485.

Patented Oct. 8, 1912.

4 SHEETS—SHEET 1.

Fig 1

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4 SHEETS—SHEET 2.

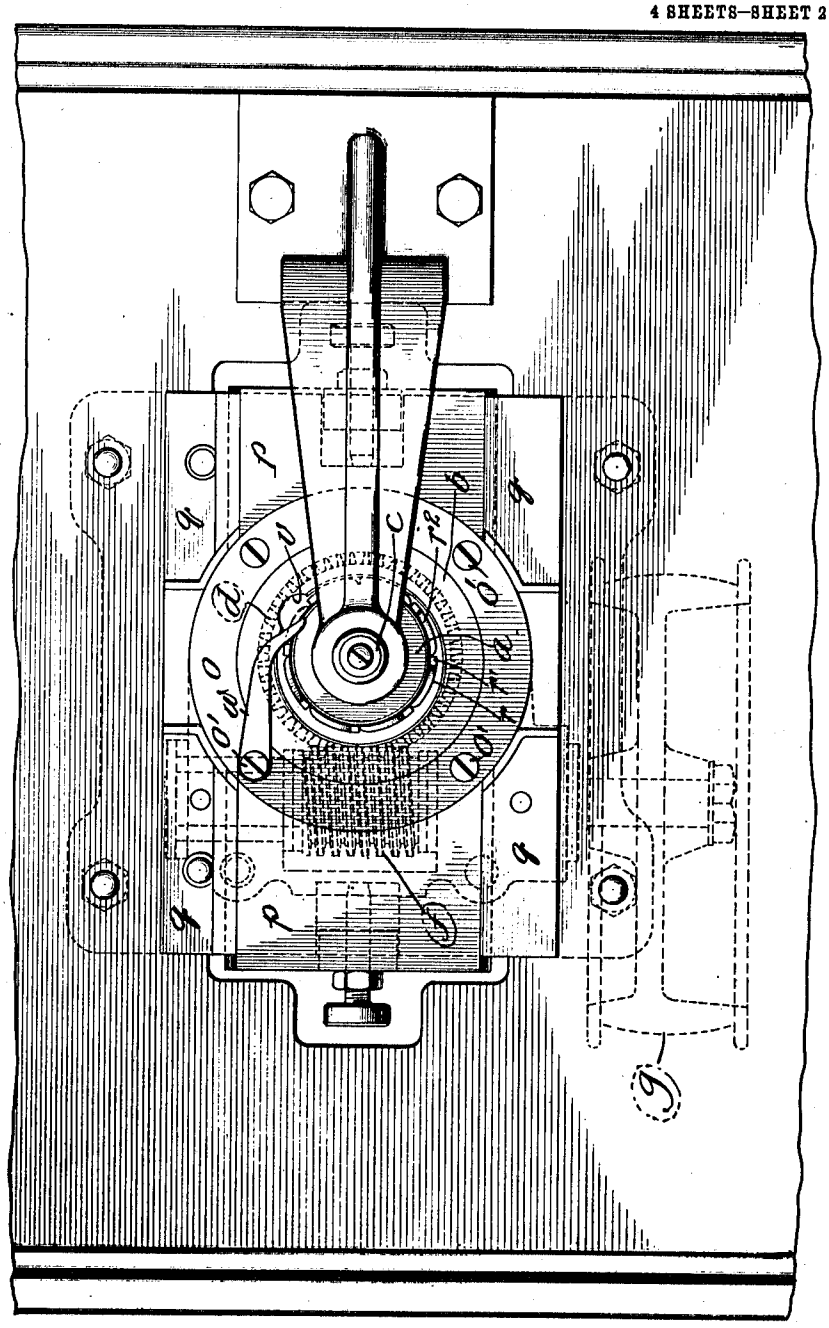

Fig. 2.

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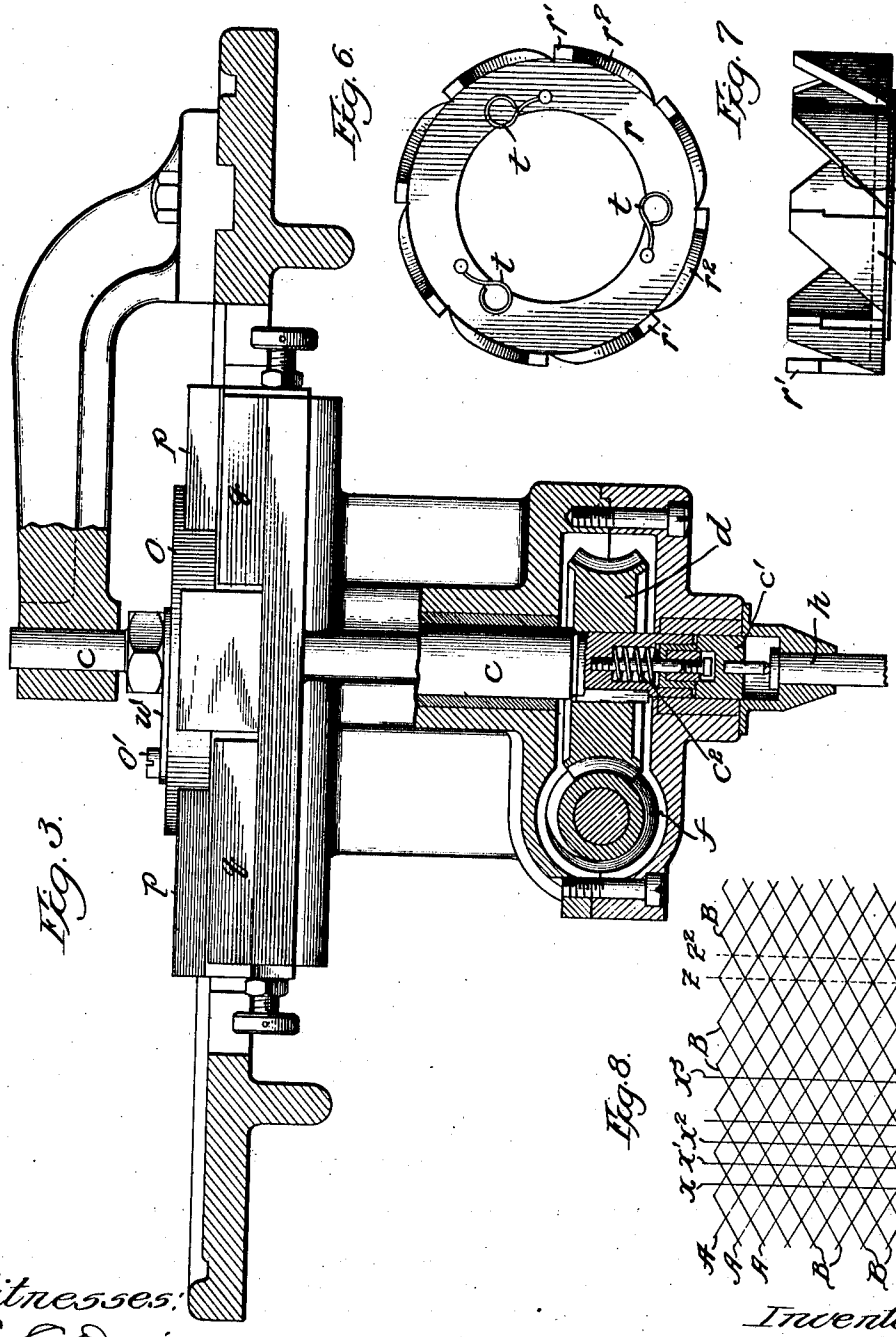


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4 SHEETS—SHEET 4.

Fig. 5

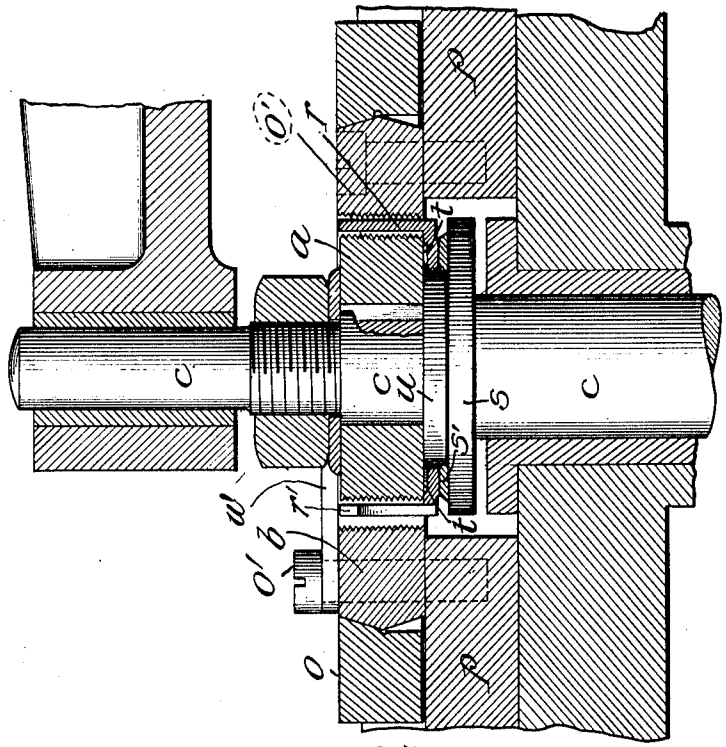
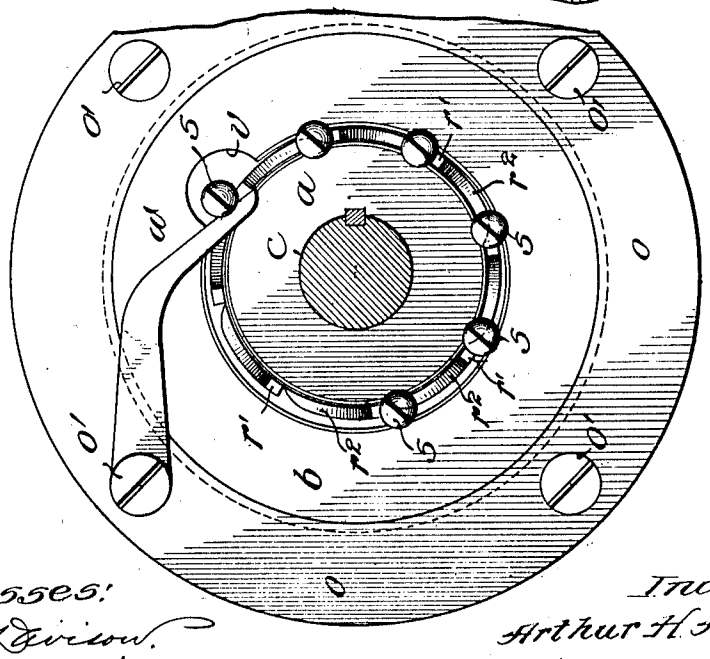


Fig. 4



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# UNITED STATES PATENT OFFICE.

ARTHUR H. ADAMS, OF OAK PARK, ILLINOIS, ASSIGNOR TO THE BLAKE & JOHNSON COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION.

## THREAD-ROLLING MACHINE.

1,040,485. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed January 29, 1910. Serial No. 540,865.

*To all whom it may concern:*

Be it known that I, ARTHUR H. ADAMS, citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Thread-Rolling Machines, of which the following is a full, clear, concise, and exact description.

My invention relates to a machine for rolling screw threads, and its object is to provide a machine which will simultaneously roll threads on a plurality of screw blanks.

A further object of my invention is to provide a means whereby the several blanks acted upon simultaneously by the dies are maintained in correct positions with respect to the opposed surfaces of the dies.

My invention consists of two dies which have a continuous relative motion in combination with means for properly positioning the blanks between the dies, whereby screw blanks may be successively fed to the dies and a plurality of blanks can be rolled simultaneously.

In order that a double thread may not be produced or that the thread may not be warped or "drunken", it is essential that the two opposed dies should be "in step", that is, the blank should be so related to two dies that the grooves formed in the blank by the ridges on one of the dies should be exactly followed by the ridges on the other die. The threads of a screw are almost circumferential and hence if a screw is improperly entered, the dies do not readily get "in step". It has been found difficult in practice to enter a screw blank in the correct relation to both dies of a machine in which the dies are cylindrical and one or both of the dies rotates continuously in a given direction. Owing to this difficulty, primarily, circular machines, by which name such machines are commonly known, although early in the field and adapted to more rapid production, have largely given way to the reciprocating machine.

Various means have been resorted to for either getting the dies in step or for entering each blank in a definite relation to the two dies, the machine, however, acting on only one blank at a time. My invention provides a continuously operating machine in which a plurality of screw blanks can be acted on simultaneously, and in which the blanks are correctly positioned.

The several features of my invention can be more readily understood by reference to the accompanying drawings showing one type of machine embodying my invention.

Figure 1 is a rear elevation of the machine; Fig. 2 is an enlarged plan fragmentary view; Fig. 3 is a fragmentary view partly in side elevation and partly in section; Fig. 4 is an enlarged fragmentary detail showing a plan view of the dies; Fig. 5 is an enlarged, fragmentary, vertical, central section through the dies; Figs. 6 and 7 are enlarged detail views showing the spacing ring in plan and in elevation respectively, and Fig. 8 is a diagram illustrating the positions which the screw blanks should take with respect to the two opposing dies.

Similar letters of reference refer to similar parts throughout the several views.

In the drawings, *a* represents an inner rotary and *b* an outer fixed die. The former die is fastened on a spindle *c*, which, by means of a worm wheel *d* and worm *f*, is set in motion through a pulley *g* belted to a motor. The spindle *c* rests on a movable foot or step pin *h* which is supported upon one end of a pivoted lever *k*. The normal position for the die *a* is down so that the foot step *h* is at its lowest possible point. Near its lower end the spindle *c* has a section *c'* telescoping in the main section of the spindle and normally thrust out by a spring $c^2$. If conditions arise whereby it is necessary for the die *a* to descend in order to get in step, the spring $c^2$ permits of the upper section of the spindle *c* telescoping into the section *c'*. On the other hand, the counterbalancing effect of the weight *i* is sufficient to make it extremely easy for the die *a*, spindle *c* and foot step *h* to ascend should the conditions of insertion of a screw blank require such upward motion of the die *a*.

The longitudinal play of the spindle *c* and die *a* should be an amount about equal to the pitch of the largest screw that can be rolled with the particular machine. In small size machines, the shifting of the worm wheel *d* laterally with respect to its worm *f* does not interfere with the proper operation of such worm gear. It is obvious, however, that some other device for driving the spindle *c* could be employed which would give perfect freedom without involving any inaccuracy, whatever may be the size of the machine.

The outer fixed die *b* is mounted flush

with the inner die *a* and forms an inclosing ring. The die *b* is held by the clamping ring *o*. Said clamping ring is secured by screws *o'* to the slide *p* and can be moved, in the guides *q*, perpendicularly to the axis of the spindle *c* to right or to left. The inner die *a* can thus be made more or less eccentric to the outer die *b*, whereby the space between the dies can be made large enough to permit a blank to be placed freely therein on one side of the dies and to be advanced gradually to the more constricted space between said dies.

In the space between the two dies is located a spacing or feed ring *r*, detailed views of which are shown in Figs. 6 and 7. The ring *r* rests upon the shoulder *s* of the spindle *c*, a washer *s'* being interposed between the said ring and shoulder. The ring *r* is frictionally secured to the collar *u*, of the spindle *c* in such a manner that by the turning of the spindle it is frictionally carried around and turns in the space between the two dies. This engagement of the ring *r* and collar *u* may be effected, for example, by springs *t* carried by the ring *r* and pressing against the collar *u*. The ring *r* is thus driven by the spindle *c* but is mounted thereon somewhat loosely, so as to permit said ring to slip on the spindle under conditions hereinafter mentioned.

The upstanding vertical walls of the ring *r* are cut out or notched in a zig-zag or saw-tooth manner, as indicated at $r^2$, so that a number of equally spaced contact points or fingers *r'* project into the space between the dies *a*, *b*.

By reference to the diagram shown in Fig. 7, the several correct positions of the screw blanks with respect to the two opposed dies may be readily seen. Said Fig. 7 represents a plane development of each of the die surfaces projected on a common plane, the lines A A representing the apexes of the ridges on one die and the lines B B representing the apexes of the ridges on the opposing die. The series of definite correct positions for the screw blanks are represented by the full lines $x\ y$, $x'\ y'$, $x^2\ y^2$, $x^3\ y^3$, etc., and the positions farthest from correct are indicated by the dotted lines $z\ z'$, $z^2\ z^3$, etc. The positions farthest from correct, it is evident, are those where the points of contact of the ridges A A and B B of the opposing dies with the cylindrical surface of the blank are diametrically opposite each other, as indicated by the lines $z\ z'$ and $z^2\ z^3$ of the diagram, in which position of the blank a double thread would result. Clearly the position of the screw blank should be such that the projection of its axis falls half way between the nearest intersections of the projected die ridges A A and B B, that is in one of the lines $x\ y$, $x'\ y'$, etc. A further consideration of this diagram will make it plain that there is a definite series of these correct positions for the screw blanks for each relative position of the two dies, and that while these positions change as the dies move with relation to each other, the spacing or distance between these correct positions is constant. It follows that, if there is one screw in proper position with reference to the two dies, any subsequent screw, no matter in what position inserted, will be carried forward by the next contact finger of the spacing ring and will be started and maintained in a correct position.

The operation of the machine is as follows: If there is only one screw blank in the machine, the hereinbefore mentioned self adjustment of the die *a* causes the two dies to get in step and brings the screw blank and two dies into correct mutual relation. Since the speed of advance of the screw blank is less than that of the periphery of the die *a*, it follows that the finger *r'* which is immediately behind the screw blank comes into engagement with it, thereby causing the ring *r* to assume the speed of such correctly positioned screw blank. Any screws thereinafter inserted while the first screw is between the dies will be correctly positioned by the remaining finger *r'*. Thus it is clear that all screws will be maintained in correct positions, the first one by means of the self-adjusting freedom of the dies, and any subsequent screws acted on while another screw is properly positioned will likewise be properly positioned by reason of the accurate spacing brought about by the spacing ring.

The screw blanks S are inserted between the two dies at the place where the dies are farthest apart, that is at the left in Fig. 4. The blanks are freely inserted one after the other in the successive notches $r^2$ in the ring *r*, that is in front of the fingers *r'* as shown in Fig. 4. The blanks thus inserted are carried forward by the ring until by reason of the narrowing of the space between the dies the blanks are gripped and caused to roll. They then roll until they come to the opening *v* provided in the outer die *b*, whereupon they are removed by the knock-off lever *w* and drop through the opening *v*.

While I have shown the preferred embodiment of my invention, I wish it to be understood that the essential features thereof can be embodied in machines of widely different types from that illustrated, but within the scope of the appended claims.

What I claim is:

1. In a machine for rolling screw threads, the combination with two opposed suitably grooved dies constructed and arranged to have continuous relative movement, of a rotary shaft upon which one of said dies is secured, and an annular spacing device provided with a pluraiity of notches arrange

at intervals corresponding to the distances which the screw blanks should properly be spaced from each other in their simultaneous passage between said dies, said spacing device being frictionally mounted upon said shaft and arranged to be automatically adjusted circumferentially of said shaft by a screw blank held between said dies.

2. In a machine for rolling screw threads, the combination with two opposed suitably grooved dies constructed and arranged to have continuous relative movement, of a spacing device for locating a plurality of screw blanks at definite intervals between said dies, said spacing device being frictionally held in coöperative relation to said dies and arranged to be rotatably adjusted in proper relation thereto by a screw blank held between said dies.

3. In a thread rolling machine, the combination with an inner die and an outer die, of a rotary shaft upon which said inner die is secured, and an annular spacing device surrounding said shaft, said spacing device being provided with a plurality of notches arranged at intervals corresponding to the distances which the screw blanks should properly be spaced from each other in their simultaneous passage between said dies, said spacing device being in frictional engagement with said shaft and arranged to be rotatably adjusted about said shaft by a screw blank held between said dies.

4. In a machine for simultaneously rolling threads on a plurality of screw blanks, two opposed grooved dies, means for imparting continuous relative motion to said dies, means permitting of a limited longitudinal movement of said dies relative to each other, and further means, acting upon screw blanks successively fed to said dies, for starting said blanks at proper intervals apart, said last mentioned means being arranged to be rotatably adjusted in proper relation to said dies by a screw blank held between said dies.

5. In a machine for simultaneously rolling threads on a plurality of screw blanks, the combination with two opposed suitably grooved dies and means for imparting to said dies continuous relative movement, of means for permitting said dies to have a limited longitudinal movement relative to each other, whereby a screw blank initially fed to said machine will cause said screw blank and the two dies to assume a correct mutual relation and a spacing device frictionally held in coöperative relation to said dies and arranged to be rotatably adjusted in proper relation thereto by a screw blank held between said dies, said spacing device being provided with a plurality of notches arranged at intervals corresponding to the distances the screw blanks should properly be spaced from each other in their simultaneous passage between said dies.

6. In a thread rolling machine, the combination with an inner die and an outer ring die, of a rotary shaft upon which said inner die is secured, and a spacing ring carried frictionally with said shaft and die, said spacing ring having a plurality of fingers projecting into the spaces between said dies at intervals corresponding to the distances which the screw blanks should properly be spaced from each other in their simultaneous passage between said dies.

7. In a machine for simultaneously rolling threads on a plurality of screw blanks, the combination with an inner die and an outer die mounted to have a limited longitudinal movement relative to each other, of means for imparting a continuous relative rotary motion to said dies, a spacing ring interposed between said dies, said spacing ring having a series of notches in its periphery to receive and hold, in properly spaced relation, a plurality of screw blanks, said spacing ring being automatically maintained in a correct relation to both of said dies.

8. In a machine for simultaneously rolling threads on a plurality of screw blanks, the combination with an inner cylindrical die and an opposed outer ring die, of a rotary shaft upon which said inner die is secured, said shaft being mounted to have a limited longitudinal movement, and a spacing ring carried frictionally with said shaft and die, said spacing ring having a plurality of fingers projecting into the spaces between said dies at intervals corresponding to the distances which the screw blanks should properly be spaced from each other in their simultaneous passage between said dies.

9. In a machine for simultaneously rolling threads on a plurality of screw blanks, the combination with a stationary outer and a rotary inner ring die, of a vertically disposed rotary shaft upon which said inner die is secured, a support for the lower end of said shaft having a limited vertical movement, means for counterbalancing said support whereby said shaft has a limited, free longitudinal movement, and a spacing ring carried frictionally upon said shaft, said spacing ring having a plurality of fingers projecting into the spaces between said dies at intervals corresponding to the distances which the screw blanks should properly be spaced from each other in their simultaneous passage between said dies.

In witness whereof, I hereunto subscribe my name this 25th day of January, 1910.

ARTHUR H. ADAMS.

Witnesses:
GEORGE E. FOLK,
ALFRED H. MOORE.