

No. 782,220.

PATENTED FEB. 14, 1905.

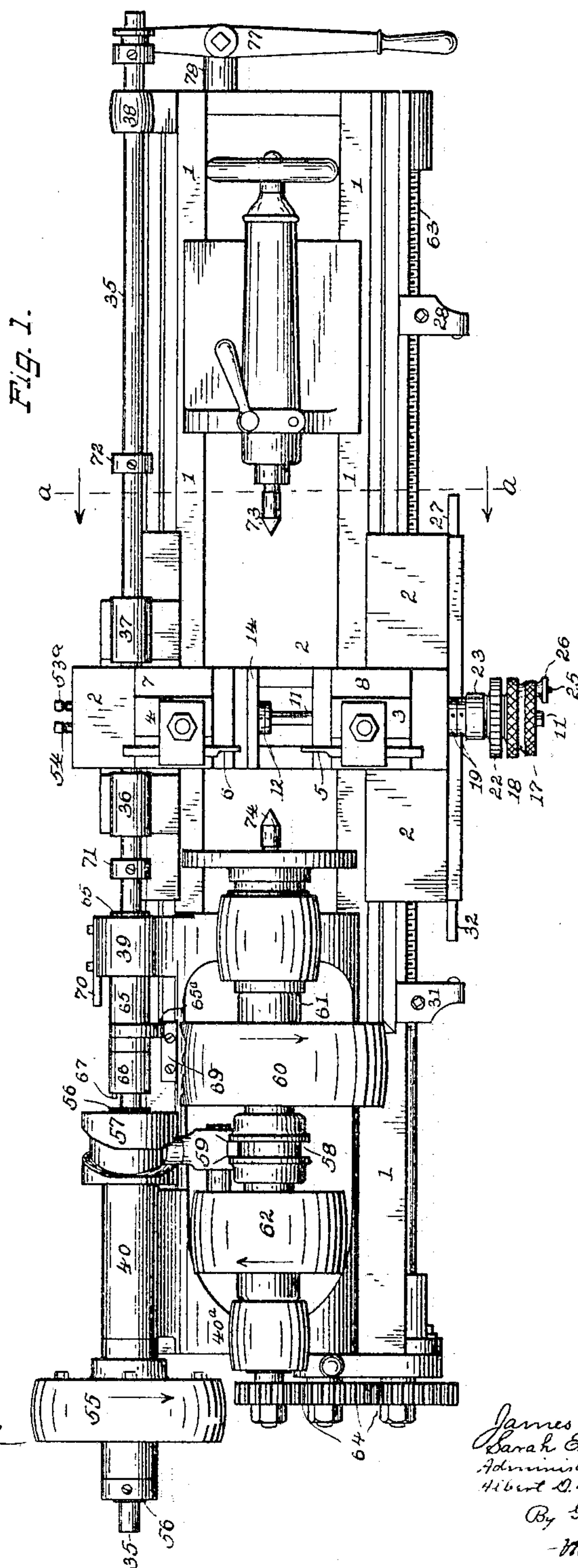
J. COULTER & A. D. LAWS.

S. E. LAWS, ADMINISTRATRIX OF A. D. LAWS, DEC'D.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

APPLICATION FILED JAN. 7, 1902.

6 SHEETS--SHEET 1.



WITNESSES :

L R Hoyt
D. J. Chaffee

INVENTORS.

James Coultier
Sarah E. Laws
Administrators of the estate of
Hilbert D. Laws, deceased.
By Geo. S. Phillips
-their ATTORNEY

No. 782,220.

PATENTED FEB. 14, 1905.

J. COULTER & A. D. LAWS.

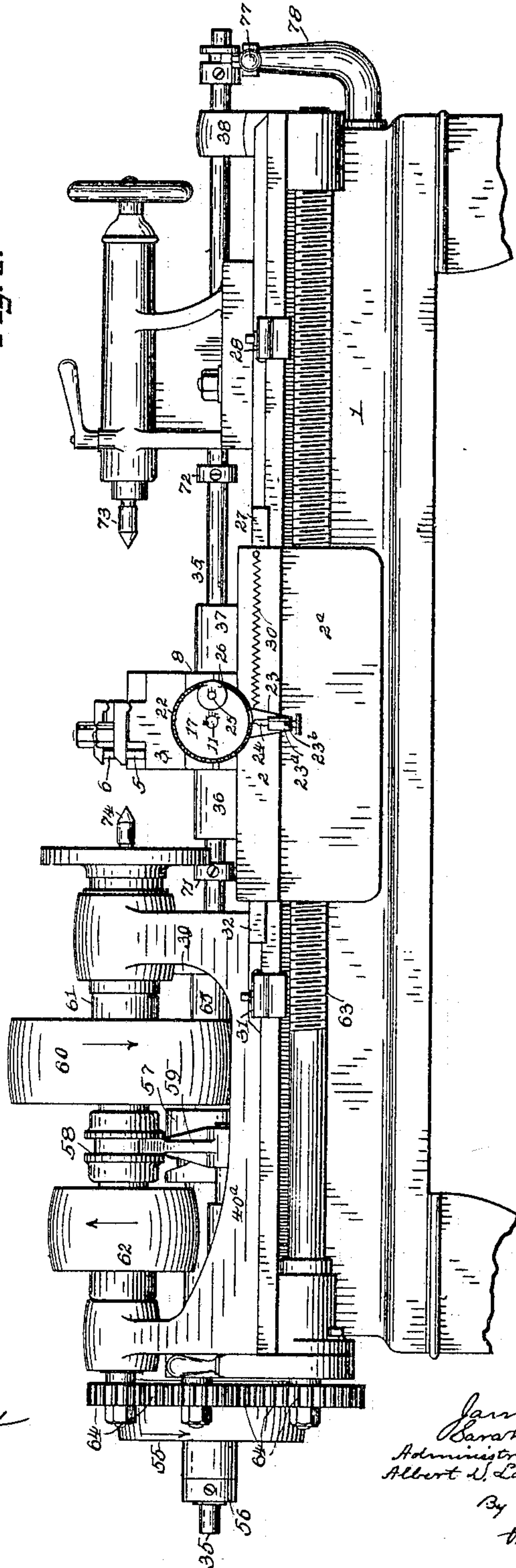
S. E. LAWS, ADMINISTRATRIX OF A. D. LAWS, DEC'D.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

APPLICATION FILED JAN. 7, 1902.

6 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

L. R. Hoyt
D. J. Chaffee

INVENTORS.

James Coulter
Barth S. Laws
Administratrix of the estate of
Albert D. Laws, deceased
By *Geo. S. Phillips*
their ATTORNEY

No. 782,220.

PATENTED FEB. 14, 1905.

J. COULTER & A. D. LAWS.

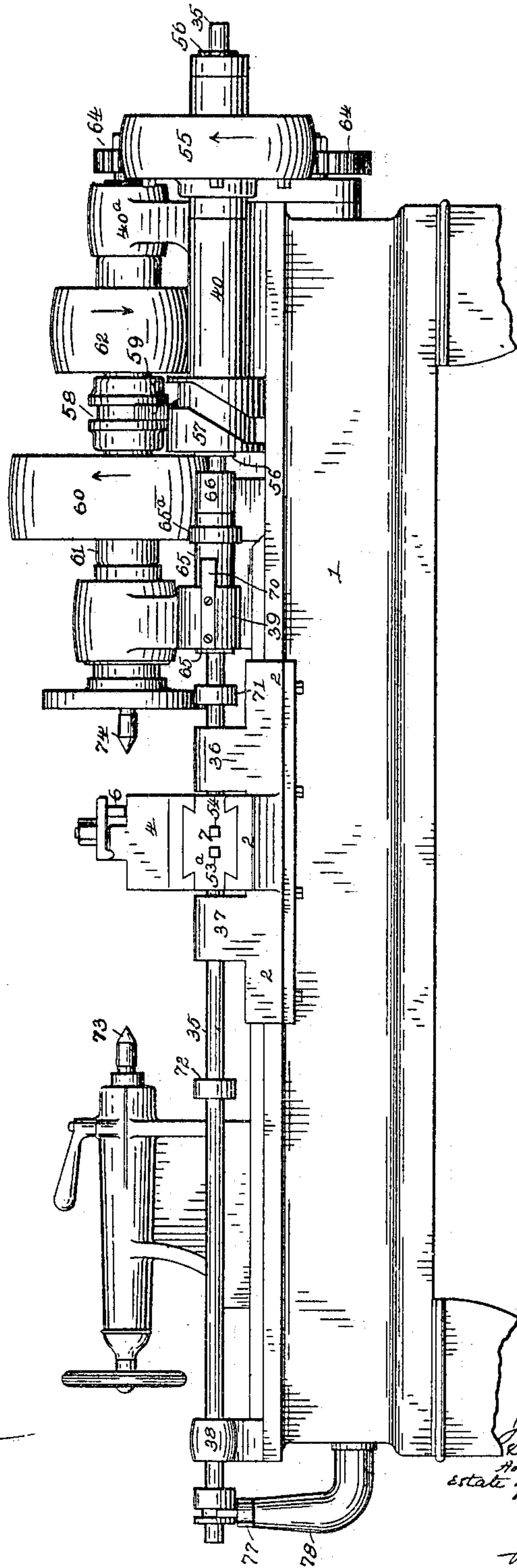
S. E. LAWS, ADMINISTRATRIX OF A. D. LAWS, DEC'D.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

APPLICATION FILED JAN. 7, 1902.

6 SHEETS—SHEET 3.

Fig. 3.



WITNESSES:

L. R. Hoyt
J. J. Chaffee

INVENTORS.

James Coulter.
Sarah E. Laws.
Administratrix of the
estate of Albert D. Laws, deceased.
By Geo. S. Phillips
their ATTORNEY

J. COULTER & A. D. LAWS.

S. E. LAWS, ADMINISTRATRIX OF A. D. LAWS, DEC'D.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

APPLICATION FILED JAN. 7, 1902.

6 SHEETS—SHEET 4.

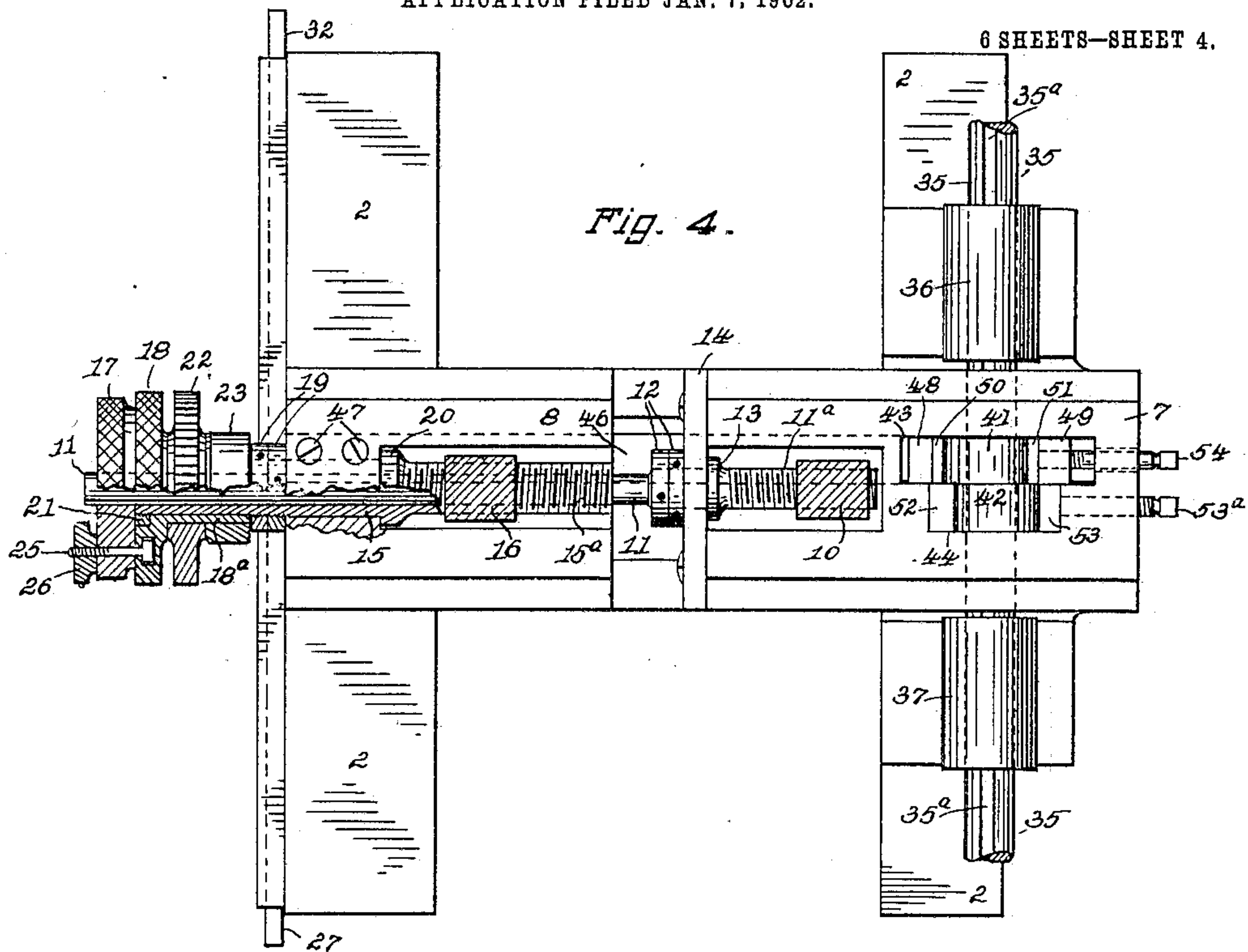
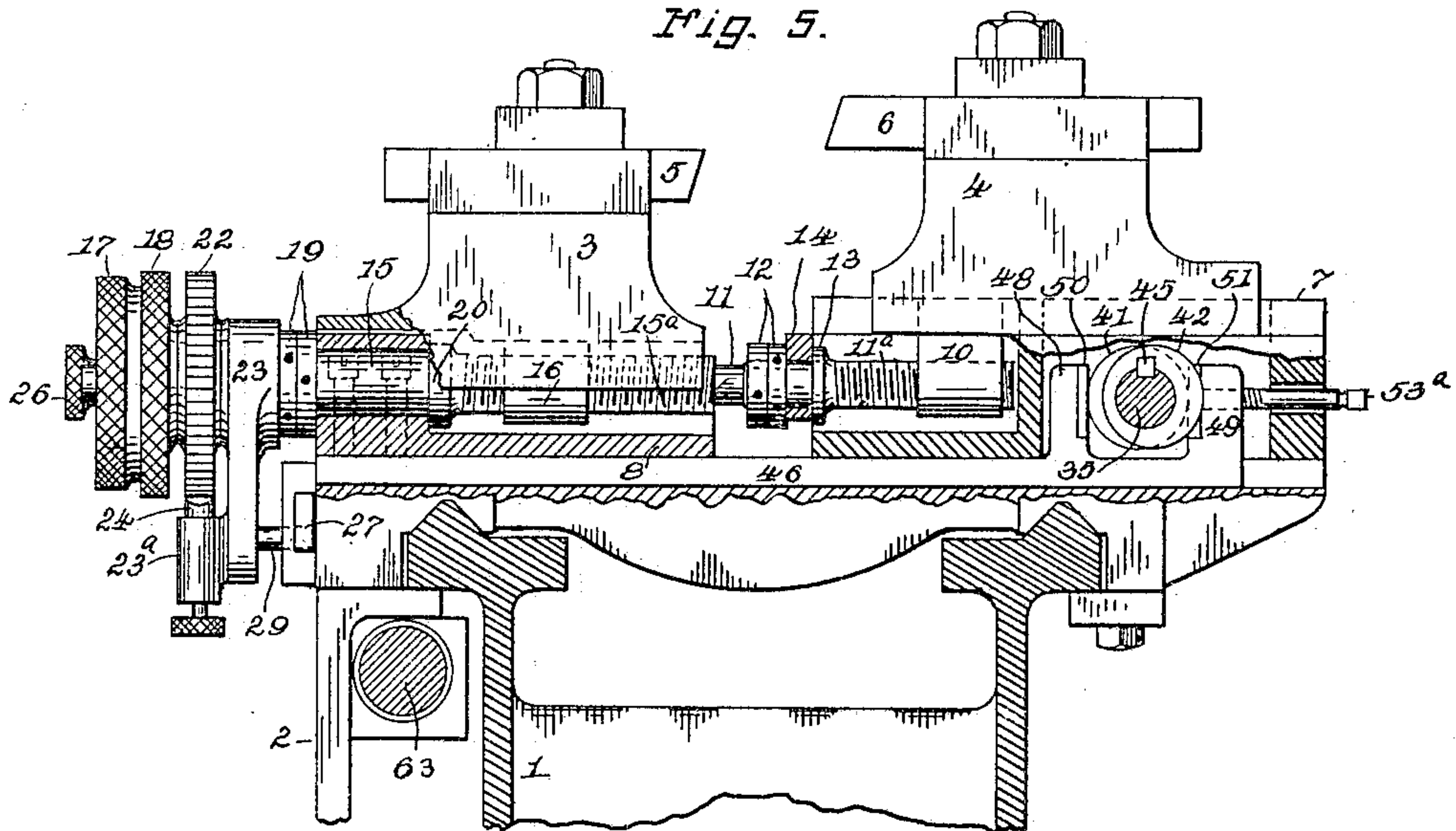


Fig. 5.



WITNESSES:

L. R. Hoyt
D. J. Chaffee

INVENTORS.

James Coulter
Sarah E. Laws,
Administratrix of the estate of
Albert D. Laws, deceased,
By Geo. S. Phillips,
THEIR ATTORNEY

No. 782,220.

PATENTED FEB. 14, 1905.

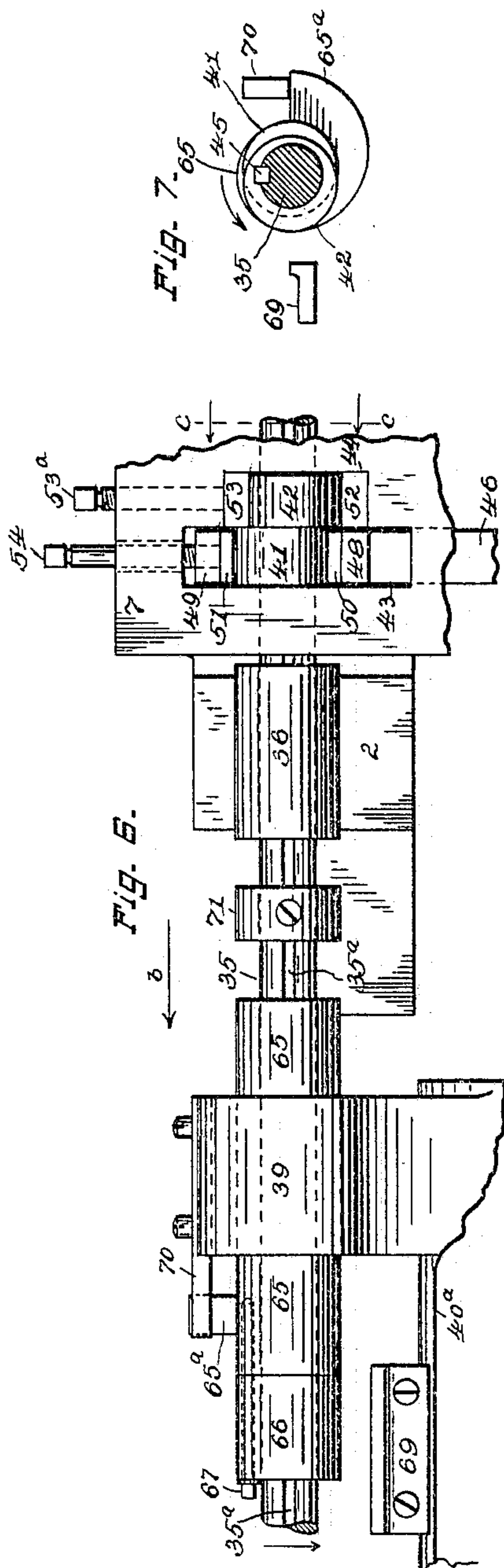
J. COULTER & A. D. LAWS.

S. E. LAWS, ADMINISTRATRIX OF A. D. LAWS, DEC'D.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

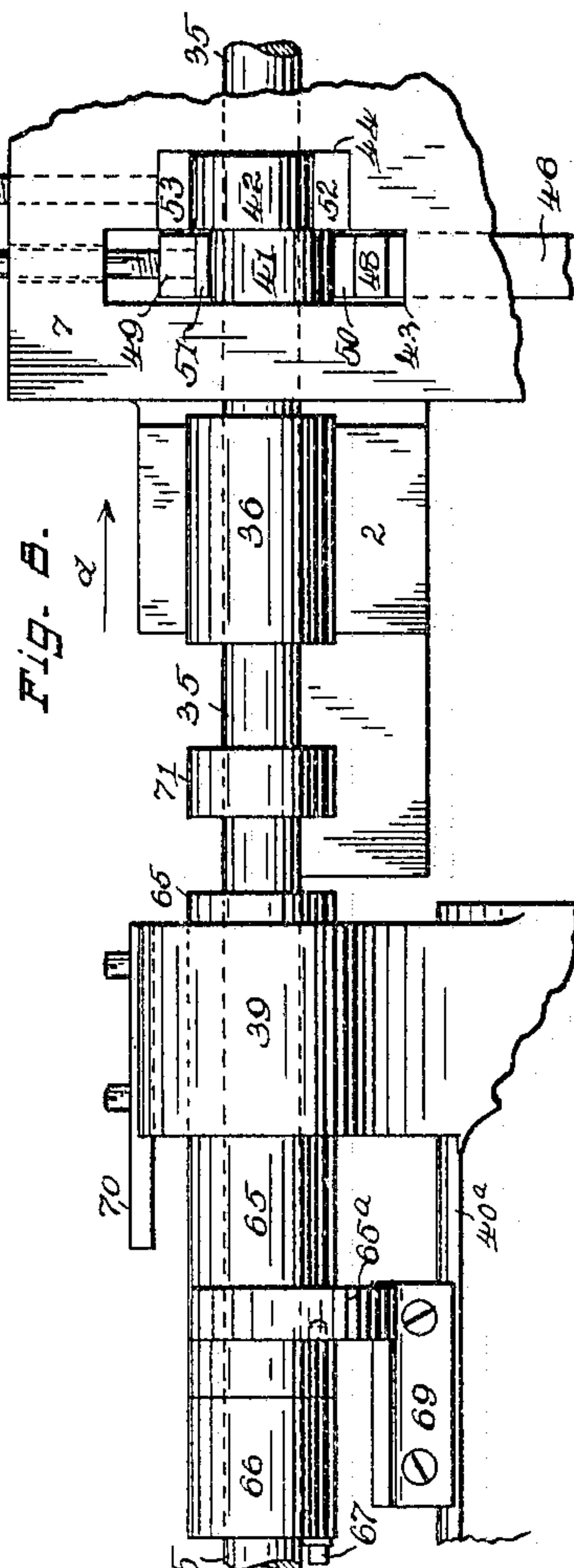
APPLICATION FILED JAN. 7, 1902.

6 SHEETS—SHEET 5.



WITNESSES:

L. R. Hoyt
J. J. Chaffee



INVENTORS.

James Coulter,
Sarah E. Laws,
Administratrix of the estate
Albert D. Laws, deceased.
By Geo. V. Phillips
their ATTORNEY

No. 782,220.

PATENTED FEB. 14, 1905.

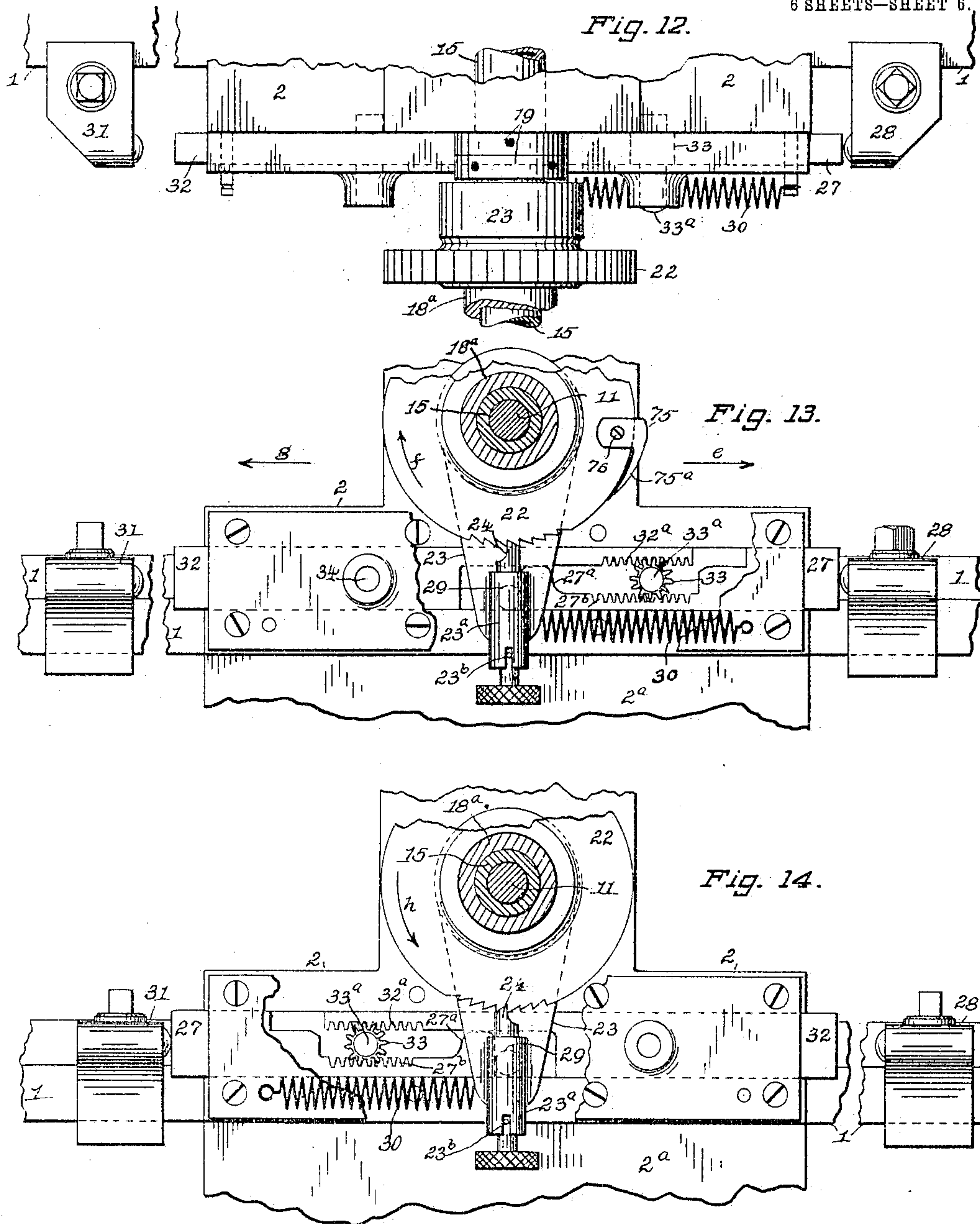
J. COULTER & A. D. LAWS.

S. E. LAWS, ADMINISTRATRIX OF A. D. LAWS, DEC'D.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

APPLICATION FILED JAN. 7, 1902.

6 SHEETS—SHEET 6.



WITNESSES:

L. R. Hoyt
D. J. Chaffee

INVENTORS:

James Coulter
Sarah E. Laws.
Administratrix of the estate of
Albert S. Laws, deceased.
By Geo. S. Phillips,
their ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES COULTER, OF BRIDGEPORT, CONNECTICUT, AND SARAH E. LAWS,
ADMINISTRATRIX OF ALBERT D. LAWS, DECEASED.

AUTOMATIC SCREW CUTTING AND TURNING LATHE.

SPECIFICATION forming part of Letters Patent No. 782,220, dated February 14, 1905.

Application filed January 7, 1902. Serial No. 88,817.

To all whom it may concern:

Be it known that we, JAMES COULTER, a citizen of the United States, and a resident of Bridgeport, county of Fairfield, State of Connecticut, and ALBERT D. LAWS, deceased, (represented by SARAH E. LAWS, administratrix,) late a citizen of the United States, and a resident of said city, county, and State, have invented certain new and useful Improvements in Automatic Screw Cutting and Turning Lathes, of which the following is a specification.

This invention relates to an improvement in lathes or machines of like character; and it consists in certain details of construction whereby automatic turning and screw-cutting is effected.

To enable others to understand the invention, reference is had to the accompanying drawings, in which—

Figure 1 represents an upper plan view of the lathe and broken view of the driving-pulley. Fig. 2 is a front elevation of the lathe and broken view of the legs. Fig. 3 is a rear elevation of the lathe and broken view of the legs. Fig. 4 is an upper plan view of the carriage with the tool-holders removed, broken view of the reversing-shaft, and broken view of one of the tool-holder-adjusting screws and locking-nuts therefor, circular handles or knurled disks for operating the adjusting-screws, and sectional view of the threaded lugs projecting from the tool-holders. Fig. 5 is a side elevation of the carriage and tool-holders mounted thereon, broken sectional view of the bed, and sectional view of the reversing-shaft and feed-screw on line *a* of Fig. 1. Fig. 6 is a broken view of the carriage, head-stock, and broken view of the reversing-shaft mounted in said carriage and head-stock, showing the carriage moving in the direction of arrow *b*. Fig. 7 is a sectional detail view of the reversing-shaft on line *c* of Fig. 6, showing the cams for operating the tool-holders mounted thereon and the stop-clutch engaged with one of the stops connected with the head-stock, as shown at Fig. 6, also end view of both stops. Fig. 8 is a view similar to Fig. 6, showing the carriage traveling in

the direction of arrow *d*. Fig. 9 is a view similar to Fig. 7, but showing the stop-clutch in the position shown at Fig. 8. Figs. 10 and 11 are detail elevations similar to Figs. 7 and 8, except that the cams for operating the tool-holders are removed and the stop-clutch is turned half-way around, so as to operate the tool-holders in an opposite manner. Fig. 12 is a broken view of the carriage, lathe-bed, and hollow threaded adjusting-screw for operating the front tool-holder. Fig. 13 is a broken front elevation of the bed, carriage, and toothed wheel for operating the tool-holders set for outside work. Fig. 14 is a view similar to Fig. 13, but showing the toothed wheel set for inside work.

Its construction and operation are as follows:

1 represents the lathe-bed; 2, the carriage.

3 and 4, Fig. 5, are tool-holders carrying the tools 5 and 6.

7 and 8 are movable tool-holder supports on which the tool-holders are mounted. Said supports are mounted on the lathe-carriage and are adapted to move to and from the center in the following manner: 10 is a lug projecting down from the tool-holder 4. 11 is the feed-screw for the tool-holder 4, whose threaded portion 11^a engages a threaded hole (not shown) in the lug 10 for moving said tool-holder on its support. 12 represents jam-nuts on this feed-screw which, in connection with the shouldered portion 13 and the bar 14, attached to the support 7, serve to take up the lost motion of said feed-screw. 15 is a sleeve whose threaded portion 15^a engages with a threaded hole (not shown) of the lug 16, depending from the tool-holder 3. The threadless portion of the feed-screw 11 passes through the sleeve 15 and extends outside of the carriage and has slidably secured to its outer end the circular knurled disk 17, (see also Fig. 4,) by means of which the tool-holder 4 is moved on its support. 18 is a knurled disk firmly secured to the outer projecting end of the sleeve 15, whereby the tool-holder 3 is also moved on its support. 19 represents jam-nuts on this sleeve, which engage the outside vertical face of the support 3, which, in connection with the shoulder 20 of

said sleeve engaging the inner wall of said support, take up the lost motion in said sleeve. 21 is a threaded ring let into the front face of the disk 18, which ring engages the threaded end of the sleeve 15 to hold said disk in place. 22 is a ratchet-wheel mounted upon the inwardly-projecting hub 18^a of the disk 18 and is secured thereto, and 23 is an arm loosely mounted on said hub whose lower end carries the spring-actuated pawl 24, adapted to engage said ratchet-wheel. (See Figs. 2, 4, 5, 13, and 14.) This pawl is of common construction and operates in the housing 23^a at the lower end of the arm 23 and is held out of engagement with the ratchet-wheel when the pin 23^b rests on the under side of said housing. The ratchet-wheel 22 is the medium for automatically feeding one or both of the tool-holders 3 and 4. In the majority of cases the tool-holders will both be in operation, one carrying the roughing and the other the finishing tool, and it matters not which is used for roughing or finishing, only the roughing-tool should be set a trifle in advance of the finishing-tool. When both tools are in operation, the outer disk 17 is firmly clamped to the disk 18 by means of the bolt 25 and nut 26, and as the threaded portion 11^a of the feed-screw is a right-hand thread and the threaded end of the bushing 15 is a left-hand thread it is evident that both tool-holders will be brought toward the center when the disks 17 and 18 are thus locked together.

The automatic rotation of the ratchet-wheel 22 to operate the tool-holders is effected, as before mentioned, by the pawl 24, and this is operated in the following manner: 27, Figs. 12 and 13, is a slide-bar operatively mounted in the front face of the lathe-carriage 2, and 28 is an adjustable stop adapted to be secured to the lathe-bed at any point to limit the travel of the carriage in one direction. 29 (see also Fig. 5) is a pin projecting rearward from the arm 23 into the path of travel of the slide-bar 27, so that when the carriage has traveled back in the direction of arrow *e*, Fig. 13, in readiness for the tools to be fed in at the end of a piece of work when right-hand threads are to be cut the inner end 27^a of the slide-bar 27 will engage the pin 29 and cause the ratchet-wheel 22 to turn in the direction of arrow *f*, and when the carriage has started forward in the opposite direction, as indicated by arrow *g*, the spring 30 will operate the arm 23 to carry the pawl 24 back in readiness to engage other teeth of the ratchet-wheel.

In cutting left-hand threads the stop 28 is moved out of the way and the stop 31 is used. 32 is a similar slide-bar and carries the teeth 32^a at its inner end to engage the pinion 33, mounted on the short shaft 33^a, which shaft is journaled in the carriage. The bar 27 is also provided with the teeth 27^b, which also engage this pinion, so that when the bar 32

strikes the stop 31 the ratchet-wheel will also be turned in the direction of arrow *f*.

The above description applies to outside threading and turning. For inside threading or turning the pawl 24 and ratchet-wheel may be reversed, as shown at Fig. 14, in which case the slide-bars 27 and 32 will also be reversed and the pinion 33 transferred to the opposite side of said pawl. For this purpose the bearing 34, Fig. 13, is provided in the carriage. This change will cause the ratchet-wheel 22 to turn in the direction of arrow *h*, in which case the spring 30, which is also changed to the opposite side of the arm 23, will bring back the pawl, as before described, which may also be either for right or left hand cutting. In this operation the stop 31 is used, and the stop 28 is moved out of the way. However, as only one tool is used on inside work it is not necessary to make the change just described, as the tool-holder 4 can be used for all inside work, and thus the construction shown at Fig. 13 can be used for both outside and inside work.

The tool-holders carrying the tools are automatically thrown in and out of cutting position through the medium of the reversing-shaft 35. This shaft is supported in the brackets 36 and 37 of the carriage, as shown at Figs. 1 and 3, also in the lathe-bracket 38 and the brackets 39 and 40 of the head-stock 40^a. This shaft makes one-half of a revolution to effect the movement of the tool-holders—viz., at the extreme forward and backward travel of the lathe-carriage. 41 and 42 (see Figs. 4, 5, 6, 8, and 9) are cams mounted on this shaft and are adapted to travel with the lathe-carriage by reason of their sides engaging with the side walls of the vertical slots 43 and 44 of the tool-holder support 7. These cams are provided with the key 45, (see also Figs. 7 and 8,) which slides freely in the keyway 35^a of the reversing-shaft.

46 is a slide-bar on the front end of which the tool-holder support 8 is secured by means of the screws 47. The rear end has the uprights 48 and 49, faced with the hardened-steel pieces 50 and 51, and between these the cam 41 operates to move the slide-bar 46 and carry the support 8 to and from the work. The cam 42 operates against the steel pieces 52 and 53, lying against the end walls of the vertical slot 44 of the support 7 to operate said support in a similar manner just explained for support 8. The vertical slot 43 is sufficiently elongated so that the uprights of the sliding bar 46 will not interfere with the support 7.

53^a and 54 are adjusting-screws to take up the wear of the steel faces against which the cams act.

55, Figs. 1 and 3, is a friction-pulley mounted upon the sleeve 56, which sleeve is keyed to the reversing-shaft 35, and 57 is a cam on the opposite end of said sleeve, which cam is connected with the clutch 58 by the arm 59.

60 is the driving-pulley on the lathe-spindle 61, and 62 is also a pulley on this spindle for reversing it to run the carriage back at a greater speed. This spindle is connected to the feed-screw 63 through the gears 64 in the usual manner.

The stop-clutch or escapement mechanism consists of the sleeve 65, provided with the arm 65^a. This sleeve is adapted to slide freely through the bracket 39 of the head-stock and is not secured directly to the reversing-shaft 35, but to the fixed collar 66 on said shaft through the medium of the screw 67. There are two longitudinally-threaded holes in the sleeve diametrically opposite each other for the purpose presently to be described. One of these holes, 68, is shown at Figs. 10 and 11.

69 is a stop secured to the head-stock, and 70 is another stop, secured to the bracket 39, with which stops the arm 65^a will alternately engage.

71 and 72 are adjustable stop-collars secured to the reversing-shaft and are set the proper distance apart to represent the travel of the carriage in either direction.

When the arm 65^a is in contact with either of the stops 69 or 70, the reversing-shaft 35 cannot turn, but the friction-pulley 55 will continue to rotate. As soon, however, as the said arm 65^a is released from either of said stops the reversing-shaft will be brought under the influence of the friction-pulley and given one-half of a revolution in the following manner, viz: In Figs. 6 and 7 the arm 65^a is in contact with the stop 70 and the carriage is moving forward in the direction of the arrow *b* to cut a right-hand thread. Now when the carriage 2 engages the collar 71, which, as before mentioned, is fixed to the reversing-shaft, it will move the reversing-shaft in the same direction, and by reason of the collar 66 being also fixed to said shaft the sleeve 65 will also be carried with such shaft. This will carry the arm 65^a out of engagement with the stop 70, and the instant said arm is released said shaft is immediately brought under the influence of the friction-pulley 55 and will make one-half of a revolution, which will bring the arm 65^a in contact with the other stop, 69. (See Figs. 8 and 9.) This movement of said shaft will cause the cams 41 and 42 (see also Figs. 4 and 5) to release the tools 5 and 6 from the work by carrying their tool-holders 3 and 4 outward. This partial rotary movement of the reversing-shaft will also give a partial rotary movement to the cam 57, which will bring the clutch 58 into engagement with the fast reversing-pulley 62, and thereby reverse the travel of the carriage 2. When, therefore, said carriage engages with the collar 72 on its backward travel, the reversing-shaft will be longitudinally moved in the opposite direc-

tion. This will move the arm 65^a off the stop 69, and as soon as it is released the friction-pulley 55 will cause the reversing-shaft to turn and bring the arm 65 again in contact with the stop 70, and thus temporarily check the rotation of said shaft. This last partial revolution of said shaft will, through the medium of the cams 41 and 42, have carried the tool-holders 3 and 4 inward in readiness for their tools to engage with a piece of work (not shown) on the centers 73 and 74.

When the carriage has reached its extreme backward travel to throw the tool-holders toward the center in cutting right-hand threads, the slide-bar 27 on the front of the lathe will also have engaged the stop 28, so as to give an additional inward movement to the tools and take off another chip, and so on until the proper depth of the thread is reached. This is determined by means of the stop 75, adjustably secured to the ratchet-wheel 22, as shown at Fig. 13. 75^a is a curved tailpiece projecting from this stop and resting on the periphery of the ratchet-wheel. 76 is a screw for holding the block 75 in any position on said wheel. In cutting threads or turning the stop 75 is so placed on the ratchet-wheel in such a position that when the said wheel has been rotated so as to bring the thin end of the curved tailpiece of the stop 75 directly under the center of said wheel the pawl in its backward stroke will ride on said tailpiece and not engage the ratchet-teeth. It will thus be seen that after the last cut has been taken and there is no one at hand to stop the lathe the carriage may continue to travel backward and forward to open and close the tool-holders without doing any damage, as the further feeding in of the tool-holders has been checked by the stop 75.

In cutting left-hand threads the driving-screw 67 for the stop-clutch 65 is transferred from the hole 68, Figs. 10 and 11, to the hole opposite. This will bring the arm 65^a against the under side of the stop 70 and the cams 41 and 42 into another position relative to the travel of the carriage, so that when said carriage has traveled forward to engage the collar 71 the cutting-tools will engage the work and when the reverse position of the carriage has been reached the tools will be moved outward. These movements are the reverse of the movements described for right-hand work.

77 is a handle pivotally supported on the arm 78, projecting from the rear end of the lathe, and is connected to the reversing-shaft, whereby said shaft may be operated by hand.

From the foregoing description it will readily be seen that the machine can either be operated by hand, as an ordinary lathe, or automatically, and when set to work automatically it requires no further attention than to remove the finished work and put in another piece. Another great advantage, al-

ready mentioned, is that the work cannot be spoiled by neglecting to remove it after the last cut is taken.

There are many details of construction which may be varied without departing from the spirit of the invention, the gist of which consists, essentially, in a reversing-shaft adapted to reverse the carriage at any predetermined point and to cause the cutting-tools to retreat from the work at one extreme point of the travel of the carriage, and be advanced toward the work at the other extreme point of the travel of said carriage, and, further, the said reversing-shaft is to remain in a state of rest while the carriage is traveling. It will also be understood that one of the tool-holders can be removed and only one tool-holder and one cutting-tool used, if desired.

Having thus described the invention, what is claimed as new is—

1. The combination, in a machine of the character described having a traveling tool-supporting carriage, a head-stock and spindle, said spindle carrying driving and reversing pulleys with interposed clutch mechanism, of an intermittently-rotatable reversing-shaft, means for connecting said clutch mechanism with said shaft, a continuously-running friction-pulley adapted to rotate said shaft, means whereby said shaft is held stationary against the rotative influence of said friction-pulley while the carriage is traveling, and means whereby said shaft is released by said carriage and permitted to be rotated by said friction-pulley, for the purpose set forth.

2. The herein-described improvement in a machine of the character described, consisting, in combination with a driving-spindle carrying driving and reversing pulleys and interposed clutch mechanism and a traveling tool-supporting carriage connected to said spindle, of an intermittently-rotatable reversing-shaft carrying means for connecting it with said clutch mechanism, a continuously-running friction-pulley on said shaft, means for checking the rotation of said shaft, tool-holders on said carriage adapted to move at right angles to the travel of said carriage, means on said reversing-shaft to effect such movement of said tool-holders at predetermined points in the travel of said carriage, for the purpose set forth.

3. The herein-described improvement in a machine of the character described having a work-driving spindle and a traveling tool-supporting carriage, of an intermittently-rotatable reversing-shaft, stationary bearings for said shaft, adjustable means on said shaft to be engaged by said carriage to move said shaft longitudinally in said bearings and cause the reversal of said driving-spindle and carriage, escapement mechanism connected with said shaft adapted to hold it against rotation while said carriage is in motion, said escapement mechanism consisting of a sleeve mount-

ed on said shaft and carrying an arm adapted to alternately engage oppositely-placed stops, said sleeve being adjustably secured to a collar rigid on said shaft and a bearing in which said sleeve is adapted to move longitudinally with said shaft, for the purpose set forth.

4. The combination with a driving-spindle mounted in a head-stock and carrying driving and reversing pulleys with interposed clutch mechanism, a traveling tool-supporting carriage, means for operating said carriage, a reversing-shaft, means for connecting said shaft with said clutch mechanism, escapement mechanism connected with said shaft, said shaft carrying a continuous-running friction-pulley to effect an intermittent rotary movement through the medium of said friction-pulley and escapement mechanism, said shaft carrying adjustable collars adapted to be engaged by the carriage to effect a longitudinal movement of said shaft and thus actuate the interposed clutch mechanism to effect the reversal of said spindle and escapement mechanism for the purpose set forth.

5. The herein-described improvement in a machine of the character described, having a driving and work-supporting spindle and a traveling carriage, of an intermittently-rotatable reversing-shaft carrying means for connecting it with said spindle, means whereby a rotary motion is imparted to said shaft, and means for temporarily checking said motion, oppositely-located movable tool-holder-carrying supports mounted on said carriage and means whereby said supports are controlled by said reversing-shaft, and means whereby said tool-holders are independently operated on said supports, for the purpose set forth.

6. The combination, in a machine of the character described having a driving and work-supporting spindle carrying pulleys with interposed clutch mechanism, and a traveling tool-carrying carriage, of a reversing-shaft and means to connect it with said clutch mechanism, a continuously-running friction-pulley adapted to rotate said shaft, an arm on said shaft and oppositely-arranged stops with which said arm contacts to hold the shaft against rotation, adjustable collars on said shaft adapted to be engaged by the carriage and thereby move the shaft longitudinally to disengage said arm from the stops, oppositely-located supports carrying tool-holders mounted on said carriage and under the control of the reversing-shaft, tool-holders mounted on said supports, and means whereby said tool-holders can be independently operated on said supports, for the purpose set forth.

7. The combination, in a machine of the character described having a traveling tool-supporting carriage, of a reversing-shaft having an intermittent rotary movement and an intermittent longitudinal movement, adjustable stops mounted thereon to be engaged by said carriage, and means for temporarily check-

ing the rotary movement of said shaft, adjustable tool-holder supports mounted on said carriage and oppositely located with respect to the work to be cut, for the purpose set forth.

5 8. The combination, in an automatic machine of the character described having a traveling carriage, of a reversing-shaft mounted to rotate and move longitudinally in bearings on the machine and means to rotate it, adjustable stops thereon adapted to be engaged by the carriage to effect the longitudinal movement, stops to check the rotary movement, oppositely-located tool-holders mounted on adjustable supports slidably mounted on the carriage, and means on the reversing-shaft for effecting a movement of said supports on the carriage, for the purpose set forth.

9. The combination, in an automatic machine of the character described having a traveling carriage, of movable supports carrying tool-holders mounted on said carriage, means for automatically feeding said tool-holders toward the work or center line of the machine, a reversing-shaft mounted to rotate and move longitudinally in bearings on the machine, adjustable stops thereon adapted to be engaged by the carriage to effect the longitudinal movement, and stops to check the rotary movement, means on said shaft for effecting a movement of said supports on the carriage to and from the center line of the machine so that, when the carriage has traveled a predetermined distance in one direction, it will release said shaft from one of its stops and thereby cause it to be rotated against the other of said stops, which rotary movement will effect the withdrawal of said supports and the reversal of said carriage, and when said carriage has traveled a predetermined distance in the opposite direction, it will again effect the release of said shaft, which shaft in rotating to the other of said stops will carry the supports toward the center line of the machine, for the purpose set forth.

10. The combination, in an automatic machine of the character described, of a reversing-shaft having an intermittent rotary movement and an intermittent longitudinal movement, supporting-bearings therefor, a sleeve on said shaft carrying a stop-arm, stops against which said arm is adapted to alternately engage, said stops located outside of said shaft and sleeve, a collar splined to said shaft, and means for connecting said collar with said sleeve, for the purpose set forth.

11. The combination, in an automatic machine of the character described, having a traveling carriage, and a work supporting and driving spindle carrying clutch mechanism, a sleeve journaled in a stationary part of the machine and carrying a driving-pulley and cam, means whereby said cam is connected with said clutch mechanism, a reversing-shaft mounted to rotate and move longitudinally in bearings on the machine, and also to move

longitudinally in said sleeve and be rotated therewith, adjustable stops on said shaft adapted to be engaged by the carriage to effect the longitudinal movement, stops to check the rotary movement, oppositely-located tool-holders mounted on adjustable supports slidably mounted on the carriage, and means on the reversing-shaft for effecting a movement of said supports on said carriage, and means for effecting a movement of the tool-holders on said supports, for the purpose set forth.

12. The combination, in an automatic machine of the character described having a traveling carriage carrying one or more tool-holders adapted to move at right angles to the travel of said carriage, and a work holding and driving spindle, of a reversing-shaft having an intermittent longitudinal movement and an intermittent partial rotary movement so that, through the instrumentality of said shaft, all of the above-named moving parts are reversed, for the purpose set forth.

13. The combination, in an automatic machine of the character described, of a work holding and driving spindle and a traveling tool-supporting carriage carrying one or more tool-holders and movable supports for said holders, a reversing-shaft having an intermittent movement, reversing connections between the spindle and said shaft, said shaft adapted to be moved longitudinally, means on said shaft to effect the rotary movement, adjustable stops on said shaft adapted to be engaged by the carriage to effect the longitudinal movement, stops to check the rotary movement, said stops so arranged that the longitudinal movement of the shaft releases and engages such stops and operative connections between the shaft and movable tool-holder supports and the spindle so that, through the instrumentality of said shaft, the carriage, tool-holder supports and spindle are reversed, for the purpose set forth.

14. The combination, in an automatic machine of the character described having a bed and a traveling carriage mounted thereon of movable supports slidably mounted on said carriage and oppositely located thereon with respect to the work or center line of the machine, tool-holders on said supports, a feed-screw, means for connecting the rear tool-holder therewith, said screw projecting outside of the carriage and carrying a disk or handle portion, a threaded sleeve loosely embracing said feed-screw, and means for connecting the front tool-holder with said sleeve whereby the front tool-holder can be operated independent of the rear one, said sleeve projecting outside of the carriage and carrying a disk or handle having a hub, means for locking said handles together, said hub carrying a ratchet-wheel secured thereto and an arm loosely mounted thereon, means for actuating said ratchet-wheel to actuate both tool-holders, for the purpose set forth.

15. The combination, in an automatic machine of the character described having a traveling carriage and a driving-spindle, of oppositely-located tool-holders mounted on adjustable supports slidably mounted on said carriage, a reversing-shaft mounted to rotate and move longitudinally in bearings on the machine and means for rotating it, adjustable stops thereon adapted to be engaged by the carriage to effect the longitudinal movement, stops to check the rotary movement, reversing clutch mechanism on the spindle and means for connecting the shaft with said clutch mechanism, means on said shaft to effect the movement of said supports, so that, through the instrumentality of said shaft, the supports are first actuated to or from the work or center line of the machine, and second, the carriage is reversed, for the purpose set forth.

16. The combination, in an automatic machine of the character described having a traveling carriage, a work holding and driving spindle carrying pulleys with interposed clutch mechanism, of a reversing-shaft mounted to rotate and to move longitudinally in bearings on the machine, means for connecting said shaft with the clutch mechanism, adjustable stops thereon adapted to be engaged by the carriage to effect the longitudinal movement, means to check the rotary movement, oppositely-located tool-holders mounted on adjustable supports slidably mounted on the carriage, a cam actuated by said shaft for effecting a movement of said supports on said carriage, for the purpose set forth.

17. The combination, in an automatic machine of the character described having a bed and a traveling carriage thereon, oppositely-located tool-holders adjustably mounted on supports slidably mounted on the carriage, a work holding and driving spindle carrying pulleys and interposed clutch mechanism therefor, with the following cooperating elements adapted to effect, first, a movement of the supports on the carriage to or from the work or center line of the machine, and second, a reversal of the carriage, viz: a reversing-shaft mounted to be intermittently rotated and reciprocated longitudinally in bearings on the machine, adjustable stops on said shaft adapted to be engaged by the carriage

to effect the longitudinal movement, stops adapted to temporarily check the rotary movement, means on said shaft to effect the movement of the supports on said carriage, and means substantially as shown for connecting the shaft with the clutch mechanism, for the purpose set forth.

18. In an automatic machine of the character described, comprising, a traveling carriage, oppositely-located tool-holders adjustably mounted on supports slidably mounted on the carriage, a work holding and driving spindle carrying pulleys with interposed clutch mechanism, a reversing-shaft mounted to be intermittently rotated and reciprocated longitudinally in bearings on the machine, adjustable stops on the shaft adapted to be engaged by the carriage to effect the longitudinal movement, stops to temporarily check the rotary movement, means on said shaft for effecting a movement of the supports on the carriage, and means substantially as shown for connecting the shaft with the clutch mechanism, all combined and arranged so that, through the instrumentality of the reversing-shaft, the supports on the carriage are first moved to or from the center line of the machine, and such movement immediately followed by a reversal of the spindle and carriage, for the purpose set forth.

19. The combination, in a machine of the character described having a work-holding and work-driving spindle, of a bed having a traveling tool-supporting carriage, tool-holders carrying cutting-tools mounted on said carriage and on opposite sides of the center line of the spindle or work to be cut, a reversing-shaft, means on said shaft for simultaneously engaging the cutting-tools of both of said holders with the work and disengaging them therefrom, for the purpose set forth.

Signed at Bridgeport, in the county of Fairfield and State of Connecticut, this 21st day of September, A. D. 1901.

JAMES COULTER.

SARAH E. LAWS,

Administratrix of the estate of Albert D. Laws, deceased.

Witnesses:

A. K. LOVELL,

GEORGE W. FINN.