

No. 687,674.

Patented Nov. 26, 1901.

F. W. BÜHNE & A. RITZ.
FEED MOTION.

(Application filed Sept. 23, 1899.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1

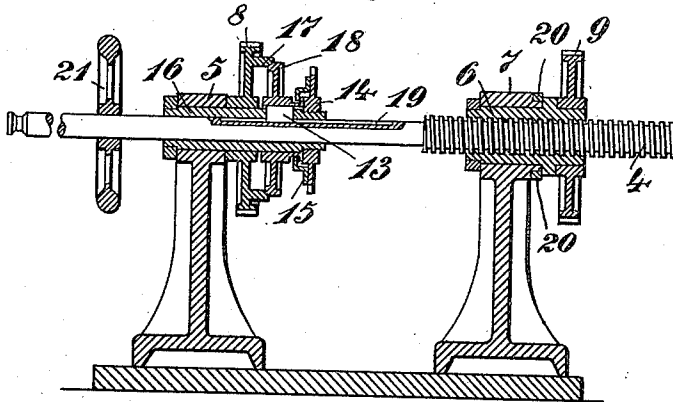
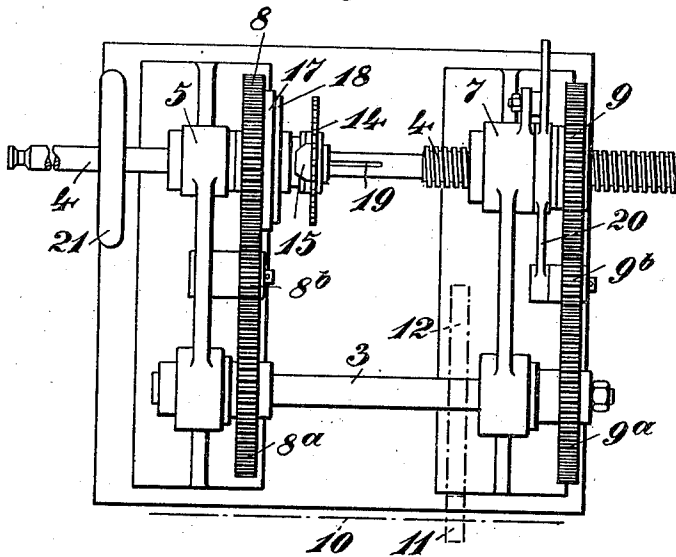


Fig. 2



WITNESSES
Ella L. Giles
O. W. Munson

INVENTORS.
Friedrich Wilhelm Bühne
August Ritz
BY
Richard R.
ATTORNEYS

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Fig. 2

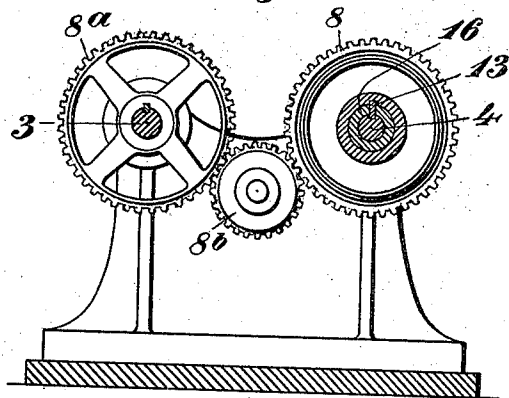


Fig. 5

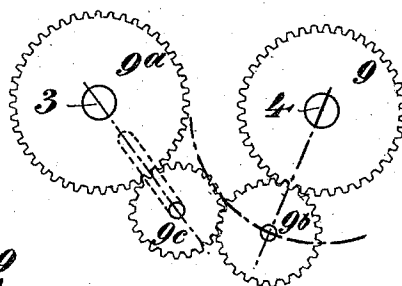
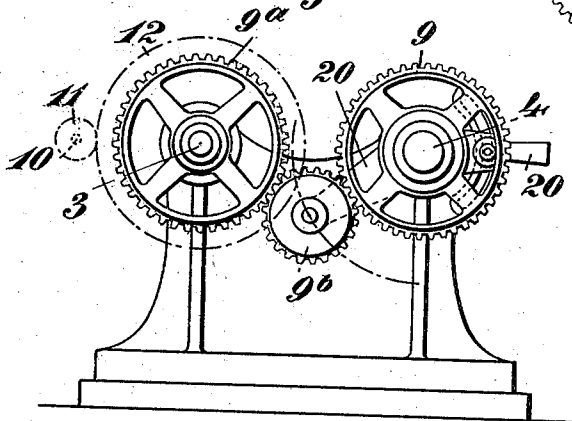


Fig. 3



WITNESSES

Ella L. Giles
O. Munn

INVENTORS

Friedrich Wilhelm Bühne
August Ritz
BY
Richardson

ATTORNEYS

No. 687,674.

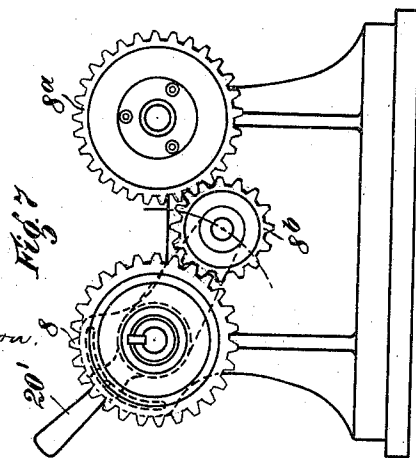
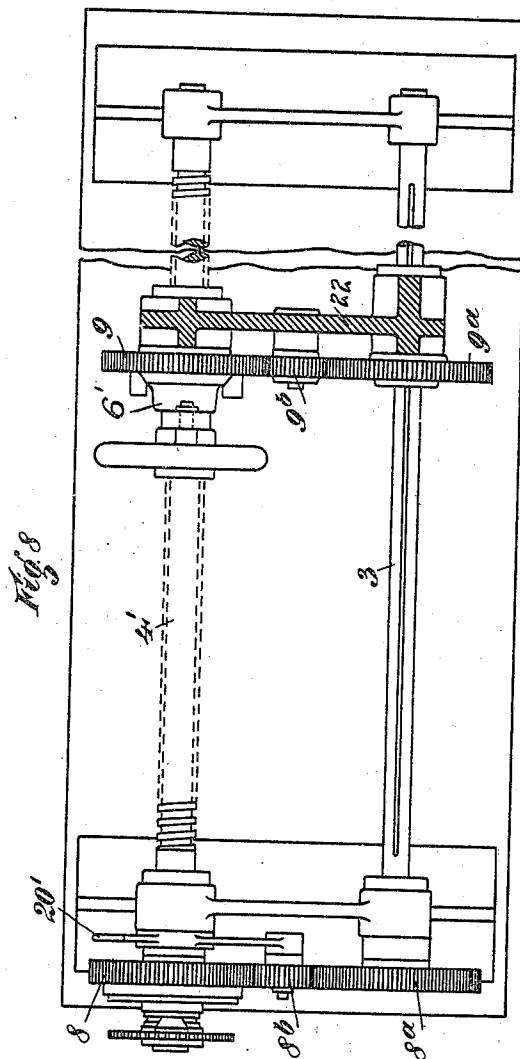
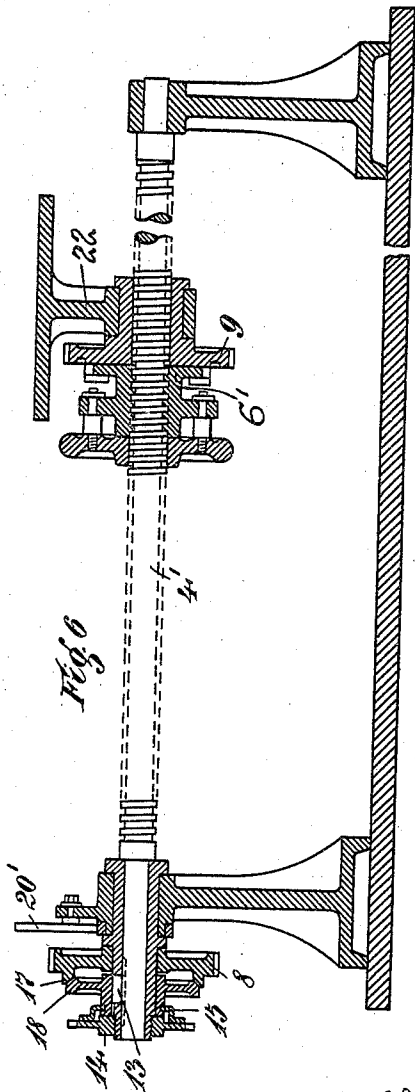
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Witnesses:
Isabella Aldron
Adelaide Claire Gleason.

Inventors.
Friedrich Wilhelm Bühne
August Ritz
By *Richardson*
Attorneys.

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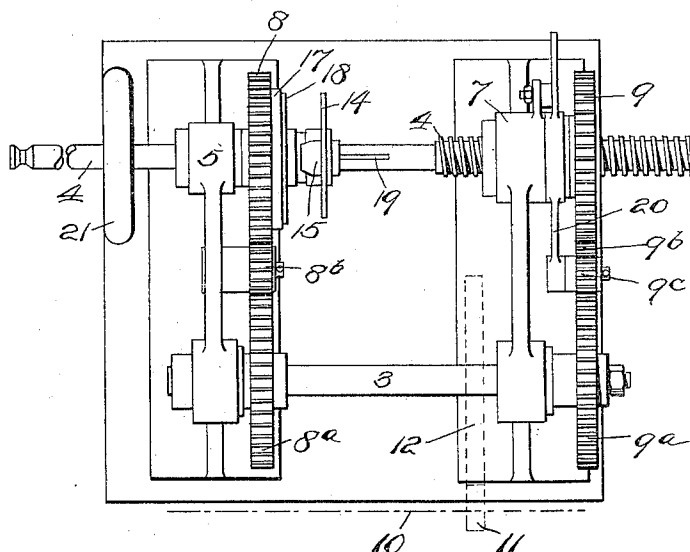
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(No Model.)

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Fig. 9.



attest:
Edw. L. Reed
Edw. L. Reed.

Inventors:
Friedrich W. Bühne
August Ritz.

by *Richard D. [Signature]*
attys

UNITED STATES PATENT OFFICE.

FRIEDRICH WILHELM BÜHNE, OF FREIBURG, AND AUGUST RITZ, OF ST. GEORGEN, GERMANY, ASSIGNORS TO THE FIRM OF AUG. BÜHNE & CO., OF FREIBURG, GERMANY.

FEED-MOTION.

SPECIFICATION forming part of Letters Patent No. 687,674, dated November 26, 1901.

Application filed September 23, 1899. Serial No. 731,485. (No model.)

To all whom it may concern:

Be it known that we, FRIEDRICH WILHELM BÜHNE, a subject of the Grand Duke of Baden, residing at No. 17 Erbprinzenstrasse, Freiburg, in the Grand Duchy of Baden, in the German Empire, and AUGUST RITZ, a subject of the Grand Duke of Hesse, and a resident of St. Georgen, Germany, have invented certain new and useful Improvements in Feed-Motions, of which the following is a specification.

It is a known means to effect the advance of the working spindles of a working machine by forming that spindle into a screw-spindle and by then letting this screw-spindle and the screw-nut compassing the spindle rotate at different speeds. Such arrangements could be employed up to now only in a limited measure, as a change in the extent of the advance of the spindle could be attained either not at all or was possible only between very narrow limits. This drawback has been obviated by this invention, which relates to an arrangement in which a very great number of variations in the extent of the advance may be attained by throwing only one wheel out of gear. The arrangement is such that it may be employed for measuring spindles as well as in a great variety of manners for working spindles—for instance, such as turning-lathes and all such other machine-tools in which a change in the advance of the tool could be brought about up to now only by exchanging a whole group of wheels, which could not in every case be easily performed, especially if the tabula belonging to the respective machine had been lost. In our machine the wheel which determines the amount the screw will be advanced for each revolution is marked to indicate the extent of advance of the screw which will be given by it, and the workman by simply inspecting this mark on the wheel can tell whether or not it is the one desired. In the new device is made use of the above-mentioned arrangement, according to which the spindle as well as the nut are rotated, the speed of the rotation of these two parts being different. The arrangement is, however, such that the shaft from which the power is transmitted to the spindle and to the nut is situated parallel to

the spindle and is connected with the spindle and the nut by means of geared wheels. One set of these geared wheels is furnished with an intermediate wheel adapted to be swung outward and to be secured in position in different heights, so that as soon as the driving-wheel belonging thereto has been exchanged upon the spindle or upon the nut the connection with the cog-wheel located upon the shaft of the transmission-wheels may again be effected by adjusting the aforementioned intermediate wheel, which allows of being swung out. By interposing a second transmitting-gear in the train for driving the nut a movement may be given to the latter in a direction opposite to that of the spindle, and thus a much-accelerated advance movement will be given to said spindle. The one cog-wheel upon the spindle or upon the spindle-nut is connected with the spindle or with the spindle-nut by means of a coupling in such a manner that said wheel may loosely rotate upon the spindle or nut after the coupling parts are disconnected, so that either only the nut or only the spindle is rotated and the other part is held fast in the bearing and wedged by friction. The advance of the spindle proceeds then, consequently, in correspondence with the full pitch of the thread. This arrangement is especially important in case the respective machine shall work with a very slight advance, but with a quick back movement. The essential features of the new arrangement consist thus in, first, the possibility of producing a great variety of extents in the advance of the spindle by exchanging only one wheel; second, the possibility of multiplying the advance movement by intercalating only one wheel more, so that thus a second series of changes in the advance is obtained, and, third, the possibility of obtaining a quick back movement by disconnecting the parts of the coupling.

In order to make our invention more clear, we refer to the accompanying drawings, in which similar numerals denote similar parts throughout the several views, and in which—

Figure 1 is a longitudinal section through a machine constructed according to our invention, the section being taken shortly in

front of the screw-spindle. Fig. 2 is a cross-section through the middle of the machine. Fig. 3 is a side view, Fig. 4 a plan, and Fig. 5 a diagrammatical representation, of the gearing. Figs. 6, 7, and 8 show in front view, side view, and plan the reverse of an actuating movement of the kind afordescribed, such as may be used, for instance, to actuate the slide-rest of a turning-lathe. Fig. 9 is a plan view similar to Fig. 4, but showing the arrangement of the gearing illustrated in Fig. 5.

The screw-spindle 4 is provided at one end with a thread extending nearly to one-half of the length of the spindle and is supported in this part by a rotary nut 6. The other part of the spindle is supported by a box 16, which may freely rotate in a bearing 5, and carries a freely-rotatable wheel 8 with an interior cone 17 as well as a friction-disk 18, connected with the screw-spindle 4 by means of a spline 13 in such a manner that it may be moved along said spindle. The longitudinal groove, 19 in the spindle permits of a lateral displacement of the latter; but the rotary movement is executed both by the spindle and the box at the same time.

The end of the box 16 has a thread, upon which is screwed a small hand-wheel 14, with clamps 15 taking into a corresponding nut of the friction-disk 18, and make it possible to establish or break the coupling with the cog-wheel 8 by the friction-disk 18 when the hand-wheel 14 is rotated in a forward or backward direction. By this means the rotary movement of the cog-wheel 8 may or may not be transmitted to the screw-spindle 4, as desired. The cog-wheel 8 is rotated from the cog-wheel 8^a, which is secured to the shaft 3 and has the same diameter as the said wheel 8, by means of an intermediate wheel 8^b. If thus the shaft 3 is rotated, the cog-wheel 8 and with it—by connecting the coupling parts—the screw-spindle 4 are rotated at the same angular speed. If, however, the connection between the coupling parts is broken, the cog-wheel 8 rotates alone upon the box 16 and the spindle 4 remains at rest.

The nut 6, which may rotate in the bearing 7, is moved by a cog-wheel 9. A lever-arm 20, which is displaceably attached to the bearing 7, carries the intermediate wheel 9^b, which gears with a cog-wheel 9^a, attached to the shaft 3 in such a manner that it may be exchanged for another one. Therefore by exchanging the cog-wheel 9^a if the shaft 3 is rotated the cog-wheel 9 receives another angular speed than the cog-wheel 8, wherefrom results a corresponding displacement of the nut relatively to the spindle. If, for instance, at the rotation of the shaft 3 the difference between the revolution of the cog-wheel 8 and the cog-wheel 9 amounts to one one-hundredth part, more or less, then also the nut will have been caused to make a rotary movement with regard to the spindle equal to one one-hundredth part of a complete rotation, and the spindle is thus caused to make a lateral move-

ment equal to one one-hundredth part of the pitch of the thread. The shaft 3 may be driven from a shaft 10, arranged parallel therewith, through the gearing 11 and 12. Concerning the exchangeable cog-wheel 9^a and with the use of a set of wheels the teeth of which number upward or downward from one hundred—for instance, one hundred and one, one hundred and two, one hundred and three, one hundred and four, and so on, or ninety-nine, ninety-eight, ninety-seven, ninety-six, and so on—a lateral movement of the screw-spindle for "0," "01," "0.02," "0.03," "0.04," and so on, will be attained. By inserting an intermediate wheel 9^c, such as is diagrammatically represented in Fig. 5, the direction of rotation of the nut relatively to the spindle 4 is reversed, and there is thus made possible a duplication of the angular speed with regard to the wheels 8 and 9—that is to say, a longitudinal displacement of the screw-spindle up to the threefold or fourfold pitch of the thread proper. In order to be able to draw the spindle 4 quickly back, only a slight rotation of the hand-wheel 14 is necessary, whereupon the frictional coupling is disconnected and then the spindle by operating the driving parts 3 9^a 9^b 9 to rotate the nut 6 is moved back. This may also be attained by drawing the spindle directly back by a rotation of the hand-wheel 21. In both cases the spindle proceeds forth from the nut like an ordinary screw.

Concerning the production of very great advances of the spindle a number of further combinations is possible, in that instead of the intermediate wheel 9^c transmission-wheels of different diameters may be used, so that the nut receives a multiplied speed of the contrary direction relatively to the spindle, whereby a very great advance is obtained.

It is a matter of course that the whole system may be arranged in a reverse manner in such a way that the nut instead of the spindle receives the lateral displacement.

Figs. 6, 7, and 8 show that the mechanism is provided with two horizontal shafts located parallel one to the other, one of them, 4', being the spindle. In this arrangement the spindle cannot be actually displaced in its bearings, but the nut 6' may be displaced in such a direction. In order to insure in spite of the displacement of the nut 6' a constant gearing of the teeth of the cog-wheel 9 with the cog-wheel 9^a or with the intermediate wheel 9^b, respectively, belonging thereto, the cog-wheel 9^a and the intermediate wheel 9^b are arranged upon a common traverse or head-piece 22. (See Fig. 8.) The headpiece may be horizontally displaced upon the shaft 3, but is prevented from a rotary movement, as may be seen from Fig. 8. If thus the wheel 8^a is rotated in a suitable manner by transmission-wheels from the shaft of the cone-pulley, then the movement is transmitted from this pulley also to the wheel 9^a and to the nut 6'. In this arrangement the exterior

wheel 8^a is of course exchangeable and the intermediate wheel 8^b can be laterally swung out by means of the arm 20' in a manner as has already been described. In the same manner the coupling 14 15 for the obtainment of a quick back movement is located upon the exterior side, so that its actuation may be easily effected.

Having now described our invention, what we desire to secure by Letters Patent of the United States is—

1. In a feed-motion, the combination of a screw-spindle, a nut thereon, a driving-train of gears for the nut, a driving-train of gears for the spindle, one of said trains having a transmitting-gear arranged to be thrown aside, a movable support for said transmitting-gear and an exchangeable gear by which the relative motions between the spindle and nut may be varied by adjusting said transmitting-gear and exchanging said exchangeable gear, substantially as described.

2. In a feed-motion, the combination of a screw-spindle, a nut thereon, a driving-train of gears for the nut, a driving-train of gears for the spindle, one of said trains having a transmitting-gear arranged to be thrown aside, a movable support for said transmitting-gear and an exchangeable gear by which the relative motions between the spindle and nut may be varied by adjusting said transmitting-gear and exchanging said exchange-

able gear, and a second transmitting-gear whereby the movement of the nut and spindle may be reversed with respect to each other, substantially as described.

3. In combination in a feed-motion, a screw-spindle, a nut through which the same moves, a train of gearing for driving the nut, a train of gearing for driving the spindle, a clutch in the spindle-driving train whereby the spindle may be rotated independent of said train or allowed to be at rest against rotary movement, and means for rotating the spindle independent of said train, substantially as described.

4. In combination, the screw-spindle, the nut, a driving-train for rotating the nut and a driving-train for rotating the spindle comprising the loose gear 8, the clutch between the same and the spindle consisting of the friction-cone 18, the spline connection between the friction-cone and the spindle and the hand-wheel connected with the friction-cone and the screw-support for said hand-wheel, substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

FRIEDRICH WILHELM BÜHNE.
AUGUST RITZ.

Witnesses:

CARL KEIFFER,
CHRISTIAN WEILBRENNER.