No. 812,898. PATENTED FEB. 20, 1906.

J. J. THACHER.

FEED MECHANISM.

APPLICATION FILED FEB. 13, 1905.

4 SHEETS—SHEET 1.

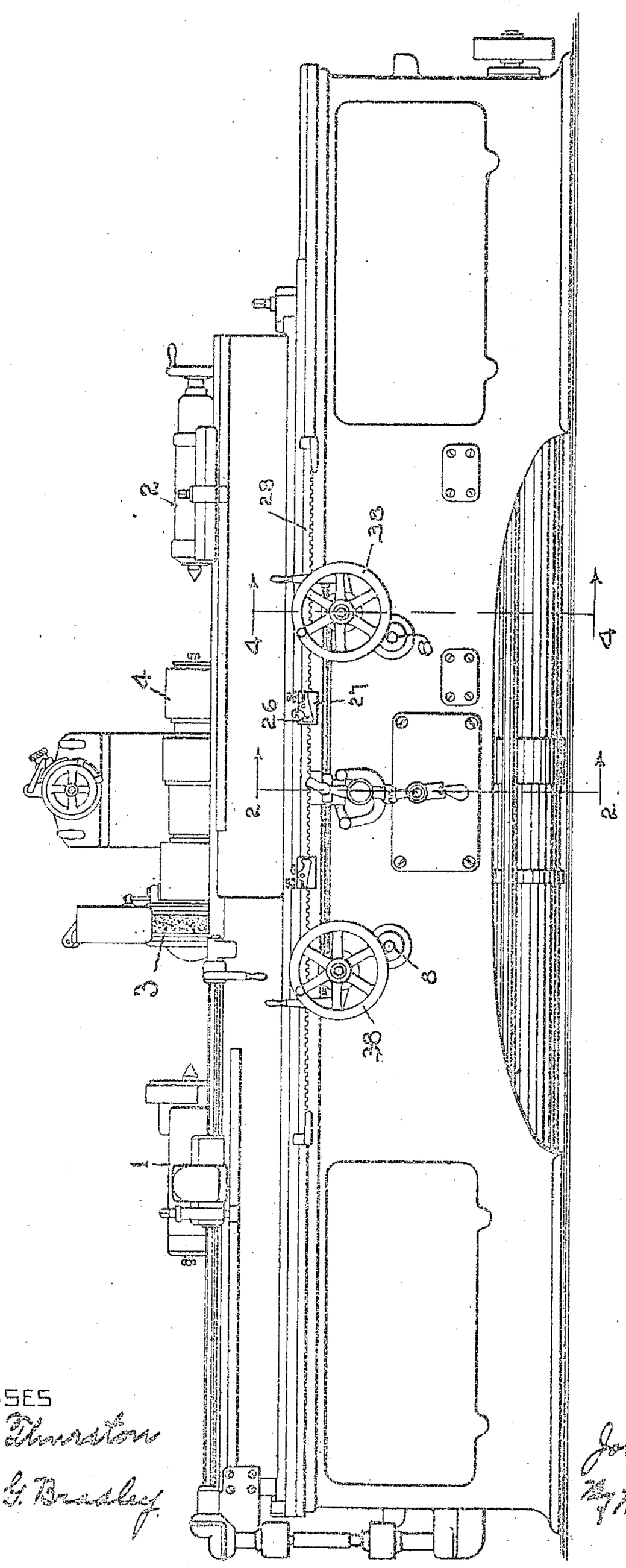

FIG. 1.

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4 SHEETS—SHEET 2.

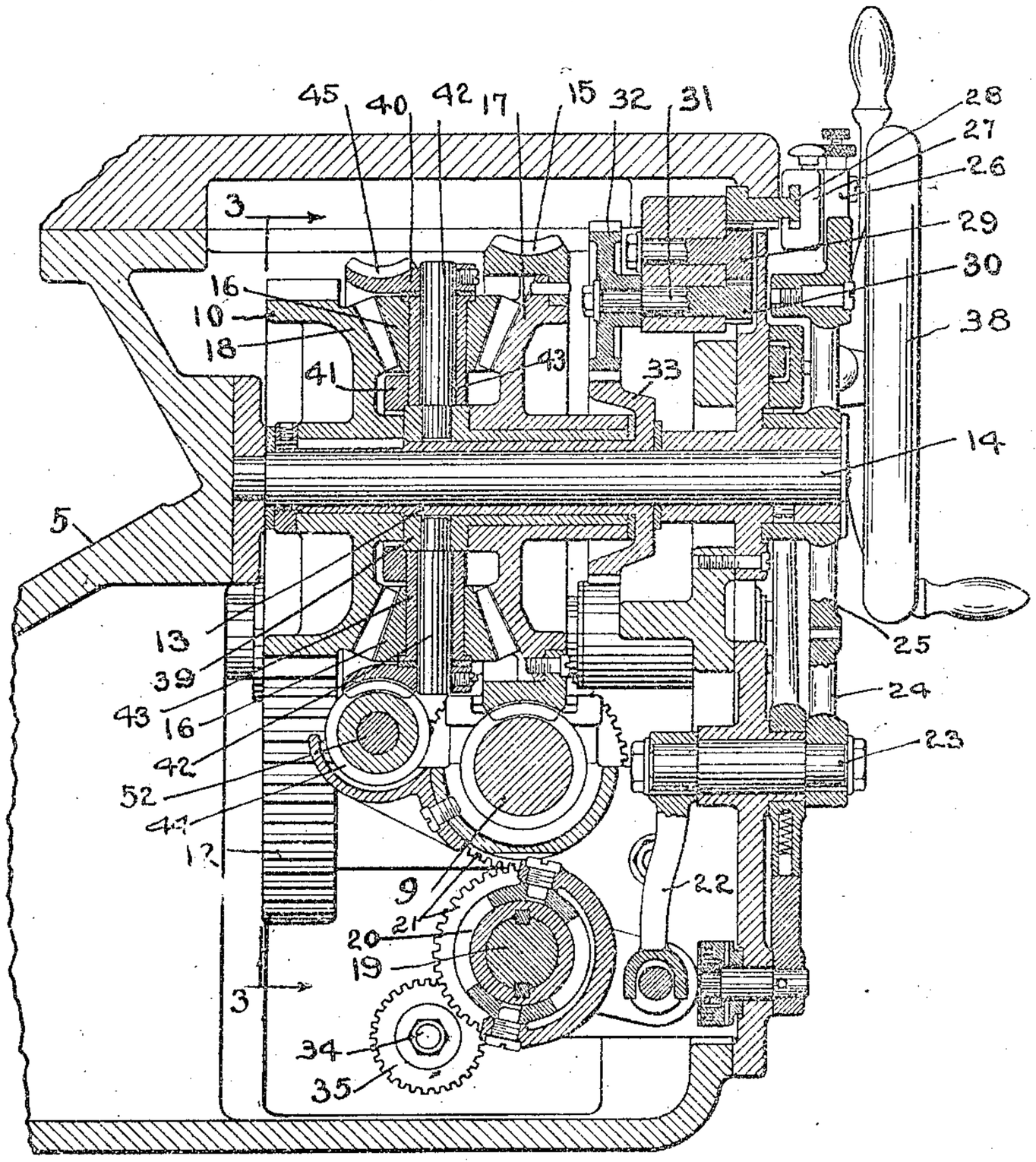

FIG. 2.

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4 SHEETS—SHEET 3.

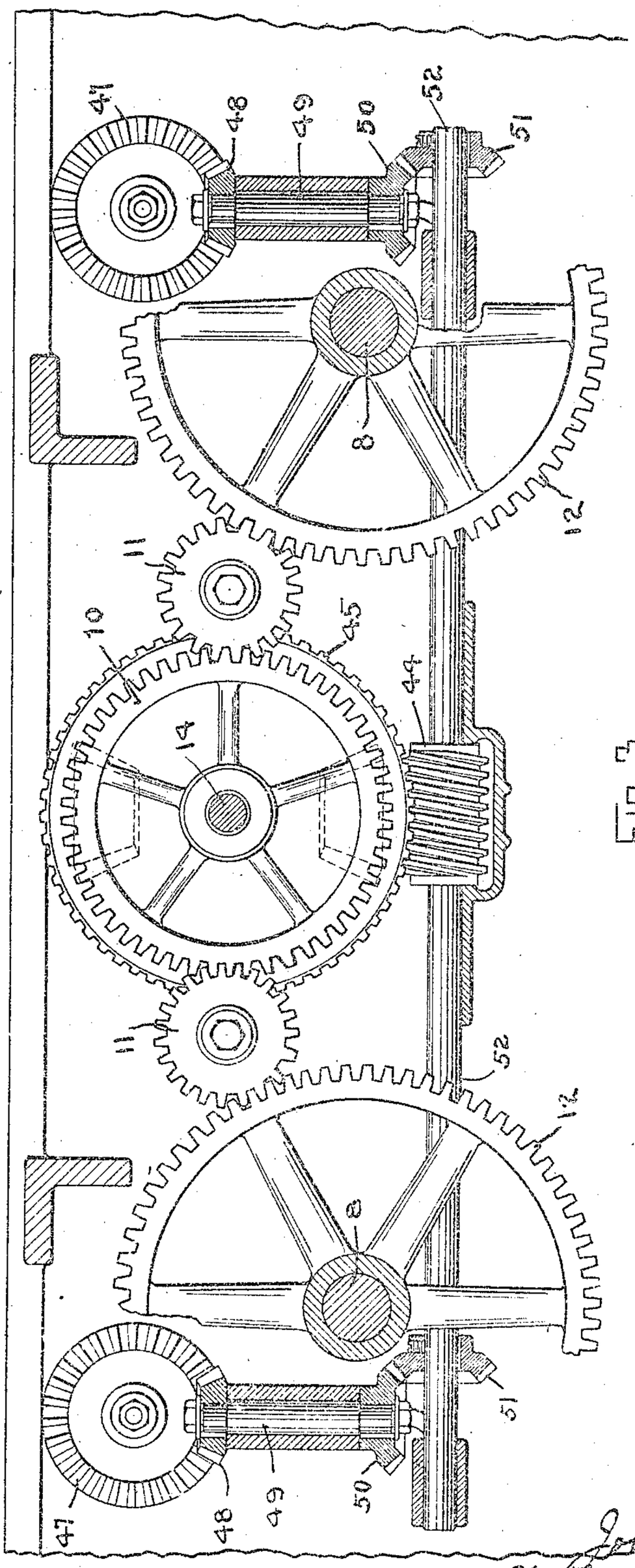

FIG. 3.

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4 SHEETS—SHEET 4.

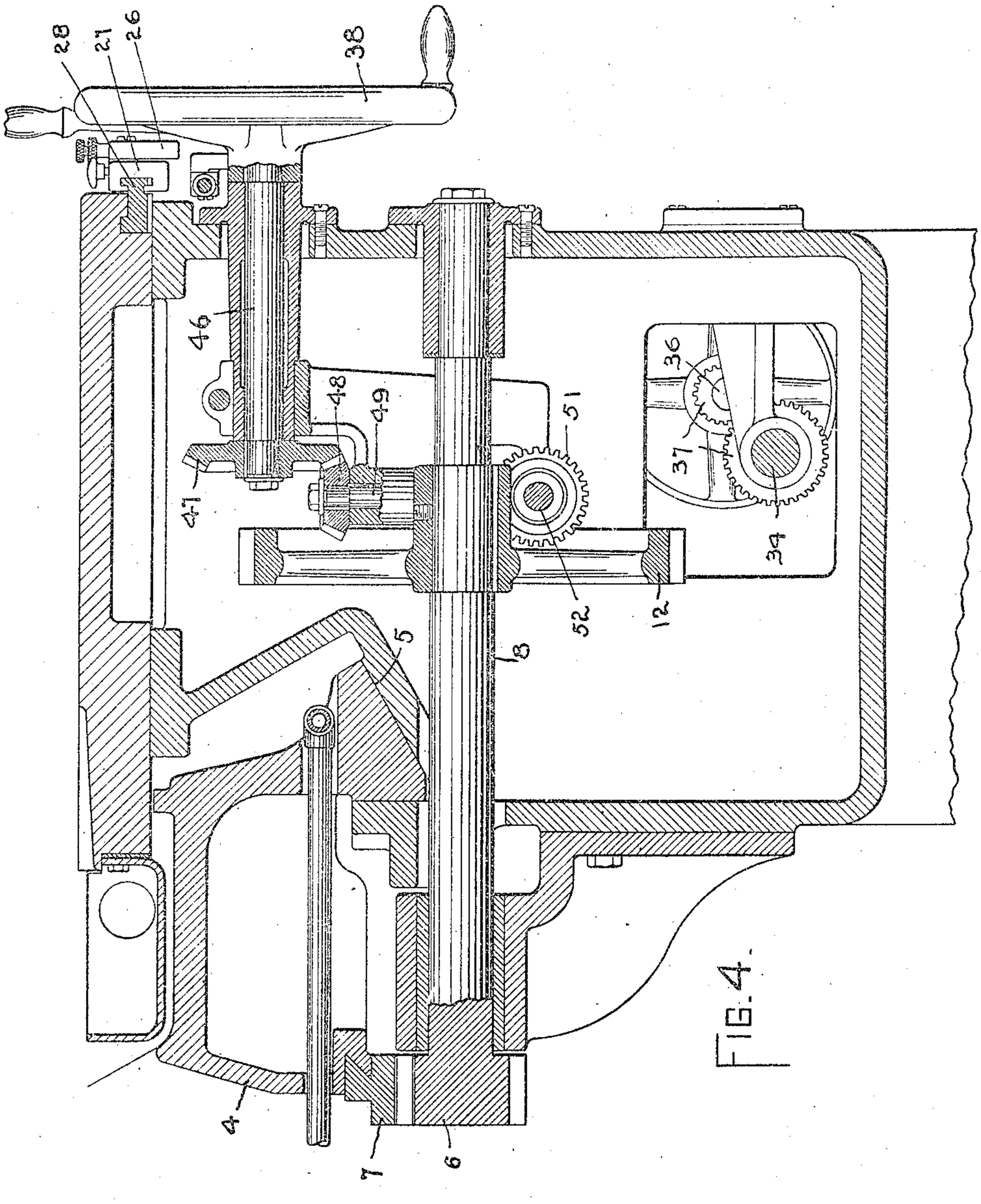

FIG. 4.

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UNITED STATES PATENT OFFICE.

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FEED MECHANISM.

No. 812,898. Specification of Letters Patent. Patented Feb. 20, 1906.

Application filed February 13, 1905. Serial No. 245,467.

To all whom it may concern:

Be it known that I, JOHN J. THACHER, of Attleboro, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Feed Mechanisms; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

The invention relates to mechanism for manually operating or controlling a carriage or other part which is connected with power-driven mechanism for automatically feeding or operating it, the object being to provide a hand-operated mechanism whereby the movement imparted to the carriage or other part by the automatic or power-driven mechanism may be accelerated or retarded by the operation of the hand mechanism.

A further object is to provide a mechanism for manually operating the carriage or other part which is so connected therewith that while it is in operative connection with the carriage the handle or other device by which it is manipulated is unaffected by the operation of the power-driven mechanism in feeding or operating the carriage, the result being that the operating-handle or other part remains stationary except when manipulated by the operator and at the same time may remain connected with the carriage ready to act thereon whenever manipulated by the operator.

The various features of the invention will be explained in connection with their application to a mechanism for feeding the grinding-wheel carriage of a grinding-machine, in which the grinding-wheel is fed along the work in making a cut. It will be understood, however, that the invention may be applied with equal advantage to the feeding mechanisms of grinding-machines in which the relative movement between the grinding-wheel and work is produced by the movement of a carriage carrying the work and in which the grinding-wheel has no movement of translation in making the cut. It will also be understood that various features of the invention may be embodied in other classes and styles of machine in which it may be desirable to manually regulate and control the effect of a power-driven mechanism upon a carriage or other operating part.

In the operation of grinding-machines the grinding-wheel usually acts unequally upon the work while taking the first cuts upon a new piece of work, for the reason that the surface of the work is unsymmetrical. The grinding-wheel will therefore take a heavy cut as it moves along certain parts of the work and may take a very light cut or no cut at all as it moves along other parts of the work. The feed of the grinding-wheel as it takes the light cuts or passes over the places where it does not act upon the work might be at a much higher rate of speed than is produced by the automatic feed of the carriage, which is limited by the heaviest cut taken by the wheel as it is fed along the work. In practicing the present invention the movement of the carriage may be accelerated at any point by the operation of the mechanism for manually effecting the movement of the carriage. It is also frequently desirable for various reasons for the operator to be able to retard or slow down the feed of the grinding-wheel carriage or work-carrying carriage, as the case may be, and this result may also be effected by the operation of the mechanism for manually controlling the movement of the carriage.

In grinding-machines, as well as in other machines, the mechanism for manually operating the carriage is usually operated by a hand wheel or wheels arranged at the front of the machine, and it is desirable that such wheels should not turn during the automatic feed of the carriage. In practicing the present invention this desirable result is accomplished, and at the same time the hand-wheel or other operating device may remain in operative connection with the carriage, so that it is unnecessary for the operator to manipulate clutches or other couplings in order to connect and disconnect the hand-wheel or other operating device with the carriage when it is desired to manually operate the carriage or to prevent movement of the operating device during the automatic feed of the carriage.

The invention consists in the various features and combinations referred to in the claims, which will be readily understood from the following detailed description of the mechanism shown in the accompanying drawings.

In the drawings, Figure 1 shows a front view of a grinding-machine in which the in-

vention is embodied in the form in which I prefer to use it. Fig. 2 is a cross-sectional view on line 2 2 Fig. 1, showing so much of the mechanism for feeding the grinding-wheel carriage as is essential to the understanding of the present invention. Fig. 3 is a view looking toward the right on line 3 3, Fig. 2; and Fig. 4 is a cross-sectional view on line 4 4, Fig. 1.

The grinding-machine shown in the drawings is provided with the usual work-supporting centers carried by the head-stock 1 and the tail-stock 2, the work being revolved by suitable driving mechanism, as is common in this class of machines. The grinding-wheel 3 is mounted in a carriage 4, guided in suitable ways extending longitudinally of the machine, the front way being indicated at 5 in Fig. 4. The grinding-wheel carriage is moved on its ways through two pinions 6, arranged to engage a rack 7, secured to the carriage. There are two of these pinions 6, and the rack 7 is continually in engagement with either one or both of the pinions, two pinions being employed in order that a shorter rack may be employed upon the carriage than could be employed with a single pinion. These pinions are formed on shafts 8, which are connected with a gear 10 by means of intermediate gears 11, which engage gear 10 and also gears 12, secured to the shafts 8. The gear 10 is keyed to a sleeve 13, mounted to turn upon a fixed stud 14, and both the mechanism for operating the carriage automatically and for operating it manually are connected with the carriage through this gear. The carriage is fed automatically in either direction by the rotation of a worm 9, engaging a worm-wheel 15, which is connected with the gear 10 through intermediate bevel-gears 16, engaging bevel-gears 17 and 18, secured to the worm-wheel 15 and gear 10, respectively.

The shaft on which worm 9 is formed is driven from a shaft 19 through a clutch (indicated at 20) which is keyed to the shaft 19 and is arranged between two sets of gearing connected to the worm-shaft in such manner that the worm-shaft is driven in one direction when the clutch is in engagement with one set of gearing and in the opposite direction when the clutch is in engagement with the other set of gearing. One set of gearing is indicated as two intermeshing gears 21, one of which is secured to the worm-shaft and the other loosely mounted on the shaft 19 and arranged to be connected thereto by the clutch 20. The other set of gearing is not shown, but consists of gears similar to gears 21, connected by an intermediate gear and arranged on the opposite side of the clutch 20. This reversing and driving mechanism forms no part of the invention, and the details of the mechanism have not been illustrated and need not be described.

As is usual in this class of machines, mechanism is provided for automatically shifting the reversing and driving clutch, so that the carriage is automatically reciprocated back and forth to feed the grinding-wheel along the work, the clutch being shifted automatically as the carriage reaches each end of its stroke. The mechanism for automatically shifting the clutch in the machine shown comprises an arm 22, the lower end of which is connected with the clutch and the upper end of which is secured to a short shaft 23, which carries a second arm 24, provided with gear-teeth engaging teeth formed on the lower end of a lever 25, the upper end of which is arranged in the path of the reversing-dogs 26. The reversing-dogs 26 are mounted upon blocks 27, adjustably secured to a rack 28, which is connected with the carriage-operating mechanism, so that the rack moves in unison with the carriage. The connection between the rack 28 and the carriage-operating mechanism consists of a pinion 29, engaging the rack and also engaging a pinion 30, formed on a shaft 31, to the inner end of which is secured a gear 32, which meshes with a gear 33, formed on the end of the sleeve 13 to which the gear 10 is keyed. The operation of reversing mechanisms of this character is well understood and need not be specifically described herein. The shaft 19, through which the carriage is automatically operated, is driven continuously from a shaft 34, connected with the shaft 19 by two intermeshing gears, one of which is indicated at 35 in Fig. 2. The shaft 34 is driven from the pulley-shaft 36 through gears 37, Fig. 4.

Through the mechanism thus far described the carriage may be automatically moved along its ways to feed the grinding-wheel longitudinally of the work as the work is rotated upon the supporting-centers. During the normal operation of this power feeding mechanism the bevel-pinions 16 revolve about fixed axes and act merely as intermediate pinions between the bevel-gear 17 on the worm-wheel 15 and the bevel-gear 18 on the gear 10. The bevel-pinions, however, are so mounted that they may be caused to travel about the axis of the gears 17 and 18 by the manual operation of either of two hand-wheels 38, arranged at the front of the machine. When the pinions 16 remain in fixed position, the gear 10 will be driven at the same speed as the worm-wheel 15 but in the opposite direction. If the pinions are moved about the axis of the gears 17 and 18, however, the speed of the gear 10, and therefore the speed of the carriage, will be either accelerated or retarded, according as the movement of the pinions is in the direction of rotation of the gear 10 or in the opposite direction. By manually operating these pinions, therefore, during the operation of the power-feed the rate of movement of the car-

riage may be either accelerated or retarded at the will of the operator and to an extent depending upon the rate at which he operates the pinions. In order that the pinions may be thus manually operated to vary the movement of the carriage, they are mounted upon a frame consisting of a sleeve 39, mounted to turn about the sleeve 13, and an annular ring 40, connected with the sleeve by means of a hub 41 and the studs 42, on which the pinions 16 are mounted. The hub 41 and ring 40 are connected by a web (not shown) which is cut away to accommodate the pinions 16. The pinions are secured to sleeves 43, which are loosely mounted on the studs 42. The frame carrying the pinions is normally held in fixed position by means of a worm 44, engaging a worm-wheel 45, formed on the ring 40, and this worm and worm-wheel also form the means for turning the frame in order to modify the effect of the power-feed on the carriage or to effect the manual operation of the carriage when the power-feed is thrown out.

The mechanism for connecting the worm 44 with the hand-wheels 38 is shown in Figs. 3 and 4. As here shown, each wheel 38 is connected with a shaft 46, to the inner end of which is secured a bevel-gear 47. This gear engages a pinion 48, secured to a vertical shaft 49, which carries at its lower end a bevel-pinion 50, meshing with a similar pinion 51, secured to the shaft 52, on which the worm 44 is secured.

During the normal running of the machine and while the power-feed is operating upon the carriage the hand-wheels 38 remain stationary, although they are in operative connection with the carriage. The inconvenience and the complication in construction incident to the employment of clutches or other devices which require manipulation in order to connect and disconnect the mechanism for manually operating the carriage are eliminated. By operating the hand-wheel the operator is also enabled to accelerate the movement of the carriage during the operation of the power-feed or to retard the movement of the carriage at will and to any desired extent. He can therefore move the carriage quickly forward along any portion of the work where the wheel is taking a light cut or is not acting upon the work at all, or he can slow down the carriage as the wheel grinds up to a shoulder or when he desires to do so for any reason. When the power-feed is thrown out, the operation of the hand-wheel will move the carriage along its ways, the gear 17 in this case being held from movement while the pinions 16 travel about the gear, and thus impart movement to the gear 10 and the connected carriage.

While the mechanism which has been described is a simple and efficient mechanism for effecting the desired results, it will be understood that the invention is not limited to such mechanism and that the construction and arrangement of the devices for connecting the hand-operated device with the carriage and for manually controlling the speed of the carriage while being operated by the power-feed may be varied and modified without departing from the invention.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of a power feed mechanism, a part operated thereby, and mechanism for manually accelerating the movement of the part during the operation of the power-feed.

2. The combination of a power feed mechanism, a part operated thereby, and mechanism for manually accelerating or retarding the movement of the part during the operation of the power-feed.

3. The combination of a power-feed, a carriage operated thereby, mechanism for manually accelerating the movement of the carriage during the operation of the power-feed.

4. The combination of a work-support, a grinding-wheel support, power mechanism for feeding one of said supports, and mechanism for manually varying the feed during the operation of the power feeding mechanism.

5. The combination of a carriage, a power-driven member, gearing through which motion is transmitted to said carriage, and mechanism for manually operating said gearing while in operation to vary the movement of said carriage by the power-driven member.

6. The combination of a carriage, a power-driven member, gearing through which motion is transmitted to said carriage, and mechanism for manually moving said gearing about the axis of the driving member to vary the movement of the carriage by the driving member.

7. The combination of a carriage, of a driven member connected with the carriage, a driving member, intermediate gearing, power mechanism for operating the driving member, and mechanism for manually turning the intermediate gearing about the axis of the driving and driven members.

8. The combination with a carriage of a power-driven feed mechanism therefor, and a manual feed therefor unaffected by the power-feed when operatively connected with the carriage.

9. The combination with a carriage of a power-driven feed mechanism therefor, intermediate gearing in said mechanism, means for holding said intermediate gearing in position during the operation of the feed mechanism, and mechanism for manually shifting said gearing to effect the manual feed of the carriage.

10. The combination with a driven gear and a part operated therefrom, of a driving-gear, power mechanism for operating said

driving-gear, intermediate gearing between said driving and driven gears, a frame carrying said intermediate gearing, and mechanism for manually operating said frame.

11. The combination with a driven gear and a part operated therefrom, of a driving-gear, power mechanism for operating said driving-gear, intermediate gearing between said driving and driven gears, a frame carrying said intermediate gearing, means for locking said frame in position and means for manually operating said frame.

12. The combination with a driven gear and a part operated therefrom, of a driving-gear, a worm-wheel connected with said driving-gear, a worm engaging said worm-wheel, a power mechanism for operating said worm, intermediate gearing between the driving and driven gears, a frame carrying said intermediate gearing, a worm-wheel connected with the frame, a worm engaging the worm-wheel, and mechanism for manually operating said worm.

13. The combination of a work-support, a tool-support, a driven gear connected to feed one of said supports, a driving-gear, power mechanism for operating said driving-gear, intermediate gearing between the driving and driven gears, means for holding said intermediate gearing in position, and means for manually shifting said intermediate gearing to impart movement to the connected support.

14. The combination of a work-support, a tool-support, a driven gear connected to feed one of said supports, a driving-gear, power mechanism for operating said driving-gear, mechanism for reversing said power mechanism, intermediate gearing between said driving and driven gears, and mechanism for manually shifting said gearing to impart movement to the connected support.

15. The combination of a work-support, a tool-support, a power-driven feed mechanism connected with one of said supports, a hand-operated device, and gearing between said device and the movable support for transmitting motion from the device to said support and preventing movement of said device by the power-driven mechanism.

16. The combination of a work-support, a tool-support, a reversing mechanism, gearing intermediate said reversing mechanism and one of said supports for feeding it in either direction, and manually-operated mechanism for effecting a relative movement between parts of said gearing to transmit motion to the connected support.

17. The combination of a work-support, a grinding-wheel support, a reversing-mechanism gearing intermediate said mechanism and one of said supports for feeding it in either direction, a hand device, and connections between said device and said gearing for shifting a part of said gearing to transmit motion from said device to the connected support.

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Witnesses:
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