No. 792,024. PATENTED JUNE 13, 1905.

W. J. HAGMAN.

METAL PLANER.

APPLICATION FILED DEC. 14, 1904.

3 SHEETS—SHEET 1.

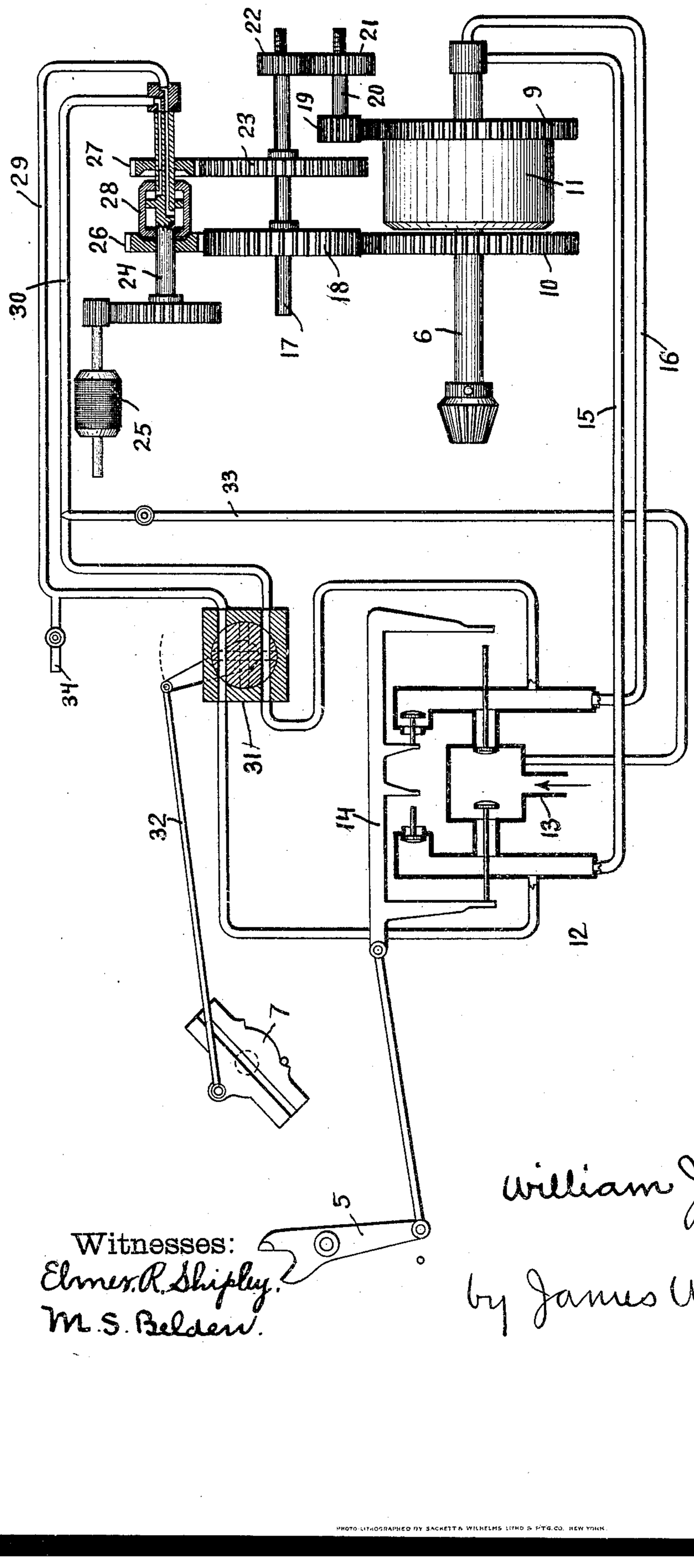

FIG. 1.

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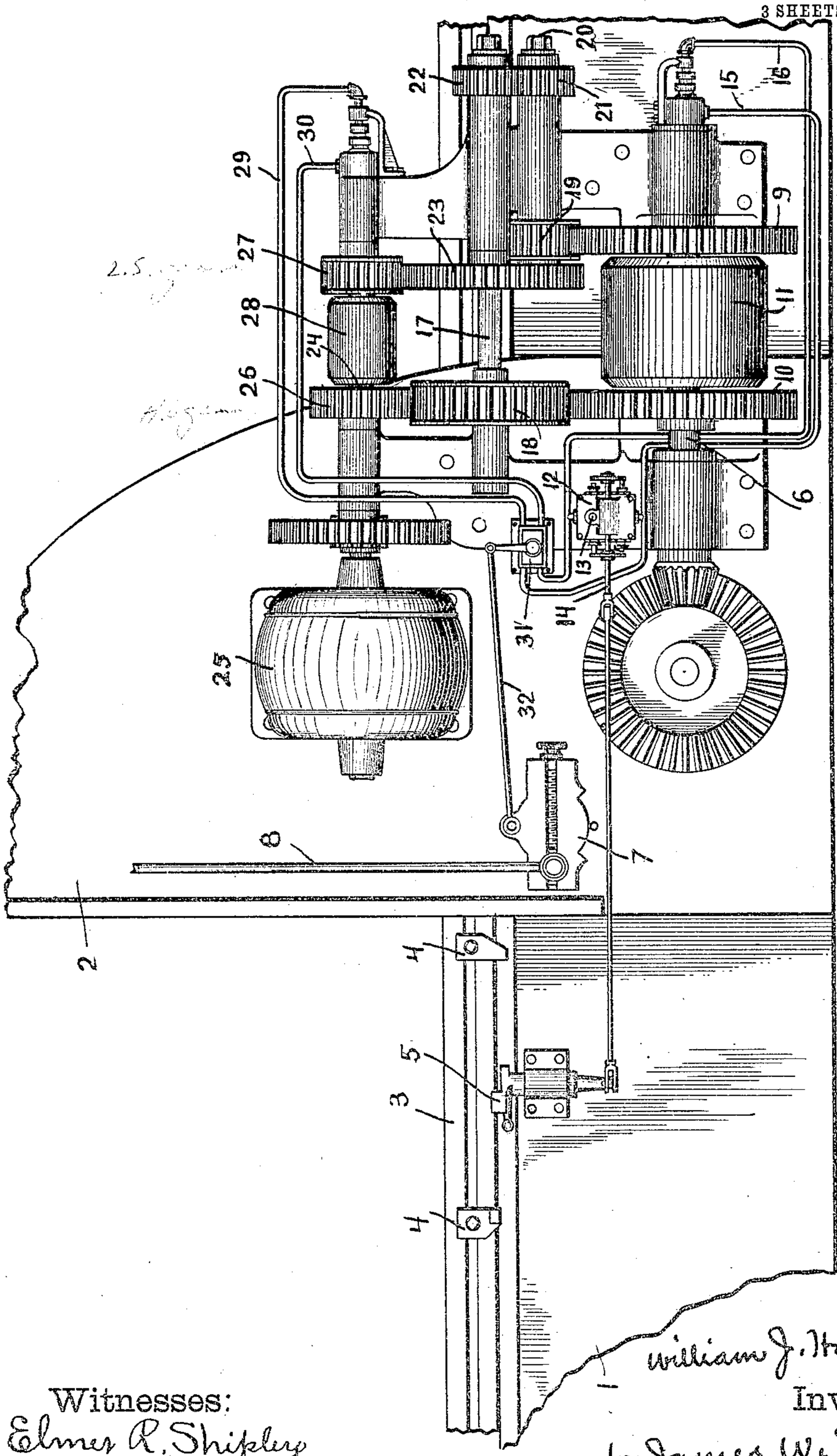

FIG. 2.

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3 SHEETS—SHEET 3.

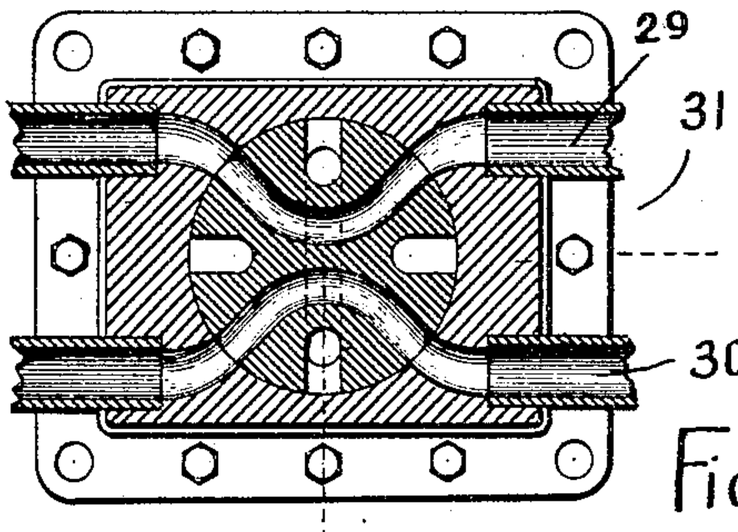

Fig. 5.

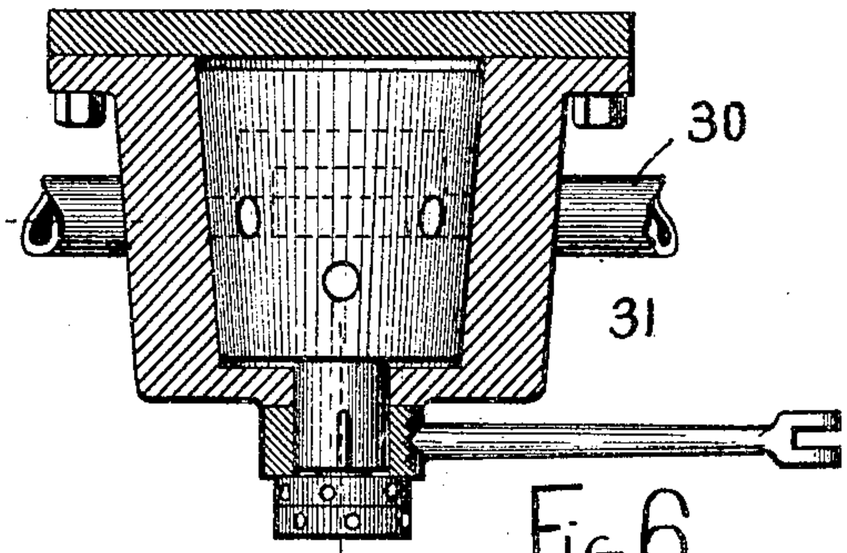

Fig. 6.

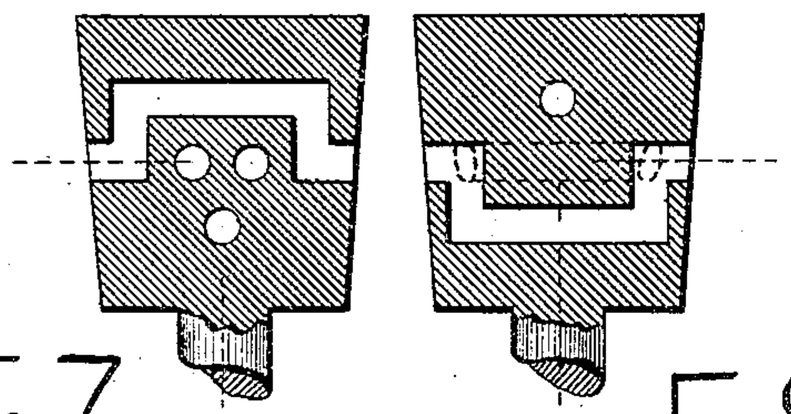

Fig. 7.

Fig. 8.

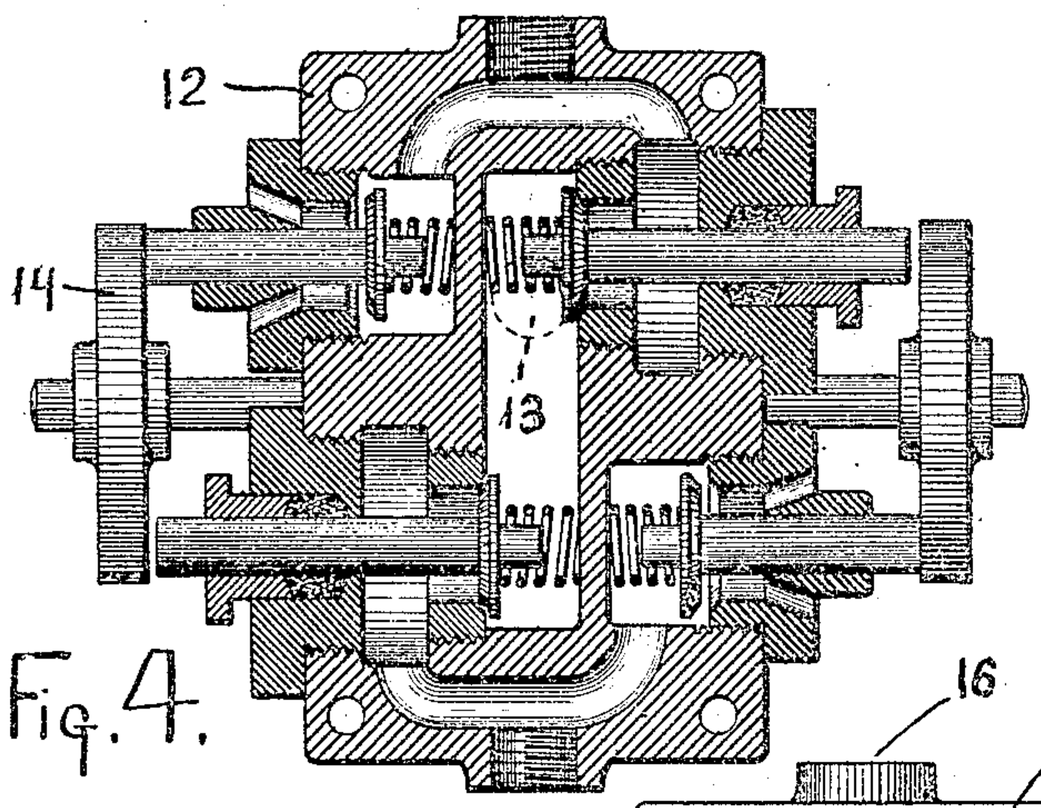

Fig. 4.

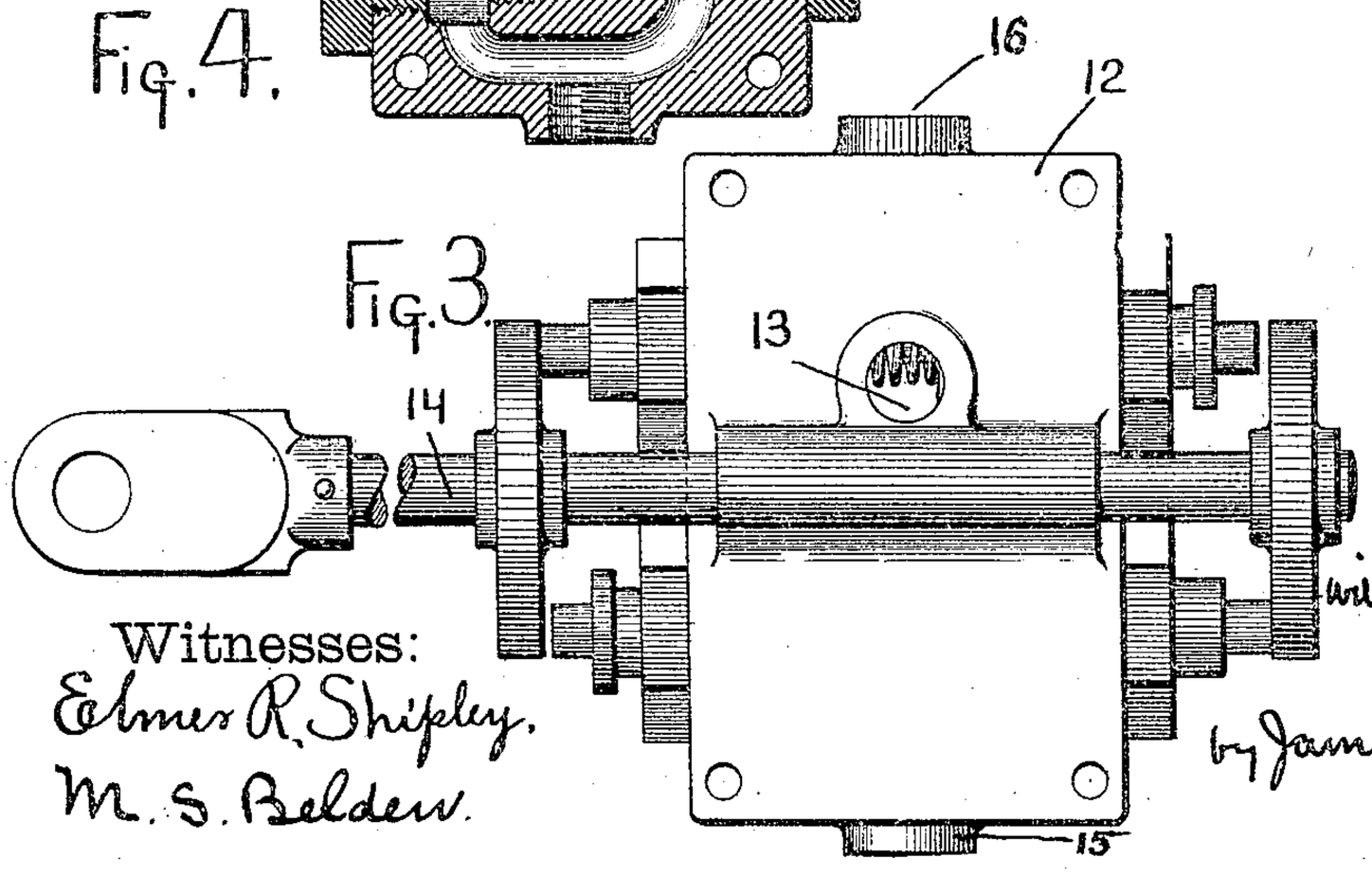

Fig. 3.

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No. 792,024. Patented June 13, 1905.

UNITED STATES PATENT OFFICE.

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METAL-PLANER.

SPECIFICATION forming part of Letters Patent No. 792,024, dated June 13, 1905.

Application filed December 14, 1904. Serial No. 236,868.

To all whom it may concern:

Be it known that I, WILLIAM J. HAGMAN, a citizen of the United States, residing at Philadelphia, Philadelphia county, Pennsylvania, have invented certain new and useful Improvements in Metal-Planers, of which the following is a specification.

This invention pertaining to improvements in metal-planers will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a diagrammatic view of mechanism exemplifying the peculiarities of my invention; Fig. 2, a side elevation of portions of a planer embodying an exemplification of my invention; Fig. 3, a face view of the reversing-valve; Fig. 4, a vertical section of the same, the tappet and valves being shown in an intermediate position as corresponding with a condition during the reversal of the planer; Fig. 5, a vertical section of the speed-valve; Fig. 6, a horizontal section of the same; and Figs. 7 and 8, diametrical sections, in planes at right angles to each other, of the plug of the speed-valve.

In metal-planing machines, especially the larger sizes, when employing the very high backing speeds obtaining in the more recent practice, it becomes highly desirable to effect the reversal of the table while it is moving at comparatively low speed and to later accelerate the table motion for the long run, the speed to be lessened again before the next reversal. The reversal of motion is almost universally accomplished by means of a tumbler thrown by the table-dogs. The movement of this tumbler is necessarily a condition precedent to the reversal of the table, and the reverse movement of the table is consequently a condition subsequent to the complete movement of the reversing-tumbler. The tumbler is therefore not well adapted to serve in imparting motion to controlling devices to go into action subsequent to reverse.

In carrying out my invention I prefer to employ pneumatically-thrown clutches in effecting changes in direction and speed and I operate the valve of the reversing-clutches through the medium of the tumbler. The automatic speed-varying clutches should be actuated through some part acting subsequent to reversal of the planer, and as the duration of table movement is a variable quantity and as the valve for controlling the speed-varying clutches should have a movement of substantially constant extent I prefer to impart motion to the speed-controlling valve through the medium of a converting device, such as ordinarily employed as the "feed-box" in planers, and in practice I impose this valve-moving office on the usual feed-box of the planer. It should be understood that the feed-box of a planer starts into motion with the driving mechanism after reversal and continues in motion long enough to effect the feed and then becomes released from the driving mechanism and arrested, so that the motion of the driving mechanism may continue, a reverse motion being given to the feed-box just after the next reversal of the driving mechanism, whereby intermittent feeding motion of definite extent is derived from the planer-driving mechanism, effecting movements to variable extent.

In the drawings, referring particularly to Fig. 2 for the present, 1 indicates the planer-bed; 2, the housings; 3, the table; 4, the dogs; 5, the tumbler; 6, one of the main shafts in the driving mechanism, which shaft I will herein term the "planer-shaft;" 7, the feed-box, and 8 a connection for transmitting motion from the feed-box to the feed devices on the rail. All of these parts may be precisely as usual and subject to all of the usual appropriate modifications in those parts. The dogs are to throw the tumbler and bring about the usual reversals of motion of the planer-shaft. The backing motion of the table is to be faster than its cutting motion. The feed-box is to make a partial turn of definite degree just after each reversal of the planer motion, its directions of motion alternating, all as usual in metal-planers.

Turning now to Fig. 1 and having in mind the ordinary features of planer construction

just referred to, 9 indicates a gear loose on planer-shaft 6, designed when clutched to the shaft to drive the planer in the cutting direction; 10, a similar gear loose on the planer-shaft for use in driving the planer in backing direction; 11, a clutch, herein termed the "reversing-clutch," mounted on planer-shaft 6 between the gears 9 and 10 and adapted under the influence of properly-controlled pneumatic pressure to lock either gear alternatively to planer-shaft 6; 12, a reversing-valve, considered as a whole to serve in controlling clutch 11; 13, the inlet to the reversing-valve, the same to be connected with any suitable source of air-supply under pressure; 14, a tappet linked to tumbler 5 to serve in operating the reverse-valve, so that of two pipes connected with the valve one will be put to pressure and the other to exhaust, and vice versa; 15, a pipe leading from the reverse-valve to clutch 11 and put selectively to pressure or exhaust by the action of the reverse-valve, pressure in this pipe serving to throw clutch 11 into engagement with gear 9, which gear pertains to the cutting motion of the planer; 16, a pipe similarly connecting the clutch with the reverse-valve and serving when under pressure to throw clutch 11 to gear 10, which pertains to the backing motion of the planer; 17, the counter-shaft, parallel with the planer-shaft 6; 18, a gear fast on the counter-shaft and engaging backing-gear 10 on the planer-shaft; 19, a pinion engaging the cutting-gear 9 of the planer-shaft; 20, the shaft of pinion 19; 21, a change-gear removably secured on shaft 20; 22, a change-gear engaging gear 21 and removably secured on counter-shaft 17, change-gears 21 and 22 being transposable or susceptible of substitution after the usual manner of change-gearing in machinery; 23, a gear fast on the counter-shaft; 24, a second counter-shaft, which I will term the "speed-shaft;" 25, a motor, illustrated as an electric motor, geared to speed-shaft 24 and typifying means for imparting to shaft 24 continuous motion in one direction at constant rate; 26, a gear loose on the speed-shaft and engaging gear 18, and herein termed the "high-speed" gear; 27, a gear loose on the speed-shaft and engaging gear 23, and herein termed the "low-speed" gear; 28, a pneumatically-operated clutch on the speed-shaft to serve in locking gears 26 and 27 alternatively to the shaft, and herein termed the "speed-clutch;" 29, a pipe leading from the speed-clutch to reverse-valve 12 and serving when under pressure to clutch high-speed gear 26 to the speed-shaft; 30, a similar pipe between the speed-clutch and reverse-valve and serving when under pressure to clutch the low-speed gear 27 to the speed-shaft; 31, a valve, herein termed the "speed-valve," interposed in pipes 29 and 30 and serving when the valve is in one position to secure direct courses of the two pipes and when in another position to transpose the courses of the two pipes; 32, a connection between the speed-valve and feed-box 7 of the planer to serve in moving the speed-valve to its one position just subsequent to the beginning of the cutting stroke of the planer and to its other position just subsequent to the beginning of the backing stroke; 33, a pipe provided with a stop-cock and serving when the cock is open to connect pipe 30 with the supply of compressed air, and 34 an outlet provided with a stop-cock leading from pipe 29.

Reversing-clutch 11 and speed-clutch 28 need no detailed description, it being sufficient to say that the construction selected for exemplification is known in the art and comprehends a piston fast on the shaft and a cylinder sliding but not turning on the shaft and having clutch-faces to engage the gears, the air-pipes leading through the shaft, so that air-pressure may be put to either end of the cylinder while the other end of the cylinder is open to exhaust. In Fig. 1 the speed-clutch 28 is conventionally illustrated in vertical diametrical section, and it is to be understood that the reversing-clutch 11 is or may be of precisely the same construction. For similar reasons the reverse-valve 12 requires no detailed description. The details of construction can be readily comprehended from an inspection of Figs. 3 and 4, it being sufficient to say that tappet 14 in one extreme position (the one illustrated in Fig. 1) puts pipe 15 to pressure and pipe 16 to exhaust, while in the other extreme position it puts pipe 16 to pressure and pipe 15 to exhaust, these two positions of the tappet and conditions of the two pipes corresponding with the two positions of tumbler 5. In Fig. 1 the tumbler is in the position in which it was left at the completion of the backing stroke, the result being that reversing-clutch 11 has been thrown to cutting-gear 9 and the planer may be assumed as making its cutting stroke.

Fig. 4 illustrates the valves as in the intermediate position assumed during the act of reversal of the general mechanism, both exhaust-valves being open and both of the pressure-valves being closed as a preliminary to the opening of one of the pressure-valves and the further opening of one of the exhaust-valves.

The motor drives the speed-shaft, and, considering speed-clutch 28 for the present as being permanently locked to high-speed gear 26, the motion is transmitted, through gear 26, gear 18, counter-shaft 17, change-gears 22 and 21, shaft 20, pinion 19, gear 9, and reversing-clutch 11, to the planer-shaft. The change-gears 21 and 22 are of differing sizes and may be transposed or others may be substituted for them, so that provision is made for a given rate of cutting speed or for selective rates of cutting speed. This feature is not essential; but it is highly desirable and be-

comes of special utility in connection with my present invention.

Still assuming speed-clutch 28 in permanent engagement with high-speed gear 26, when the planer-table throws tumbler 5 and shifts tappet 14 to the left the condition of pipes 15 and 16 is reversed and reversing-clutch 11 is thrown to backing-gear 10, under which conditions the planer makes its backing stroke, but manifestly at a speed in excess of the cutting stroke, owing to the fact that the motion from shaft 17 to gear 10 is transmitted by direct gearing, while the motion from that shaft to gear 9 is transmitted through reducing-pinion 19, and in some cases the change-gearing may form reducing-gearing. As thus far described we would have simply a planer with a pneumatically-operated reverse-gear with cutting and backing speeds differing from each other, but individually constant. It is obvious that under these assumed conditions the reversals of the planer motion will take place at whatever the two constant speeds may be—that is to say, one reversal takes place at full cutting speed and the other reversal takes place at the full and much greater backing speed.

Under the conditions assumed gear 27 has been without office.

If speed-clutch 28, which has been assumed as permanently engaging high-speed gear 26, were, on the other hand, permanently engaged to low-speed gear 27 instead of high-speed gear 26, then it is clear that the two motions of the planer would be at slower rate, the cutting and backing motions being still individually constant, while differing from each other, and the reversals still taking place at these two full constant speeds; but I provide for the employment of the two speeds available from the speed-shaft, the lower speed being utilized at reversal and the higher speed for the long run. In Fig. 1 the parts assume the planer as making its cutting stroke at the faster speed corresponding with high-speed gear 26. At this high rate the planer will continue its cutting stroke till near the end of the stroke the table-dogs throw tumbler 5, causing the reverse-valve to throw reverse-clutch 11 to backing-gear 10 and at the same time throw speed-clutch 28 to low-speed gear 27. Under these conditions the planer is reversed at the lower speed and starts on its backing trip. The planer, thus moving in backing direction, proceeds to rock feed-box 7 through its limited motion, the effect being to shift speed-valve 31 and effect such transposition of the courses through pipes 29 and 30 as to throw speed-clutch 28 to high-speed gear 26, whereupon the backing speed, initiated by low-speed gear 27, becomes accelerated, under which conditions the backing stroke is continued until near its end, whereupon the same regimen is repeated, the reversal being effected and the new stroke initiated at the lower speed and then accelerated for the long run. Such will be the operation of the system under ordinary conditions. By disconnecting link 32, setting speed-valve 31 to permanently close the two pipes, and by opening pipes 33 and 34 the speed-clutch will be permanently held to slow-speed gear 27, thus abandoning for the time being the high-speed gear, and, as thus far considered, having the lower speed for cutting and backing, the two speeds of course differing from each other. Assuming that this abandonment of the higher speed was for the purpose of reducing the return speed, as may be desirable for extra-heavy work, a corresponding reduction in the cutting speed need not necessarily be effected, for the change-gears may be employed in adjusting the cutting speed to the normal or as desired; but the preferable system for reducing the backing speed while leaving the cutting speed undisturbed is to simply disconnect link 32 and leave speed-valve 31 in the position indicated in Fig. 1, under which condition reversing-valve 12 will reverse the reversing-clutch and the speed-clutch, thus causing the cutting to be done under the influence of the high-speed gear and the backing to be done under the influence of the low-speed gear. It will be understood, of course, that the best conditions are those permitting the high-speed gear and the low-speed gear to both be used for both the cutting and backing stroke.

It is of course to be understood that the specific devices illustrated constitute merely an exemplifying embodiment of my invention and that many modifications may be effected consistent with the invention.

I claim as my invention—

1. In a planer, the combination, substantially as set forth, with the driving and reversing mechanism of the planer and mechanism for actuating the reversing mechanism from the planer motion prior to reversal, of a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism connecting the speed-shaft with the driving mechanism at selective speeds, a clutch for connecting said trains alternatively with the speed-shaft, and operative mechanism connecting said clutch with a part of the planer operated by said driving mechanism, whereby said clutch is operated subsequent to the reversal of the planer motion.

2. In a planer, the combination, substantially as set forth, with the driving and reversing mechanism of the planer and mechanism for actuating the reversing mechanism from the planer motion prior to reversal, of a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism connecting the speed-shaft with the driving mechanism at selective speeds, a clutch for connecting said trains alternatively with the

speed-shaft, operative mechanism connecting said clutch with a part of the planer operated by said driving mechanism, whereby said clutch is operated subsequent to the reversal of the planer motion, and change-gearing in the portion of the driving mechanism pertaining to the cutting motion, whereby selective speeds may be given to both the cutting and backing motion and the speed of cutting motion adjusted relative to said selective speeds.

3. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, driving mechanism to operate said shaft in the two directions, a reversing-clutch to determine the direction of motion of the shaft, connecting devices for operating said reversing-clutch from the tumbler of the planer, a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism for transmitting selective speeds from the speed-shaft to the driving mechanism, a speed-clutch for connecting the two trains alternatively with the speed-shaft, a constant-throw device operated by the driving mechanism subsequent to reversal of planer motion, and connections between said constant-throw device and speed-clutch, whereby the reversing-clutch is thrown before and the speed-clutch thrown after reversal of planer motion.

4. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, driving mechanism to operate said shaft in the two directions, a reversing-clutch to determine the direction of motion of the shaft, connecting devices for operating said reversing-clutch from the tumbler of the planer, a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism for transmitting selective speeds from the speed-shaft to the driving mechanism, a speed-clutch for connecting the two trains alternatively with the speed-shaft, and connections between the feed-box of the planer and the speed-clutch, whereby the reversing-clutch is thrown prior to and the speed-clutch thrown subsequent to the reversal of planer motion.

5. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, driving mechanism to operate said shaft in the two directions, a reversing-clutch to determine the direction of motion of the shaft, change-gearing in that portion of the driving mechanism transmitting the cutting motion to the planer-shaft, connecting devices for operating said reversing-clutch from the tumbler of the planer, a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism for transmitting selective speeds from the speed-shaft to the driving mechanism, a speed-clutch for connecting the two trains alternatively with the speed-shaft, a constant-throw device operated by the driving mechanism subsequent to reversal of planer motion, and connections between said constant-throw device and speed-clutch, whereby the reversing-clutch is thrown before and the speed-clutch thrown after reversal of planer motion.

6. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, driving mechanism to operate said shaft in the two directions, a pneumatic reversing-clutch to determine the direction of motion of the shaft, a reversing-valve connected with the reversing-clutch, connections between the reversing-valve and the tumbler of the planer, a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism for transmitting selective speeds from the speed-shaft to the driving mechanism, a pneumatic speed-clutch for connecting the two trains alternatively with the speed-shaft, a constant-throw device operated by the driving mechanism subsequent to reversal of planer motion, a speed-valve connected with the speed-clutch, and connections between said constant-throw device and speed-valve, whereby the reversing-clutch is thrown before and the speed-clutch thrown after reversal of planer motion.

7. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, driving mechanism to operate said shaft in the two directions, a pneumatic reversing-clutch to determine the direction of motion of the shaft, change-gearing in that portion of the driving mechanism transmitting the cutting motion to the planer-shaft, a reversing-valve connected with the reversing-clutch, connections between the reversing-valve and the tumbler of the planer, a speed-shaft for giving motion to the driving mechanism, means for turning the speed-shaft, two trains of transmitting mechanism for transmitting selective speeds from the speed-shaft to the driving mechanism, a pneumatic speed-clutch for connecting the two trains alternatively with the speed-shaft, a constant-throw device operated by the driving mechanism subsequent to reversal of planer motion, a speed-valve connected with the speed-clutch, and connections between the speed-valve and said constant-throw device, whereby the reversing-clutch is thrown before and the speed-clutch thrown after reversal of planer motion.

8. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, a counter-shaft geared thereto to trans-

mit the cutting motion in one direction and the faster backing motion in the other direction, a speed-shaft, means for turning the speed-shaft, two gears connecting the speed-shaft with the counter-shaft to drive the latter at selective speeds, a pneumatic speed-clutch for locking either gear to the speed-shaft, a pneumatic clutch for reversing the direction of the planer-shaft, a reversing-valve connected with a source of supply of compressed air, conduits from said valve to both said clutches, connections between said valve and the tumbler of the planer, a speed-valve in the conduits leading from the reversing-valve to the speed-clutch and serving to transpose those conduits, and a connection from the speed-valve to a portion of the planer mechanism operated by the driving mechanism independent of the tumbler.

9. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, a counter-shaft geared thereto to transmit the cutting motion in one direction and the faster backing motion in the other direction, change-gearing in that portion of the transmitting mechanism pertaining to the cutting motion, a speed-shaft, means for turning the speed-shaft, two gears connecting the speed-shaft with the counter-shaft to drive the latter at selective speeds, a pneumatic speed-clutch for locking either gear to the speed-shaft, a pneumatic clutch for reversing the direction of the planer-shaft, a reversing-valve connected with a source of supply of compressed air, conduits from said valve to both said clutches, connections between said valve and the tumbler of the planer, a speed-valve in the conduits leading from the reversing-valve to the speed-clutch and serving to transpose those conduits, and a connection from the speed-valve to a portion of the planer mechanism operated by the driving mechanism independent of the tumbler.

10. In a planer, the combination, substantially as set forth, of the planer-shaft to turn first one way and then the other to operate the planer, a counter-shaft geared thereto to transmit the cutting motion in one direction and the faster backing motion in the other direction, a speed-shaft, means for turning the speed-shaft, two gears connecting the speed-shaft with the counter-shaft to drive the latter at selective speeds, a pneumatic speed-clutch for locking either gear to the speed-shaft, a pneumatic clutch for reversing the direction of the planer-shaft, a reversing-valve connected with a source of supply of compressed air, conduits from said valve to both said clutches, connections between said valve and the tumbler of the planer, a speed-valve in the conduits leading from the reversing-valve to the speed-clutch and serving to transpose those conduits, and a connection from the speed-valve to the feed-box of the planer.

11. In a planer, the combination, substantially as set forth, of the planer-shaft to be driven first one way and then the other to operate the planer, a counter-shaft, means for driving the counter-shaft constantly in one direction, two gears loose on the planer-shaft, a clutch for connecting said gears alternatively with the planer-shaft, a gear on the counter-shaft engaging one of said gears, a pinion engaging the other of said gears, and change-gearing connecting the counter-shaft and the pinion.

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