

No. 714,570.

Patented Nov. 25, 1902.

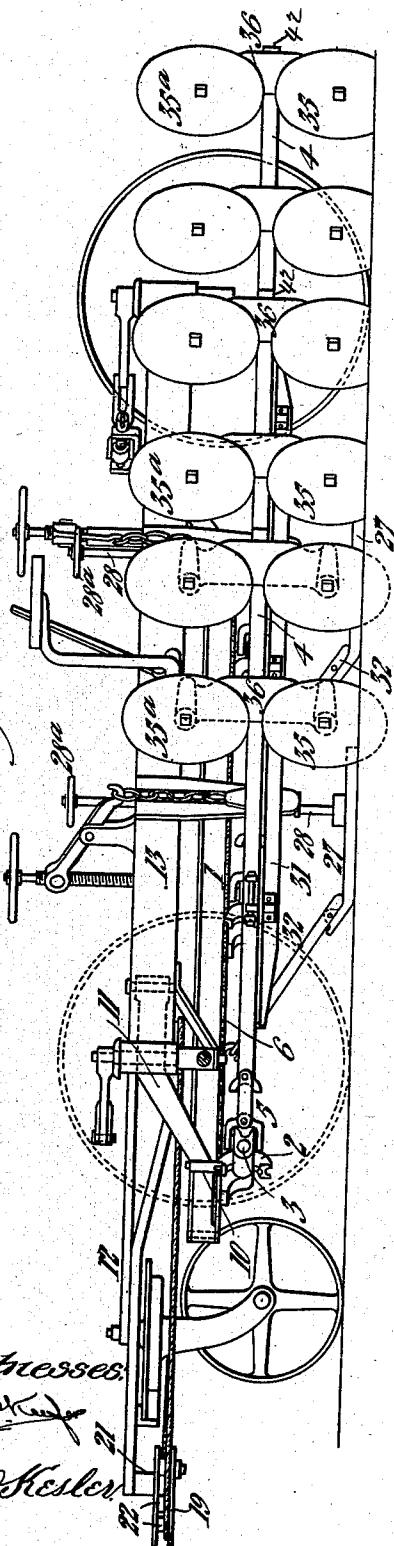
R. H. FOWLER & T. BENSTEAD.
APPARATUS FOR STEAM CULTIVATION.

(Application filed Feb. 10, 1902.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

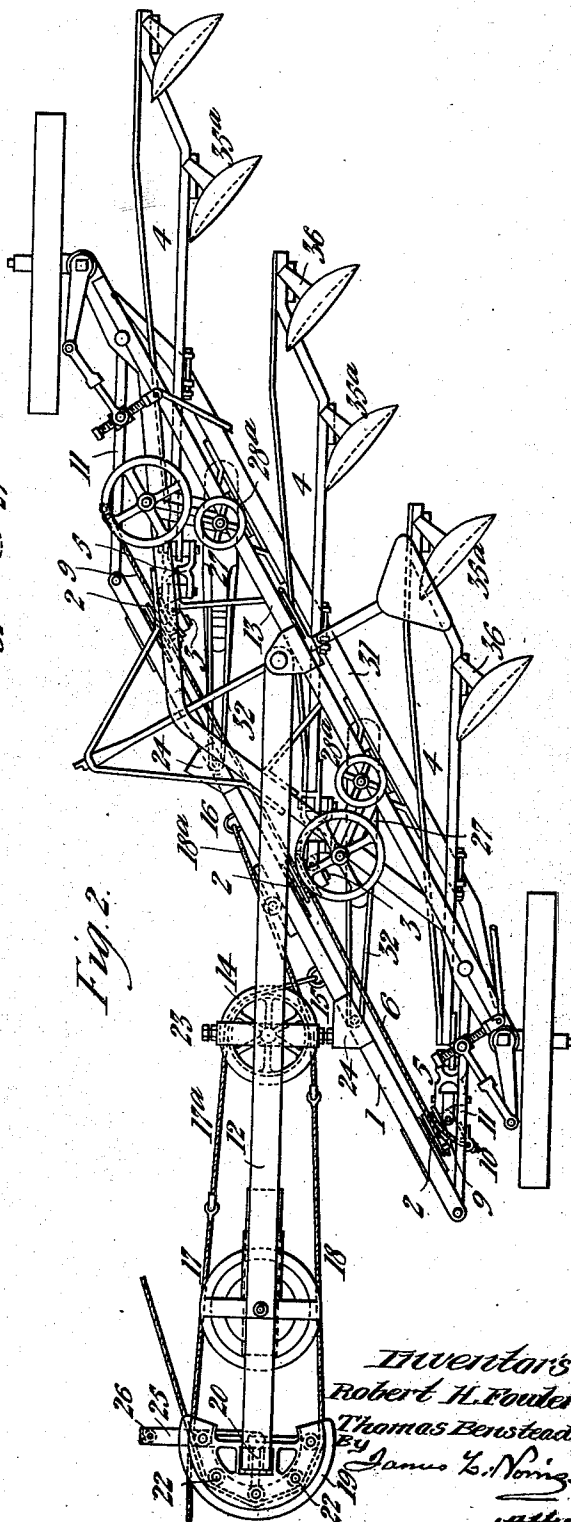


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Fig. 2.



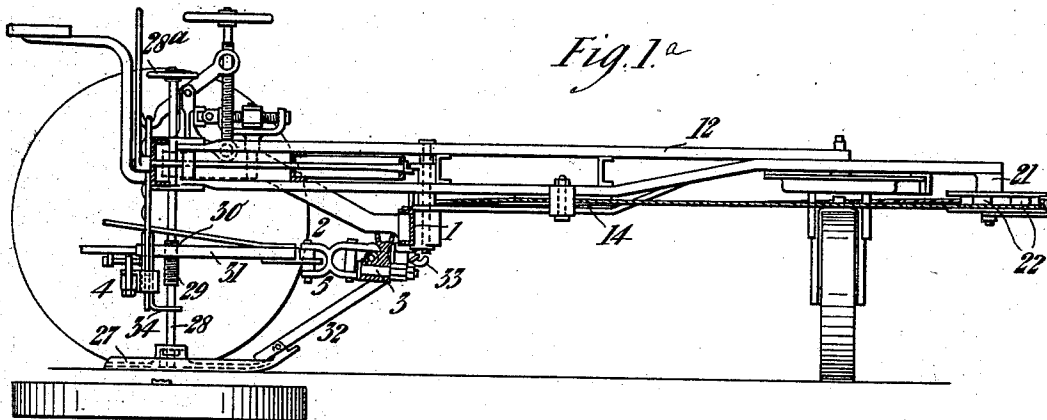
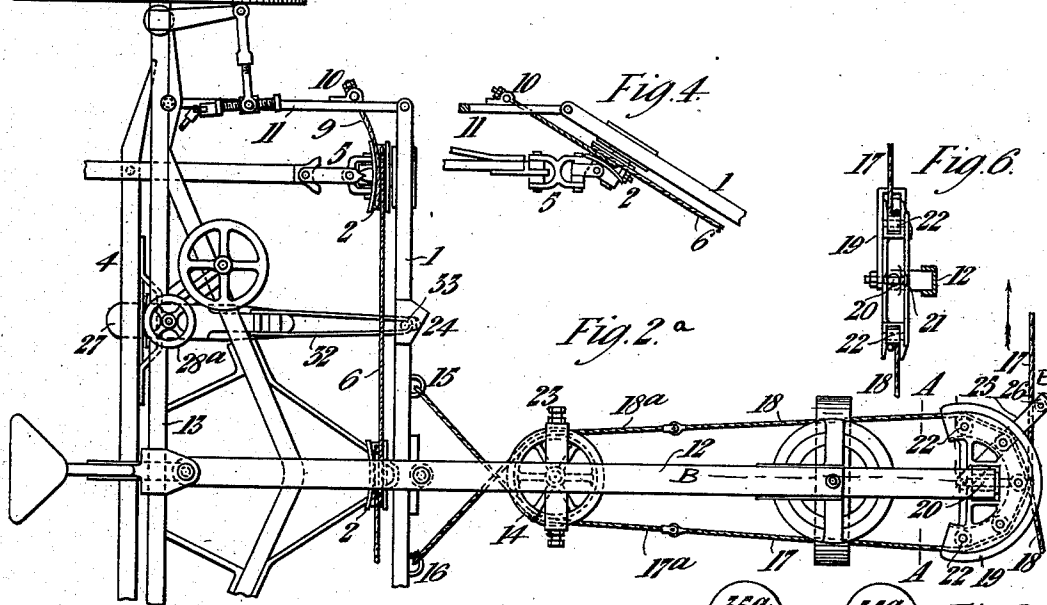
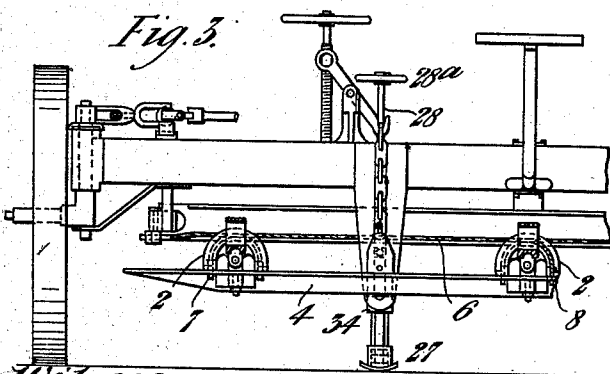
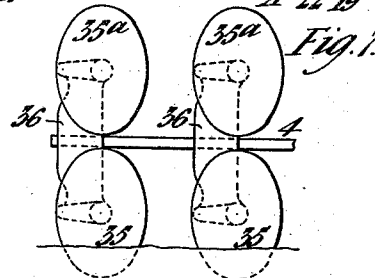
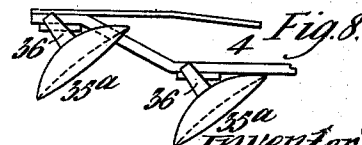
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3 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

ROBERT H. FOWLER AND THOMAS BENSTEAD, OF LEEDS, ENGLAND.

APPARATUS FOR STEAM CULTIVATION.

SPECIFICATION forming part of Letters Patent No. 714,570, dated November 25, 1902.

Application filed February 10, 1902. Serial No. 93,407. (No model.)

To all whom it may concern:

Be it known that we, ROBERT HENRY FOWLER and THOMAS BENSTEAD, citizens of England, residing at the Steam Plough Works, Leeds, in the county of York, England, have invented a certain new and useful Improved Apparatus for Steam Cultivation, (for which we have applied for a patent in Great Britain, dated July 13, 1901, No. 14,325,) of which the following is a specification.

Our invention relates to improvements on apparatus for steam cultivation such as those described in the specifications to Patents No. 463,502, No. 534,216, and No. 608,514.

We will describe the said improvements with reference to the accompanying drawings, in which—

Figure 1 shows a side view of the complete improved cultivating-machine with the operative parts in position for plowing. Fig. 2 shows a plan of the machine with the operative parts in the same position as in Fig. 1. Fig. 1^a shows a part longitudinal section with the operative parts in the position for turning, with the tool-frames in the middle position. Fig. 2^a shows a part plan with the operative parts in the same position as at Fig. 1^a. Fig. 3 is a part sectional back view with the parts in the same position. Fig. 4 shows a part plan of the parallel-motion bars and quadrants in the angular or operative position. Fig. 5 shows an enlarged section on line B B, Fig. 2^a, through the semicircular head of the hauling-bar. Fig. 6 shows a section on line A A, Fig. 2^a, showing a back view of the semicircular head. Fig. 7 shows a part elevation of one of the tool-frames with the disk plows in the operative position. Fig. 8 shows a plan of the same. Fig. 9 shows a section through one of the disks and its pivot and support. Fig. 10 shows an enlarged cross-section through one of the turn-over quadrants with its attachments to the front parallel-motion bar and to the tool-frame. Fig. 11 shows a section on line C C, Fig. 10. Fig. 12 shows a plan of the forked link 37, and Fig. 13 shows an enlarged sectional side view of the skid and its regulating-screw.

One part of our invention relates to the mechanism for turning over the cultivating-tools and their frames. In the Patent No.

534,216 was described, with reference to Figs. 12, 13, and 14, an arrangement of toothed segments and arms for raising one set of tools off the soil and also bringing another set onto the soil on turning the machine around at the end of a bout. According to our present invention we effect the said operation in a simpler and more reliable manner, as follows:

On the front parallel-motion bar 1 of the machine we mount a series of grooved quadrants 2, free to turn upon pins 3 on the said bar, each quadrant being in line with one of the frames 4, carrying the two sets of cultivating-tools, as shown at Figs. 1 and 2, to which frame the quadrant is connected by a universal joint and shackle 5, so that when the quadrant 2 is partially rotated it will also effect the required partial rotation of the tool-frame 4 either for raising the one set of tools off the soil and lowering the other set or for maintaining both sets raised off the ground. This arrangement is shown more clearly in the enlarged part sectional side view of these parts at Fig. 10 and cross-section on line C C at Fig. 11. The shackle 5 is pivotally connected, on the one hand, to the eye 4^x of the tool-frame 4 and, on the other hand, to the eye 37^x of the forked link 37, connected by a horizontal pivot-bolt 38 to the boss 2^x of the quadrant 2, which in its turn is mounted loose on the pivot-bolt 3, secured to the bracket 39, fixed to the front parallel-motion bar 1.

The quadrants 2 are all connected together by a series of ropes or chains 6, passing around their periphery, as shown more clearly at Figs. 3 and 10, the one end of a rope being fixed to the one quadrant at 7 and the other end thereof fixed to the contiguous quadrant at 8. The end quadrants on the bar 1 are also connected by a rope or chain 9 to a point 10 on the side parallel-motion bar 11. By this arrangement when the machine is being turned around from the position shown at Fig. 2^a into the position shown at Fig. 2 and the parallel-motion bars are brought into the required angular position for closing up the tool-frames 4 by means to be presently described the connection of the rope 9 to the bar 11 will cause it to draw around the quadrant 2, to which it is attached, as shown at Figs. 2 and 4, and this in its turn will by means of rope 6 draw around the other quad-

rants into the same relative positions, and such rotation of the quadrants will effect a corresponding rotation of the frames 4 and their tools by means of the connections 5, thus bringing the tools from the position in which both sets are raised off the ground into the position with the one set lowered ready for commencing the next bout.

It will be noticed that the shackle 5 has at its upper side a projecting finger 5^x, engaged between two ribs 40, formed on the face of the quadrant 2. This device serves as a supplemental means, in addition to the pivot-bolt 38, for turning over the tool-frame 4 when the quadrant is turned by the ropes 6 9. As in the previous patent, No. 534,216, the tool-frame 4 is carried on the lower bar 31 of the plow-frame by means of a pivotal connection 41, which enables it to be turned over by the quadrant 2 into either of the two opposite operative positions from the middle position shown at Figs. 2^a and 10.

The above-described arrangement has the advantage that it affords entire independence to each plow-frame—that is to say, each frame can rise or fall independently of the others in working to suit the varying levels of the ground being plowed, which was not the case with the previous arrangement with toothed quadrants and connecting-bars above referred to.

For effecting the above-mentioned shifting of the parallel-motion bars into the required angular position for closing up the tool-frames and rotating these, as above described, during the turning motion at the end of a bout, so as to bring the tools into correct position for plowing the next set of furrows, we according to our present invention directly utilize the pull of the hauling-rope itself, whereby we are enabled to dispense with the looped hauling-lever L, with roller L², and bent bar M, described in our Patent No. 534,216, and at the same time obtain a more reliable closing up of the frames than was possible with that arrangement. For this purpose the arm 12, which, like the arm J of the said prior construction, is pivoted both to the front and back parallel-motion bars 1 and 13, has pivoted to it a grooved pulley 14, and to eyes 15 16 on the front bar 1 on each side of the pivotal connection of arm 12 we attach the ends either of the hauling-ropes 17 18 themselves or preferably of short steel wire ropes 17^a 18^a, which are connected to the hauling-ropes by a shackle, as shown. From the said eyes these ropes are respectively led to the opposite sides of the pulley 14, so that they cross each other, as shown, and they are then led parallel with the arm 12 to the end thereof, to which is attached a semicircular grooved head-piece 19, free to turn with a pivot-pin 20 in a bearing 21 on the end of arm 12. In the groove of this head-piece are pivoted small rollers 22, and around these are passed the hauling-ropes 17 18, which, as usual, alternately constitute the operative pulling-rope

and the slack rope. Assuming that the machine has arrived at the end of a bout and that after being turned partly around by the pull on one of the ropes the parts have assumed the position shown in Fig. 2, the parallel-motion bars being then in the rectangular position, with the arm 12 projecting at right angles from bar 1, then each of the ropes 17 18 will extend partly around the groove of the head-piece 19 in bearing upon the rollers 22. If 17 is at this time the operative hauling-rope, while 18 is the slack rope, then on continuing the pull in the direction of the arrow, and consequently pulling over the arm 12 in the same direction, the parallel-motion bars will be gradually shifted into the angular position, on the one hand, by the action of the arm 12 and, on the other hand, directly by the pull on the rope 17, which pull in being transmitted obliquely to the point of attachment 15 on the bar will in shortening the length of rope between the point 15 and the pulley 14 eventually draw that point as close up to the pulley axis as permitted by the stop 23 on the arm 12 in butting against the abutment-piece 24 on bar 1. At the same time, the rope 18 being slack, it is free to be drawn inward by the oppositely-directed motion of point 16, and the parts will then after the completion of the turn-around motion be in the angular position for plowing, (shown at Fig. 2,) with the hauling-rope 17 extending straight out parallel with the bar 12 and exerting a direct pull upon the bar 1, keeping the stop 23 and abutment 24 in close contact, and thereby preventing any possibility of the parallel-motion frame and tool frames shifting out of the correct closed-up position during the operation of plowing, which shifting was liable to occur with the arrangement described in the said prior patent, No. 534,216, where unless the hauling-lever L was exactly in the right position relatively to the arm J and bar M (and this position was liable to be altered in the steering) the parallel-motion and consequently the tool frames were liable to open somewhat during the work, the resistance of the soil not being always sufficient to exert the necessary drag on the frames for keeping them closed up. As with the present improved arrangement the parallel-motion and tool frames are held rigidly in the described position by the pull on the hauling-rope, it will be seen that any deviations in the direction of motion caused by the steering will not affect that position.

By mounting the head-piece 19 upon a horizontal pivot, as described, it can adjust itself into any angular position to suit any variation in the height of the hauling-rope above the soil, and thus prevents the rope from forcing the arm 12 upward or downward. In order to insure the ropes always being guided correctly into the groove of the head-piece, a guide-arm 25 is provided, pivoted to the center of the head-piece and provided with a roller 26, between which and the groove of

19 both ropes are always confined, as the arm will shift around on its pivot to whatever position the two ropes assume.

On the machine arriving at the end of the bout and being again turned, by making the rope 18 the operative hauling-rope the parts are again shifted first from the position at Fig. 2 into that at Fig. 2^a and then over into the opposite angular position, when the rope 18 will assume the same position and have the same action as rope 17 in Fig. 5.

Another of our improvements refers to the adjustment and control of the skids, so that the depth of the plowing can be altered by the plowman conveniently from the seat on the machine. This we effect by connecting to the skid 27 a vertical rod 28, that passes up vertically to near the driver's seat, where it is provided with a hand-wheel 28^a, while at 29 it has a screw-thread formed on it, screwing through a nut 30, fixed to the lower bar 31, that carries the tool-frames 4. The front end of the skid 27 is also connected by a pivoted link 32 to a hook 33 on the parallel-motion bar 1, so that when the parts are shifted from the rectangular position, Figs. 1^a, 2^a, and 3, into the angular or closed-up position, Figs. 1 and 2, when turning around the skid 27 in turning upon the rod 28 will be shifted around by bar 1 in a corresponding manner to the tool-frame 4 and will consequently always lie in the same direction as these. On the steersman turning the rod 28 in one direction or the other the nut 30, and consequently the bar 31 and tool-frames, will be raised or lowered relatively to the skid, thereby regulating the depth at which the cultivating-tools work. The screw 28 is steadied by a guide 34, fixed to the bar 31.

Another of our present improvements consists in the employment of disks as cultivating-tools in combination with the above-described mechanism. These disks are generally similar to those employed in what is known as "disk-plowing," and they are arranged in two or more pairs, carried by double-armed brackets on the tool-frames 4, as shown in elevation at Figs. 1 and 7 and in plan at Figs. 2 and 8. As shown at Fig. 9, the disks 35 35^a are mounted on pivots 42 on the double-armed brackets 36, fixed to the turnover tool-frame 4, which is arranged and operated as before described, so that for plowing either the disks 35 are working in the soil, as shown at Figs. 1 and 7, or when the plow is turned around, thereby turning over the frames 4, the disks 35 are raised off the soil and the disks 35^a are lowered onto it. On the other hand, when the parallel-motion bars are in the rectangular position, as at Figs. 1 to 3, the frames 4 in turning only half over bring the brackets 36 into the horizontal position, so that both sets of disks are raised off the soil. It will be seen that with this arrangement we are able to turn all the furrows in one and the same direction the same

as in ordinary steam-plows, whereas when using horse disk plows of known construction these are only workable in one direction, as otherwise the furrows would be turned alternately to the right or to the left hand when working the plow alternately in opposite directions.

The other parts of the machine are similar to the corresponding parts of the said prior patents, and as they have no further reference to our present invention they need not be described.

Having thus described the nature of this invention and the best means we know of carrying the same into practical effect, we claim—

1. In a cultivating-machine such as is herein referred to, the combination with the front motion-bar 1 of pivoted quadrants 2 connected to each other and to the side parallel-motion bars 11 respectively by ropes 6, 9, and to the tool-frames 4 by means of shackles 5 whereby the tool-frames and tools are turned over by the rotation of the quadrants by means of the ropes on turning around the machine, substantially as described.

2. In a cultivating-machine such as is herein referred to, the combination with the front motion-bar 1 of pivoted quadrants 2 connected to each other and to the side parallel-motion bars 11, respectively, by ropes 6, 9, and to the tool-frames 4 by means of shackles 5 with fingers 5^x engaging between ribs on the quadrants, and forked links 37 pivoted on the one hand to the shackles 5 and on the other hand to the quadrants 2, substantially as described.

3. In a cultivating-machine such as is herein referred to, the combination with the parallel-motion bars of an arm 12 pivotally connected thereto, a pulley 14 pivotally mounted on the arm, a hauling-rope attached to a point of the front parallel-motion bar 1 to the right hand of arm 12 and passed around the left-hand side of pulley 14, a second hauling-rope attached to a point of bar 1 to the left hand of arm 12 and passed around the right-hand side of pulley 14 and means for guiding the operative hauling-rope around the extremity of arm 12, substantially as described.

4. In a cultivating-machine such as is herein referred to, the combination with the parallel-motion bars of an arm 12 pivotally connected thereto, a pulley 14 pivotally mounted on the arm, a grooved head-piece 19 pivotally mounted on the extremity of the arm anti-friction-rollers 22 in said groove, hauling-ropes passed partly around the groove of said head-piece and around said pulley, on opposite sides thereof, and extending obliquely to points on the front parallel-motion bar on opposite sides of the arm 12, and a guide-arm 25 pivoted to head-piece 19 adapted to guide the hauling-ropes into the groove of the latter, substantially as described.

5. In a cultivating-machine such as is herein referred to, the combination with skids 27 of screw-threaded rods 28 pivotally connected thereto and screwing through nuts 30 fixed

to the lower bar 31 carrying the tool-frames, and means for rotating said rods so as to raise or lower the bar 31 and tool-frames relatively to the skids, substantially as described.

5 6. In a cultivating-machine such as is herein referred to, the combination with skids 27 of screw-threaded rod 28 pivotally connected thereto, and screwing through nuts 30 fixed to the lower bar 31, carrying the tool-frames,
10 and links 32 connected at one end to the skids and at the other end to the front parallel-motion bar 1, substantially as and for the purpose described.

7. In a cultivating-machine such as is herein referred to, the combination with the reversible tool-frames 4 of double-ended arms 36 fixed to said frame so as to project on either
15 side thereof, sockets on the ends of said arms

adapted to receive the pivots 42 of disks 35, 35^a serving as cultivating-tools, and means 20 for reversing the frames so as to bring either the disks 35 or the disks 35^a into action for plowing substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses. 25

ROBERT H. FOWLER.
THOMAS BENSTEAD.

Witnesses to signature of Robert H. Fowler:

JOHN BARRATT,

CHAS. GILLIARD.

Witnesses to signature of Thomas Benstead:

CHAS. GILLIARD,

ALFRED S. HOUGHTON.