(No Model.)

E. B. SELLARD.

WINDMILL.

No. 413,567. Patented Oct. 22, 1889.

Fig 1.

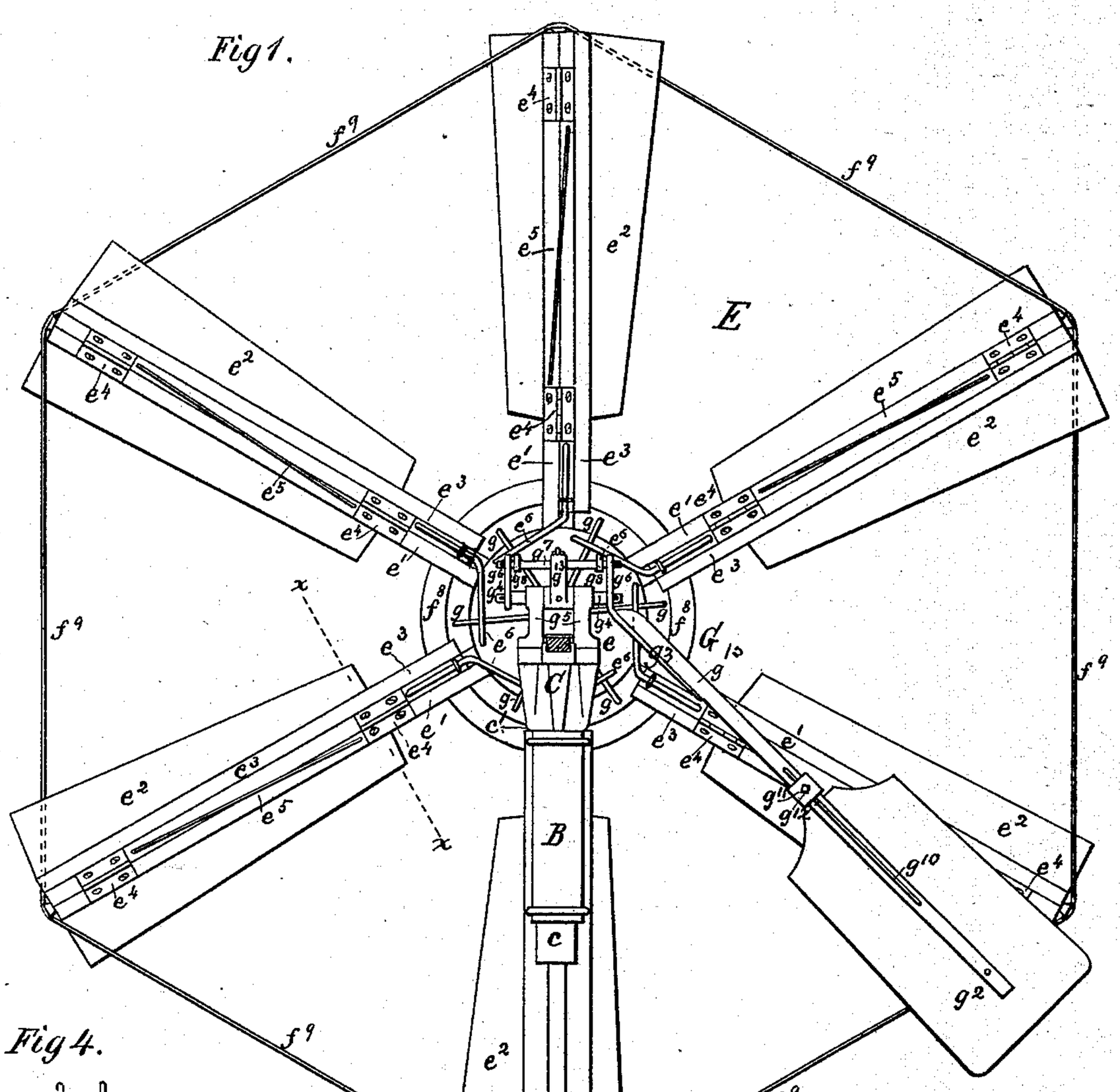


Fig 4.

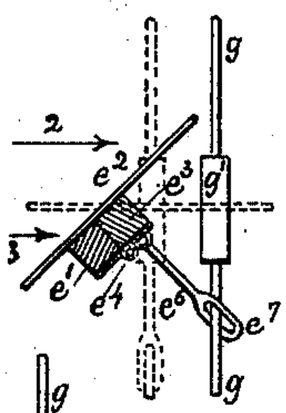


Fig 3.

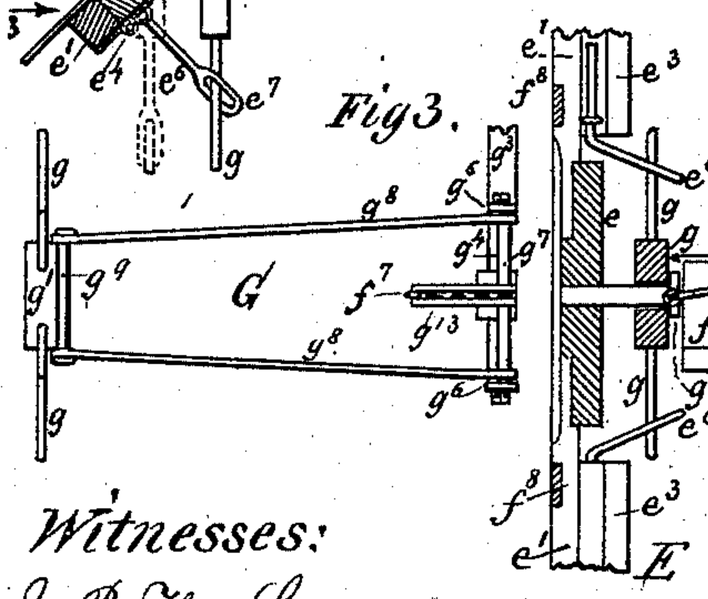
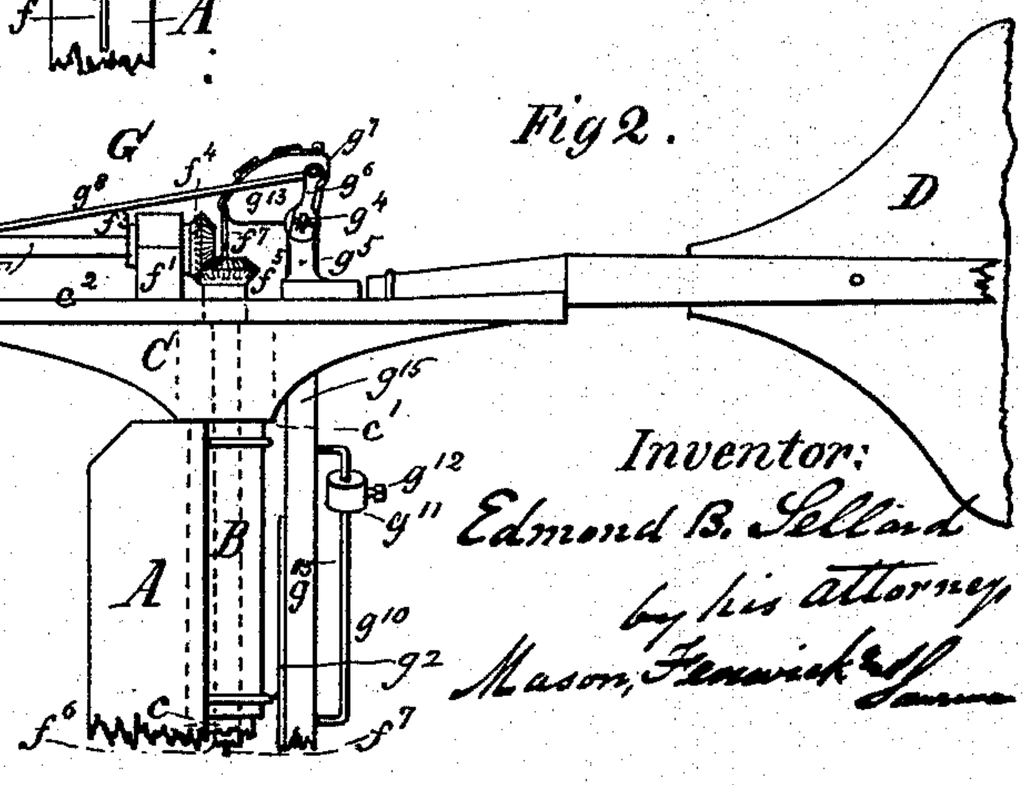


Fig 2.



Witnesses:

J. P. Theo. Lang.

E. J. Fenwick.

Inventor:

Edmond B. Selland

by his attorney,

Mason, Fenwick & Lawrence

UNITED STATES PATENT OFFICE.

EDMOND B. SELLARD, OF OGDEN, IOWA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 413,567, dated October 22, 1889.

Application filed February 25, 1889. Serial No. 301,089. (No model.)

To all whom it may concern:

Be it known that I, EDMOND B. SELLARD, a citizen of the United States, residing at Ogden, in the county of Boone and State of Iowa, have invented certain new and useful Improvements in Windmills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to wind-wheels provided with pivoted automatically-feathering blades controlled by a speed-regulating vane; and it consists in certain combinations, constructions, and arrangements of parts whereby a uniform speed can be maintained under varying pressures of the wind and according to varying resistances offered by the work being done.

In the accompanying drawings, Figure 1 is a rear view of a wind-wheel embodying my invention. Fig. 2 is a broken side view of the same, the greater portion being in elevation, while the hub of the wheel and the sliding speed-regulating collar operated by the controlling-vane are shown in section. Fig. 3 is a detail top view of the said sliding collar and the connections between it and the controlling-vane. Fig. 4 is a detail plan view, partly in section and partly in elevation, representing two extreme positions of the said sliding collar and corresponding positions of one of the hinged feathering-blades connected therewith, one position being in full lines and the other in dotted lines.

The letter A in the drawings represents the standard upon which the wind-wheel is supported. To the upper portion of the said standard a tubular bearing B is firmly attached, and therein a tubular shank c of a frame C fitted, the frame itself resting and revolving upon a shoulder c' of the bearing B, as shown. Above the shoulder c' the frame C constitutes a long narrow platform c^2, in one of the end portions of which is provided an ordinary steering-vane D, partly shown in Fig. 2, while at the other end portion and near the center bearings for the wind-wheel and gear-shaft and the shaft of the controlling-vane and other parts and connections are applied, as presently described.

The wind-wheel E is mounted upon the front end of the main shaft F, and it comprises a hub e, sustaining circle-plate f^8, both preferably of cast metal, and a number of radial arms immovably fastened to said hub and bound with a tie-rod f^9, and on which are applied undivided feathering-blades e^2, said blades being fastened centrally to longitudinal arms, bars, or rods e^3, which are arranged alongside the arms, bars, or rods e' and connected thereto by hinges e^4, so that the outer and inner surfaces of both sets of arms, bars, or rods are flush with one another, and that the blades always present a flat surface to the wind and lie in their normal position flat upon the bars or arms e', as shown in Fig. 4. The rods or bars e^3 and arms e' are so arranged that when they are in contact, as shown in full lines in Fig. 4, the blades e^2 stand at an angle of forty-five degrees to the axis of the shaft F, and in this position they are held by means of torsional springs e^5, having one end attached to the bar e^3 and the other to the arm e', and while held in this position they, as is well known, produce the greatest effect for operating machinery connected with the wind-wheel.

When less than the normal or greatest amount of power which the wind-wheel is capable of furnishing is desired, the angle of the feathering-blades requires to be changed or decreased; and to do this I have provided arms e^6, attached to the bars e^3 and standing at an angle to said bars. The end portions of said arms e^6 are slotted, as shown at e^7, and connected to and operated by radial rods g of a sliding regulating-hub g', loosely fitted upon the shaft F. This hub g', with the arms g, is intended to constitute a part of an automatic regulating device G, which is operated by the pressure of the wind upon a pressure-vane g^2, facing the wind, and resisting its pressure by means of the united force of the springs e^5, and also of a hand mechanism for controlling the power, as will now be described. The vane g^2 is fastened to bracket-bar g^3, having a vertical perforated extension-arm g^6, through which a horizontal shaft g^4, running transversely to the shaft F, is passed, said shaft g^4 being supported in a suitable bearing g^5 of the frame C. On the other end of the shaft g^4 another arm g^6 is rigidly fastened, and between the arms g^6 a swinging transverse

bar g^7 is fitted, and to the same two connecting-rods g^8 are attached, said rods being connected to a sliding collar-like plate g^9, which encircles the shaft F and bears against the sliding regulating-hub g'. When the pressure of the wind upon the vane g^2 increases, the vane is moved upward and caused to move the collar g^9, and with it the hub g', in the direction of the arrow 1, whereby the angle of the slotted arms e^6 and the feathering-blades e^2 is changed, the latter presenting a smaller surface area to the wind, and thus maintaining the normal speed of rotation. A decrease in the wind-pressure will allow the springs e^5 to push the hub g' and collar g^9 so as to change the position of the pressure-vane into that of more direct exposure to the wind, this operation being aided by the gravity of the vane g^2. The bar g^{15}, which is attached to the bracket-bar g^3 of the vane g^2, is provided with a longitudinal guide-rod g^{10} and a sliding weight g^{11}, with a set-screw g^{12}, or other means of adjustment, whereby the position of said weight may be changed upon said rod, thus rendering the resistance of the vane g^2 against the wind variable, or providing for changing its resistance so that the effectiveness or working-power of the wind-wheel may be regulated according to the requirements of the machinery to be operated thereby. The same object may be more conveniently attained by omitting the set-screw g^{12} and attaching the weight g^{11} to a cord which passes up along the arm g^3, and thence down through the tubular bearing B into the mill below, from whence it may be operated by hand, so as to cause the weight g^{11} to rise or descend, in either of which positions it may be sustained by fastening a cord around a pin.

In order to prevent twisting or forcing the wind-wheel out of the wind line or course, by reason of the resistance of the mill-gearing driven by the wind-wheel, I place the pressure-vane g^2 on that side of the frame where the pressure of the wind will have a tendency to cause the said vane to oppose or counteract said twisting force and hold the wind-wheel to the wind under all circumstances. The greater the twisting the farther away from the tubular bearing the vane should be arranged in order to increase its leverage and thus increase its counteracting force.

The wind-wheel shaft F is suitably hung in bearings $f\,f'$, preferably made of hard wood to prevent undue friction and to save lubricants, and it is held longitudinally between said bearings by two inner collars $f^2\,f^3$. At its rear end this shaft F is provided with a conical gear-wheel f^4, which gears into another gear-wheel f^5, hung in the tubular bearing C and provided with a tubular shaft f^6, which is extended in practice to the mill below, and there, by means of other ordinary gearing, keeps the machinery in motion. Through the tubular shaft f^6 a rod (or rods) f^7 is passed, which is attached to a quadrant g^{13} on the shaft g^4, and thus enables the mill-operator either to assist the regulating or pressure vane g^2 in decreasing the power of the wind-wheel or to stop the wind-wheel altogether, which latter is accomplished by pulling the said rod f^7 until the vanes e^2 are turned in line with the wind, as illustrated by dotted lines in Fig. 4. The arms e' being stiffened and stayed by the circle-plate f^8, arranged concentric with the hub e, and their ends united by means of the rod f^9, forming a tire around said arms, the wind-wheel is rendered very strong and its arms are held solidly in their positions around the hub e.

I am aware that the blades of wind-wheels have been made in two parts and that the adjustable part has been hinged to an arm carrying the part which is not adjustable; but this differs from an undivided blade, which is attached centrally to an arm hinged on one side of a fixed radial arm of the hub of the wheel and the blade extending some distance over said arm and over its hinged arm and the whole surface of the blade always presenting a flat surface to the wind, whatever may be the angle at which the blade stands.

I am also aware that a spiral spring has been employed for allowing the adjustable part of a divided blade to be turned on its hinges and for holding the adjustable part in its normal position under ordinary forces of wind; also, that wind-blades not divided and which are attached to pivotal arms of the hub have been regulated both automatically and by hand in the same structure.

I am also aware of a regulating-vane having its arm swinging in a vertical plane with the arm of the steering-vane; but this differs from a vane arranged obliquely, as I have shown and described.

I am also aware that blades fixed upon radial arms or spokes of a hub have been regulated by a vane and adjustable weights applied on an angular lever; but this differs from my construction.

Therefore I only claim as follows:

1. In a wind-wheel, in combination, a revolving non-sliding hub e, having rigid radial arms e', feathering-blades e^2, attached to arms e^3 and set facewise against said arms $e'\,e^3$, with about one half of the width of said blades on one side and the other half on the other side of the longitudinal center of the arms e^3, hinges e^4, connecting said blades to the said arms, diagonal torsional springs e^5, fastened by one of their ends to the arms e' and by their other ends to the arms e^3, angular arms e^6, attached to the arms e^3, and sliding hub g', having operating-rods g, whereby the whole surfaces of the blades are at all times presented to the wind and the angle of the set of the blades can be automatically changed or regulated, and when in their normal position the blades have a square support and bearing against both of the arms $e'\,e^3$, and when moved out of said position are still stayed by the arms

e^8, and in the event of one of the springs becoming broken the remaining ones remain operative, substantially as described.

2. In a wind-wheel, in combination, a hub e, having one set of rigid radial arms e', another set e^3, hinged to the first set, so as to present with said arms e' a broad even bearing-surface, a series of feathering-blades rigidly attached about centrally of their width to the hinged set of arms, and diagonal torsional springs e^5, attached by one of their ends to the arms e' and by their other ends to the arms e^3, whereby the blades are afforded a broad bearing-support from both arms when in their normal position and are stayed by the arms e^3 when they are moved out of their normal positions, and at the same time are free to change their angle when the force of the wind becomes too great, substantially as described.

3. In a wind-wheel, in combination, hub e, having rigid radial arms e', the undivided feathering-blades e^2, fastened by hinges e^4 and diagonal torsional springs e^5 to arms e^3 and having arms e^6, the sliding hub g', having radial rods g, the sliding collar g^9, connecting-rods g^8, arms g^6, bar g^7, shaft g^4, arm g^3, set oblique with respect to the vertical plane of the shaft B, and steering-vane D and carrying-vane g^2, substantially as described.

4. The connecting-rods g^8, arms g^6 g^6, sliding collar g^9, swinging bar g^7, and vane g^2, having bar g^{15}, which is attached to bracket-bar g^3, said vane being arranged obliquely on that side of the frame of the windmill where the pressure of the wind has a tendency to cause said vane to oppose or counteract the twisting force caused by the resistance of the machinery driven by the wind-wheel, in combination with the vane D and the wind-wheel E, having sails acted upon by collar g^9, substantially as described.

5. The combination of the looped weight-guide g^{10} and adjustable weight g^{12}, vane g^2, having bar g^{15} and bracket-bar c^3 and arranged obliquely on that side of the frame of the windmill where the pressure of the wind has a tendency to cause said vane to oppose or counteract the twisting force caused by the resistance of the machinery driven by the wind-wheel, said vane being connected by rods to the sliding collar which acts upon the blades of the wind-wheel, substantially as and for the purpose described.

6. The combination, with the arms g^6 g^6, bracket-bar g^3, bar g^{15}, oblique vane g^2, connecting-rods g^8, sliding collar g^9, and described connections with the blades of the wind-wheel, of the shaft g^4, swinging bar g^7, quadrant g^{13}, attached to both the shaft g^4 and bar g^7, and the connecting chain and rod f^7, substantially as and for the purpose described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

EDMOND B. SELLARD.

Witnesses:
FRED W. GARDNER,
CYRUS WEAVER.