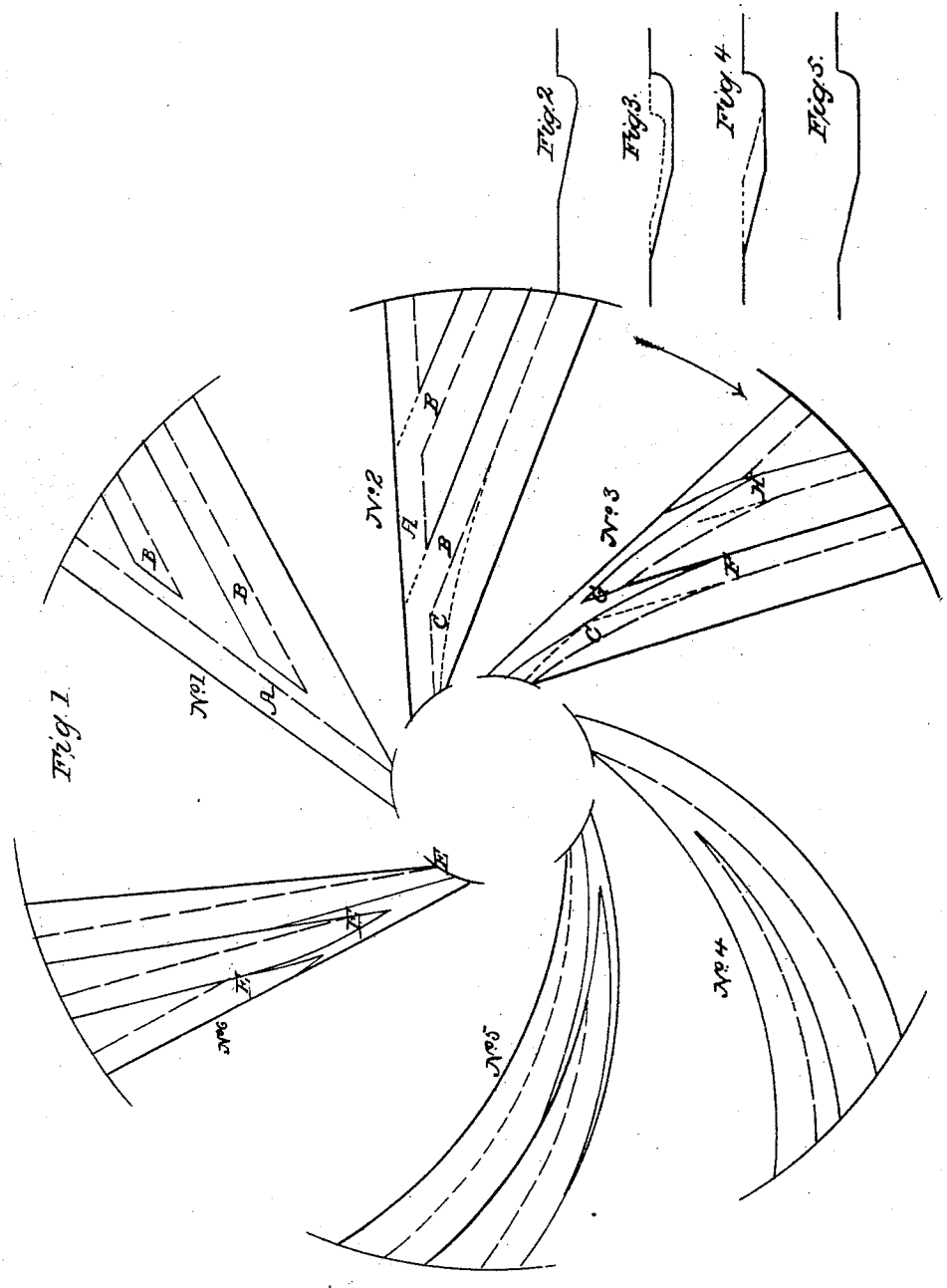
N. HAYWARD.

Millstone Dress.

No. 18,848. Patented Dec. 15, 1857.



N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

NELSON HAYWARD, OF CLEVELAND, OHIO.

DRESS OF MILLSTONES.

Specification of Letters Patent No. 18,848, dated December 15, 1857.

To all whom it may concern:

Be it known that I, NELSON HAYWARD, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in the Dress of Millstones; and I do hereby declare that the same is described and represented in the following specification and drawings.

The nature of my invention consists in making the deep portion of the furrows sufficiently wide from the eye half way to the periphery or thereabout, with a flat or nearly flat bottom parallel or nearly parallel to the face of the stone, so as to allow a portion of the grain to pass out whole a certain or proper distance from the eye of the stone toward the periphery, in proportion to the size of the stone, and the quantity intended to be ground, so as to distribute the whole kernels of grain more generally over the grinding surfaces of the stones, so that each and every portion of the grinding surfaces will perform its due share of work in converting the grain into meal or flour; thereby making the whole and partially ground or crushed grain between the stones, by being more generally and uniformly spread between the grinding surfaces at a greater distance from the eye, support the upper or runner stone and prevent it from vibrating and coming in contact with the under stone, so as to injure the flour near the peripheries, by destroying its life or rising or fermenting properties, and at the same time by their friction conserve a large portion of the power applied to operate the mill, thereby enabling the miller to set and run the grinding surfaces nearer together, without injuring the quality of the flour, and at the same time enable him to grind from fifty to seventy-five per cent. more grain with the same amount of power, and obtain five per cent. more flour and that of a better quality, from a given amount of grain, and save fifty per cent. of the labor in keeping the stones in order.

In order to illustrate the experiments which led to the invention of my improvements and to show the difference between my invention and the dresses previously used I have made a drawing, Figure 1, representing a stone four feet in diameter upon a scale of three inches to a foot, in which I have represented sections of six different forms of dress numbered from 1 to 6 inclusive; that is, I have represented one furrow of each kind of dress extending from the eye to the periphery, and the short furrows and lands between said furrow and the next leading furrow, so as to show one section of such dress, the black lines representing the back or deep edges of the furrows and the red lines the feather edges. This figure represents the bed stone. The runner stone is dressed in the same manner and revolves over the bed in the direction of the arrow with the deep part of the furrows first or forward; No. 1 represents a section of the oldest dress known to me; A, the leading furrow: B B the short furrows. A stone with this dress with furrows of the usual width and depth will grind and flour when making about one hundred and fifty revolutions per minute about five bushels per hour on a general average without overheating, and it is found in practice that by extending the furrows B B into A, as represented in No. 2, that the same stone will average about seven bushels per hour without undue heat, and I have found by numerous experiments made during a long period of time that by increasing the width and depth of the furrows and reducing the width of the lands by taking or rounding off the angle C as represented by dotted line No. 2, I can grind and flour with the same stones and number of revolutions fifteen bushels per hour without over-heating.

Within the last few years I have continued my experiments in altering the dress of old stones by increasing the width of the furrows up to one and one-fourth to one and three-fourths of an inch at the eye and periphery, and from two to three inches where the angle C is rounded off, and of various depths from one-eighth to one-half an inch, narrowing the lands toward the eye by rounding off the said angle C, and in dressing new stones I have made the lands in the form of a scalene triangle, the periphery of the stone forming the base, as represented in No. 6, making the apex of the angles at the junction of the furrows E E E. With this dress I have been enabled to grind twenty bushels per hour upon an average without overheating the flour and do perfect work, making a larger yield of superior flour, the furrows being made in the form represented by Fig. 2. In feeding the stone so as to grind on a general average more than the amounts heretofore named while using this form of furrow it was found the

stones would begin to heat, and it became evident to my mind that it arose from their being required to perform too much service near the eye, and I found that this overfeeding with these old forms of dress and furrow forced too much or too large a proportion of the grain between the faces of the stone near the eye so that there was more than could be readily and properly crushed and that it had a tendency to raise or lighten up the runner stone, thereby allowing it to vibrate and strike the skirts of the bed stone while moving with great velocity, so that the friction thereby produced not only created the heat complained of but also injured that portion of the flour that was pressing out between the skirts of the stone when they came in collision, by mashing the particles between two smooth surfaces thereby depriving the flour of its rising or fermenting properties, and at the same time consuming a portion of the power applied to drive the stone. That this was the true cause of the heat I am now certain as during my experiments I have taken up a great number of stones and uniformly found them cool around the eye out as far as there was any whole grain, and as uniformly and in every instance found them heated more or less at the skirts or periphery, the heat gradually extending in toward the eye in proportion to its intensity at the periphery, and the skirts were worn smooth from the periphery toward the eye in proportion to the amount of heat they had generated, or the length of time they had run, and their temperature while running, and where stone had been overfed or overheated I found the space generally termed the chest (between that part of the stone around the eye that did the grinding and the skirt or portion near the periphery which did the flouring) did not appear to have performed any service whatever. I also found that stones three and a half feet in diameter would grind twenty bushels per hour and clean the bran and middlings as perfectly as four or four and a half feet stones with the same number of revolutions, and with a less tendency to heat, which made it evident that stones four and a half feet in diameter could be made to grind more without heating if means could be devised to convey the additional quantity of grain farther from the eye, that is, beyond the space heretofore supplied, and distribute it into the space referred to as the chest. With this view I devised and constructed furrows of an entirely new form with flat, or nearly flat bottoms nearly parallel with the face of the stones, and with this form of furrow I have succeeded in grinding thirty, forty, and in some instances sixty bushels an hour, and this limit arose only from the want of power to grind more, as the stones did not show any symptoms of overheating, but did the work more perfectly than they could do it while grinding but from five to ten bushels with the old forms of dress and furrow. The reason of this superior work is more evident when we consider the fact that the runner stone is balanced upon a point at its center. Therefore the greater the quantity and the farther the grain can be uniformly distributed or spread from this center toward its periphery the firmer the stone is sustained and the steadier it will run being far less liable to vibrate and bring the skirts in contact. The stones therefore can be placed and run nearer together without the skirts being liable to hit one another, and from this reason I have been able to make bran thinner, taking the flour off closer and more uniformly, without the life or rising properties of any part of the flour being destroyed by being crushed between two smooth surfaces, as above stated.

This new form of furrow consists in making the furrows about one fourth of an inch deep at the eye and extending back from the eye with a level or nearly level bottom nearly parallel to the face of the stone or lands and as wide in proportion and in the form represented in the colored portion of the drawings, with inclined planes extending from the black lines and front edge of said colored portions up to the red lines, at which line the inclined planes join the lands constituting the feather edges of the furrows, but wholly avoiding the usual crack or shoulder generally made at the feather edges. This new form is represented in No. 3 as applied to stones which have an old dress of 3 furrows to a section already upon them, and No. 5 represents the new dress as applied to the old circular dress of 2 furrows to a section, as seen at No. 4, and No. 6 represents the best form (so far as I have experimented) of this new dress and form of furrows, and it is this form that I prefer to put into new stones, as best adapted to distribute the grain uniformly from the eye toward the skirts of the stone, so that each portion of the grinding surfaces will perform its proper share of service in converting the wheat into flour and so that no portion shall be overloaded nor lack grain to grind, as it did with the old dress and furrows, where there was not a sufficient quantity of unground grain between the stone at a proper distance from the eye to prevent the running stone from vibrating and producing the results heretofore stated.

In order clearly to show the difference between the old and new dress and to show the capacity of the latter to distribute the grain more generally over the stone than the former, I have made a drawing on tracing linen in which the feather edges of the old furrows are represented by dotted lines and the feather edges of the new furrows by red

lines and have fastened the drawings together in the eye at the center, so that by moving the semi-transparent one (which moves as the runner stone would) it will be seen that the feather edge of the runner furrow is at right angles with the leading furrows of the bed stone at the eye, giving them the greatest draft they can have and that the angles of the old feather edges at C close or come together about four inches from the eye, and beyond this point where I have taken up stones with the old dresses there was no whole grain, and very little broken grain, unless there were cavities or open places in the stone besides the furrows where the grain could pass out; but with the new dress and furrows the angle can hardly be said to close at all, except at the periphery or at least not until it gets three times the distance of the angle C from the eye, and when I have taken up stones with this new dress I have found whole grain from twice to three times as far from the eye as the angle C according to the quantity the stones were grinding per hour. I ascertain the true condition of the grain between the stone when grinding by taking off the power and letting the runner stop, without altering the feed or raising the stone, and then take it up.

The angle at which the feather edges of the running stone sweep over the furrows in the bed stone and the difference in the openness of the angles of the feather edges of the new and the old forms of dress and furrows from the eye to the periphery may be clearly seen by passing the semi-transparent drawing over the other, the feather edges of the new form in the running stone sweeping or traversing across the furrows and feather edges of the bed stone with a far more open angle or much nearer a right angle than they do in the old form until they reach about half the distance from the eye to the periphery, which causes them to sweep or carry the grain from the eye much more readily and effectually than the old form can, and the angles the remainder of the distance from the eye to the periphery being alike in both forms the new is no more liable to throw whole wheat or unground middling out at the periphery than the old form. Circular furrows are objectionable on account of the great draft they create from the center to the periphery of the skirt, as they do throw out or allow whole wheat to escape at the periphery if it is carried too far from the eye, the distance depending upon the depth of the furrow and the velocity of the stone.

I am of the opinion that when the furrows of the usual form, as represented in Fig. 2, are made of a depth that shall give room sufficient for the large or increased amount of grain to pass out toward the skirts that the grain lies dead in the deep part and is not stirred and carried out freely by the feather edges of the runner passing over it; also that the grain in the upper part of the furrow resting upon the grain in the lower part (which yields to the motion or pressure of the grain above it, as the feather edges of the runner passes over it) is not distributed or carried from the eye toward the skirts with the same facility nor as effectually as when the feather edges sweep across it while it rests upon a flat unyielding bottom instead of the loose grain as above stated; hence the advantage of making the furrows wide and shallow in proportion to the size of the grain and the amount to be ground per hour.

Another and important advantage my form of dress possesses over all others which have been devised for fast grinding is that others are obliged to remove the old dress before putting theirs in, while I can alter the forms of the old furrows to my new form at a cost of from two to five dollars per pair, according to the form of the dress to be altered and the amount of grain to be ground per hour. To take out an old dress and put a new one in costs from forty to fifty dollars per pair, besides the waste of stone and loss of time by the stone lying idle. My improved dress is also of especial benefit in dressing stones that are of a close or compact texture, for it has always been known that close or the least porous stones would make less middlings and more flour than open ones, but if it was attempted to grind as fast with close as with the more porous stones they would overheat and injure the quality of the flour. For the last seven years there has been bur stone imported very superior in uniformity of temper, texture and in sharpness of cut, but very close or compact, so that large flouring mills that generally desire to grind fast could not avail themselves of its advantages on account of its liability to heat and polish or get smooth at the eye and skirts, but with my improved dress this new or close bur grinds as cool and faster than the open or porous as well as produces more flour. They have produced a yield of flour of over one hundred barrels, from as low as three bu. 57 lbs. of wheat to a bbl. of flour, and all the flour was extra and branded and sold as such, while four and a half bu. is considered a fair average to use for each barrel, made so that only 80 to 90 per cent. of the flour will be marked as extra. I also save a large proportion of the power that is generally used for grinding. Where I have altered the old dress I have secured from fifty to one hundred (100) per cent. I have not been able to test the proportion saved when grinding the largest amounts named, but have ascertained that the power that will

grind twenty bushels per hour (10 bu. each) with two pair of stones with the old form of dress and furrows will grind thirty bushels per hour with one pair of stones with the furrows changed to my new form, and I have ground 14 bu. per hour (after altering the form of furrows) with the same amount of power required to grind 7 bu. before the furrows were altered. By grinding the meal more uniform and by leaving all the particles of flour in their natural form instead of mashing a portion of them, thereby making it of a sticky texture, it can be bolted much faster, and in all cases I find the bolts have bolted the increased amounts ground (after altering the furrows) equally as clean and perfect as they had done the smaller quantities ground with the old form of furrows and in the same time.

The width and depth which the level or parallel portion of the furrow should be made depends upon whether the stone is more or less porous; upon the relative proportion of land and furrows; upon the obliquity of the angle at C in the dress to be altered and upon the amount desired to be ground in a given time with the new dress. I usually make the furrows one-fourth of an inch deep at the eye, and the level part, which is nearly parallel to the face of the stone, from one-third to one inch wide at the eye gradually increasing in width to from one to two inches a little beyond the angle C at G within the point of the first short land, extending the parallel bottom to a point at F in the first short furrow about half the distance from the eye to the periphery. A furrow of this form and size is generally capable of grinding thirty bushel per hour; if a larger quantity is to be ground extend the parallel bottom from G along the leading or main furrow about half the width that it is from the eye to G into the second short furrow, bringing it to a point at H corresponding in its form to that portion extending from the eye to F, as shown by the colored portion of the drawing in No. 3, continue the furrow at its full depths from the eye for about two-thirds the length of the parallel portion of the bottom or to G, then gradually reduce the depth to three-sixteenths or one-eighth at about six inches from the periphery and continue this depth to the end. I consider this depth the most desirable for grinding wheat, but for grinding corn, coarse grain or damp wheat I increase the depth one-sixteenth of an inch. In widening old furrows I peck off the land upon one or both sides (as represented in Figs. 3 and 4, the dotted lines being the old furrow) so as to bring the line of the back edge of the leading furrows within the circle of the eye from one-half an inch to an inch, with the design of giving the furrows the greatest amount of draft they can have and at the same time making the furrows about one and a half inches wide, which I consider the most advisable width to make all the furrows before widening the bottoms.

I contemplate that slight variations may be made in the form of the lands and furrows without departing from the principles of my invention and that the level or parallel bottoms of the furrows may be made slightly inclined, concave or convexed if desirable.

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

1. Making the deep portion of the furrows sufficiently wide from the eye half way to the periphery or thereabout, with a flat or nearly flat bottom parallel or nearly parallel to the face of the stone, substantially as described and represented.

2. I also claim lands made in the form represented in No. 6 or in an equivalent form whether used in combination with furrows having parallel bottoms as described or otherwise.

NELSON HAYWARD.

Witnesses:
J. DENNIS, Jr.,
F. L. EHMAN.