No. XVI.

DRY GRINDING.

The GOLD VULCAN MEDAL *was this session presented to* ROBERT COWEN, *Esq., of Carlisle, for his improved method of carrying off the Dust produced in grinding Cotton Cards. A model of the machine has been placed in the Society's repository.*

SIR, Carlisle, March 1, 1824.

HAVING frequently witnessed the very injurious effects of the dust and particles of emery and iron produced in the operations of dry grinding, on the health of persons employed in cotton mills, induced me, several years ago, to attempt means to remove the evil; and for that purpose, in the year 1817, I constructed a grinding machine, with tubes for conveying away the particles of iron and other dust, similar in principle, with the exception of the fan, to the accompanying sketch and model. On a little experience, however, with the machine, without a fan, I found the current of air produced by the velocity of the cylinder and brush insufficient, being frequently counteracted by sudden gusts of wind, and other causes, by which the dust was thrown back into the room. To remedy this defect I afterwards adopted the fan at the extremity of the tube, which, under every circumstance, in this as well as in other machines requiring a much more powerful draught

of air, wherein a modification of the same principle had been tried, completely answered my expectations. It is obvious that the same principle may be applied, with facility, to every description of dry grinding and ventilation, where power is to be obtained. I shall feel obliged by your submitting the plan and model to the inspection of the Society; and should they be approved of, and meet the approbation of the Society, and obtain, through the medium of their Transactions, to more general utility, my object will be fully attained.

I am, Sir,

&c. &c. &c.

ROBERT COWEN.

A. Aikin, Esq.
Secretary, &c. &c.

CERTIFICATES.

SIR, Carlisle, Feb. 25, 1824.

It is a truly gratifying pleasure to witness any improvement calculated to ameliorate the condition of those people whose avocations are so destructive of health. Scarcely can any employment be conceived more injurious than dry grinding, in the way in which it is usually performed. Mr. Cowen's invention, I am happy to say, from my own observations, and from the evidence of those employed at the machine, affords the most satisfactory proof of its efficacy in removing all danger of injurious consequences from those people who are employed in dry grinding.

I am, Sir,

&c. &c. &c.

JOSHUA ANDERSON,
Surgeon.

A. Aikin, Esq.
Secretary, &c. &c.

SIR,

I have superintended, for six or seven years, the machine invented by Mr. Cowen for carrying off the dust, &c., during the operation of dry grinding. Previous to the introduction of the fan I experienced great inconvenience from the dust, being afflicted with an asthmatic complaint; but since it was added the current of air so effectually takes along with it all dust produced in the operations of brushing and grinding the cards, that no inconvenience is ever felt from it. I therefore consider myself authorized to give my grateful testimony in favour of Mr. Cowen's machine for dry grinding.

I am, Sir,

A. Aikin, Esq. &c. &c. &c.

Secretary, &c. &c. JAMES MILLIGAN.

The wire cards employed in carding cotton previous to the process of roving, require to be ground from time to time, as the points of the wires get blunted by continual use. This must necessarily be done dry, as wet grinding would cause the wires to rust: but the particles of iron and of emery which are mutually detached by this operation produce a cloud of fine dust, which, being inhaled by the workman in the act of breathing, is taken into and deposited in the windpipe, and passes into the lungs, and thus produces much irritation, and ultimately incurable disease of the latter. In order to prevent the workman from being thus annoyed, various contrivances for carrying off the dust, and adapted to different kinds of dry grinding, have

been proposed to the Society. Several of these have been rewarded and published, as calculated, more or less, to produce the desired effect; and to these is now added Mr. Cowen's machine for grinding cards, in which the apparatus for carrying off the dust is very simple, and appears to have been completely successful.

The entire machine is represented in plate VI. in which fig. 1 is a plan, fig. 2 a side elevation, fig. 3 a section, and fig. 4 a front elevation.

Before a card is ground it is first laid with the wires downwards in the slit of the cylindrical case *f f*, figs. 1 and 3, where it is cleaned from dust and the adhering fibres of cotton, by the action of the cylindrical brush within the case: the air is drawn in at the same time, as represented by the arrow, passes along the trunk *i i*, and thence into the fan case *h h*, from the mouth of which *j* it is discharged into the open air, together with the dust and filaments of cotton.

Being thus cleaned, the card is next ground. *a a*, fig. 3, is a drum covered with emery, which forms the grinding cylinder; this is surrounded by a case *b*, having a longitudinal opening *c c* of the same length as the drum (see fig. 4). Through this opening the card *d* is applied to the grinding cylinder, which by its revolution not only sharpens the card wires, but (assisted by the action of the fan) draws in at the same time a current of air, indicated by the left hand arrow, figs. 2 and 3: the air passes down between the cylinder and its case, then rising up through the passage or flue enters the fan case, and is discharged at *j* into the open air, carrying with it the whole of the dust produced in the grinding.

The moving power is applied to the wheel *v*, fixed on

the axis of the grinding cylinder, from which a strap *w*, fig. 3, passes over the wheel *x* on one end of the axis of the brush *g*, while on the other end of the axis a similar wheel is fixed, connected by means of the cord *y*, figs. 1 and 2, with a wheel on the axis of the fan.

The medal of the Society was given for that part of the machine which has now been described; but as considerable ingenuity is displayed in the mode by which certain motions are given to the card while grinding, an explanation of this part also will, it is hoped, not be unacceptable to the reader.

It is evident that if the card, while grinding, were kept in the same position with regard to the drum *a*, its surface would be brought to a concave form, the curvature of which would correspond with that of the drum. But as a card of this figure would answer its intended purpose very imperfectly, it is necessary to have recourse to some means by which the surface may be ground level. This is found to be effected by giving the card a curvilinear motion, by the union of two movements, one up and down, the other alternate lateral.

At one end of the axis of the grinding cylinder is fixed a pinion, that takes into a toothed wheel, to which is attached the heart *l*, fig. 2; by means of this an alternate lateral motion will be given to the horizontal bar *m*, which motion is conveyed to the bar *o* through the connecting lever bar *n*; the fulcrum of this latter is the square end of a horizontal bar *r r*, fig. 4, to the other end of which is attached a short bar, which is connected by a joint with the horizontal bar *o*, fig. 3. Thus the two horizontal bars *o o* move equally backwards and forwards in the eyes or guides which support them. On these bars rest the two

legs *p p* of the card holder; and as this is kept pressed against the grinding cylinder by the action of a spring, it is manifest that the holder, and consequently the card itself will receive an alternate up and down motion, in proportion as the bars *o o* move backwards and forwards.

Below the machine is the small round plate *u*, fig. 2, which is turned round by means of the strap *z z*, fig. 3, that connects it with the axis *v* of the grinding drum: this plate (see *u*, fig. 4) is placed oblique, and enters the notched end of the lever bar *t*, fig. 4; this latter, therefore, receives an alternate lateral motion from the revolution of the plate, which motion is transferred to the card-holder, by slipping the eye at the upper end of the bar over a pin projecting from the cross-bar of the card-holder. The spring that keeps the card-holder, and consequently the card, pressed against the grinding-drum, is fixed to the fore part of the lever bar *t*, and presses by its free end on the back of the card *d*.

Instead of the spring, an adjustable lever, fig. 5, may be used, or the apparatus, fig. 6, which differs from the preceding in having a treadle and two cranked arms for the convenience of withdrawing the holder, in order to take out or put in a card.