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A NEW CENTURY OF INVENTIONS BEING DESIGNS & DESCRIPTIONS OF ONE HUNDRED MACHINES, RELATING TO ARTS, MANUFACTURES, & DOMESTIC LIFE

Part 5

Chapter 5

3,899 words

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This Machine is among the first inventions I carried into real practice on coming to manhood. It must be about 40 years ago, and was first constructed as a Crane at the request of the late Doctor Bliss, of Paddington. It _may_ offer some difficulty as a _Power_ Engine from the small diameters and the friction thence resulting: but for any Machine where great _slowness_ is desirable, whether to express slow motion, or to count high numbers, &c., it still appears to me a very good Machine.

OF A DROPPING-WEIGHT-MOVER; _Or Machine for lengthening the Time of going of a Clock, Jack, or other Weight-Machine_.

Suppose A B (plate 12, fig. 4) to be the first wheel of a Clock or other Machine required to _go_ a long time without winding up. This wheel works into the two pinions _c d_, both of which are connected by ratchets with the axis E F of the wheel G H, _in one direction only_; insomuch that whether the wheel A B turn forward or backward, the wheel G H will always turn the same way. This process is well known in the

mechanical world; and I have merely adapted it to my present invention. F and G are two tubes, or square vessels, of equal size, containing a number of balls--the tubes so balanced against each other, that one of them is always heaviest by the weight of half a ball. Suppose for example that the tube F contains six balls and the tube G five; and that the tube G is so much heavier than F as only to be outweighed by half a ball: That half will then be the moving power; and the vessel F will turn the wheel A B backward, raising the tube G at the same time. But arriving at the bottom the mechanism m will let go the lowest ball in F, and then the tube G which is at the top will preponderate and turn the clock till it also gets to the bottom; when a similar mechanism at n, will disengage one ball from it, by which subtraction the tube F will resume the ascendancy and perpetuate the motion. Thus may the going of any clock, jack, &c. be protracted to a period almost indefinite. Nor need it, strictly speaking, be wound up at all. It is only taking care to drop at proper intervals, an equal number of balls into each tube, and this reciprocation of movement will become perpetual. The figure of this little Machine is unfortunately small: and the scapement is but imperfectly shewn; It has however, only one property that it is essential to notice; which is that the detent o, shall suffer the cross m to turn only one quarter round at each discharge: and this is insured by the spiral ledge of the four ratchet teeth m, which by a pin fixed to the side of the detent, draw the latter down into the succeeding tooth as soon as the tube F begins to rise, so that there is only one ball discharged at each descent of that tube.

OF A MACHINE, To promote Evaporation, with or without Heat.

The vessel containing the liquid to be evaporated, (see Plate 12, fig. 6,) is long and shallow, and the liquid rises nearly to it's brim. In this vessel is placed a long hollow drum A B, covered with open wire-work, or any kind of cloth of a very loose texture. This drum turns slowly, on the hollow centre C, to which is fitted a stuffing box and tube, connecting the drum A B, with the pump P; the latter worked by any convenient power. The pump then, drives air, either hot or cold into the drum, and thence through

the interstices of it's texture; where it comes in contact with the liquid at _an indefinite number of points_ breaks the films formed by the liquid, and, saturated thereby, passes into the open air; thus occasioning a rapid evaporation, which might be increased either by heating the liquid or the injected air, or both, _ad libitum_. The whole idea consists in the multitude of points of contact between the liquid and the drying medium.

OF A CUTTING OR GRATING MACHINE, _For Green Roots, Tobacco, &c._

This Machine is composed of a perpendicular axis A B, fig. 7, driven with considerable velocity by any proper _geering_. C D is a vessel formed something like a shoe with the toe cut off: its entrance D is concentric with the shaft A B, and a weight _m_ fastened to it's side, _equilibrizes_ the weight of the eccentric part C. Around this vessel, and concentrically with it, is placed a cylindrical _rasp_ or _grater_ E F, consisting, here, of a number of _blades_ so grooved on one surface as that by grinding them obliquely on the edge, each one shall form a line of sharp teeth, which, combined with those of the other blades, constitute a rasp similar to that used for powdering dye-woods; with this difference however, that these blades have interstices between them, through which the pulp escapes outwards, and thus the rasp is kept clean at all times. When this Machine is used the roots are merely thrown into the vessel D as into the hopper of a mill, and they are pressed against the rasp _by their own centrifugal force_ which is made as strong or weak as desired, by the greater or less velocity of the Machine.

This Machine owes its origin to the decree of the French Emperor, for encouraging the making of sugar from beet-root. With the other mechanicians of Paris I was called upon, by a house engaged in that trade, to try my hand upon it; and this Machine was the result. It acts fast and well; and from being less liable to clog, than most of the others, is I believe superior; though _this_ was never proved by any comparative experiment. If it were desired to _cut_ any substance with this machine, the blades would be sharp knives, instead of being toothed; and they would be placed obliquely to the circumference: but the process of _grating_ is that for which it was exclusively

designed.

OF A SCREW, _With greatly diminished Friction_.

My readers will perceive, that I have altered the title given in the prospectus to this Invention. It has been done in deference to the opinions of some persons in high reputation in the mechanical world, who hold that there can be no motion whatever without _friction_. For my own part I am no believer in several sorts of friction: and must therefore, require a new definition of friction, before I can flow with the stream. As the question, however, is not yet before my readers, I shall wave the discussion at present, and describe this invention, as introducing the _rolling motion_ into the threads of a screw; thus taking away the GREATEST PART of the friction on every supposition.

In Plate 12, fig. 8, A is the screw, and B C the nut, bored large enough to receive the screw, bodily, _without any penetration of their threads_. Nevertheless, these threads are made to occupy the same length, in both screw and nut, as though they did enter each other: so that the two parts running parallel to each other, leave a _square interstice_ _b_, all along both nut and screw: into which balls of brass, or _soft_ iron are introduced, which at once restore the screw-property without it's friction: a friction so considerable in the common screw, that it always surpasses the effective power, since it remains closed, (in a vice for example) while holding any object squeezed with all the force a man can apply. I have mentioned the use of soft balls: it is in order that they may _all_ act together, and work themselves to a common bearing. It will appear by fig. 9, that the _acting_ balls might, or perhaps ought to be, separated from each other by a set of smaller ones; since in this case, the surface of the touching balls move the same way, avoiding all friction between _them_; and leaving the friction only between those surfaces that are exempt from heavy pressure. These circumstances will be understood by consulting the direction of the arrows in fig. 9; and I have added two other sketches, to shew the principle in it's application to _square threaded screws_ as at fig. 10; or to

oblong threaded screws, whose threads penetrate each other, in fig. 12. I have further, in fig. 8, sketched one of the methods I propose for supporting the weight of the descending balls, and returning them again into the nut. Considering the balls as a _fluid_, I have provided a rising column of them, which the working of the screw downward will fill: and the weight of the balls themselves will return them into the nut, when the screw is drawn upward.

OF A SIMPLE AND POWERFUL MICROMETER.

This interesting Machine, see Plate 12, fig. 11, consists of a screw divided into three parts, _a_ _b_ _c_; the first, _a_ is a mere cylinder to _centre_ the screw at that end: _c_ is a screw of (suppose) 20 threads to the inch; and _b_ another screw of 21 to the inch. D E represents the frame of the Machine, the part E being the _fixed_ nut of the screw C, while the piece _f g_ forms the _moveable nut_ of the screw C, carrying a finger _g_ along the graduated bar, E _g_ D. If now, the screw be turned once round by the button H, it will have moved _to the left_ $\frac{1}{20}$ of an inch; while the nut and it's finger _g_ will have progressed on it's screw $\frac{1}{21}$ of an inch _to the right_: and the difference $\frac{1}{20} - \frac{1}{21} = \frac{1}{420}$ of an inch is what the nut _f_ has really moved to the left, along the bar E g D. If therefore, the rim of the button be divided into 100 parts, _one_ of these will represent $\frac{1}{42000}$ part of an inch by this Micrometer: and I need not add, that this minute portion may be rendered still more minute at pleasure. The means of doing this are evident: It is only making the screws _b_ and _c_ _nearer alike_ in fineness, or number of threads per inch; as 29 and 30, 30 and 31, &c.

I hope it will be understood, that I do not give any of these Machines as the only examples I could furnish of the application of the principles on which they are founded. This very Machine is not a Micrometer _only_; it might be (if made in proper forms and dimensions) a vice, a press, or other _power Machine_. It has been already hinted, that change of form must remain to be considered hereafter.

I have chosen to bring forward this Machine at an early stage of the work, because it

has, inadvertently perhaps, been ascribed to another person. I refer to an article in the celebrated *_programme_* of M. Hachette, of Paris; with which is combined an essay on the composition of Machines, by Messrs. Lanz and Betancourt. In the article D 3, at page 10 of that work, are the following words:

“M. de Prony a trouvé une maniere de transformer le mouvement circulaire, en un autre rectiligne dont la vitesse soit aussi petite que l’on voudra;” and further on--“l’idée en est extrêmement simple, heureuse; elle est d’ailleurs susceptible de plusieurs applications utiles aux arts.” And in page 11, are these words--“C’est ainsi que M. de Prony est parvenu à une solution aussi simple qu’ingenieuse du probleme qu’il s’étoit proposé.”

For the sake of my English readers, I subjoin a translation of these passages: “Mr. de Prony has found (or invented) a manner of transforming a circular movement into a rectilinear one, of which the velocity shall be as small as may be desired;” and further on “This idea is extremely simple and happy: and is besides, susceptible of several useful applications to the arts.” And in page 11, are these words--“Thus has Mr. de Prony given a solution as simple as it is ingenious, of the problem which he had proposed to himself.”

The above account appears in 1808, and M. de Prony does not prevent or disavow it. Perhaps he had forgotten the circumstance: and perhaps he did not know of this publication: but I solemnly declare that I shewed HIM this Micrometer, executed, *_fourteen years before!_* that is, while he and M. Molard were making their report on the Machines proposed for the Water-works at Marly. I certainly wish to accuse no body in this affair: but if I did not state the fact as it is, I should, myself, be stigmatized as a *_plagiary!_* I am *_forced_*, therefore, to take my stand on the adage--“Fiat justitia ruat cœlum.”

In closing the first Part of this Work, I cannot but express my gratitude for the unexpected *_degree_* of support, with which my numerous Subscribers have honoured

me. I presume to offer these pages as a _fair_ Specimen of what they may expect in the four succeeding Parts,--namely, as it regards the execution: for the _materials_ of what remains, include objects of greater importance than those preceding. If I have been fortunate enough to raise any favourable expectations in the minds of my present readers, I hope they will express those feelings; and thus induce others to join in bringing to a useful close, a work which is at least _intended_ to produce unmixed public utility. From criticism, I expect candour: and should my intentions, though pure, be misrepresented--should envious tongues or pens assail my labours, or asperse my character, I will defend both, _after_ I can use my Book as my shield--that is, after I have fulfilled my Engagements with my Subscribers: of whom (in expectation of meeting them again _within_ three months) I now respectfully take leave.

J. W.

No. 5, Bedford-street,

Chorlton Row.

SYNOPSIS, (IN ALPHABETICAL ORDER) OF THE _CENTURY OF INVENTIONS_
COMPOSING THIS WORK.

Note. The objects with Numbers after them are those contained in the present PART:
and the Numbers shew the Pages where they stand.

A

1 Adding Machine; or Machine to cast up correctly large columns of figures. 2 Air Pump; essay towards completing the vacuum.

B

3 Barrel Spring, to lengthen the going of Clocks and other spring- driven Machines. 26 4 Boats (serpentine) for lessening the expence of traction. 5 Bobbin or Lace (Machine for

making) and for covering Whips, &c. with great rapidity. 6 Bowking Machine for Calico Printers. 7 Bucket Wheels (a combination of) to raise water.

C

8 Canals (open) as Hydraulic Machines of great force. 9 Canter, or inclined Plane for Draymen. 72 10 Chain to act equally on my wheels. 11 Chocolate Mill (rotatory.) 12 Cocks (equilibrium) to avoid leakage. 13 Colour Mill for Calico Printers. 14 Compasses (bisecting.) 15 Cotton (Machine for batting.) 16 Crane, combining variable powers with speed and safety. (rewarded by the Society of Arts.) 57 17 Crank (epicycloidal) or parallel motion. Rewarded by BONAPARTE. 30

D

18 Dash Wheel for Calico Printers, acting with greater rapidity than usual. 19 Differential Wheels for gaining immense power. 54 20 Doffing Machine, of great force for taking Cylinders from their Mandrills. 21 Draw-bench for my twisted pinions. 22 Dynamometer, for measuring powers and resistances in motion. 15 23 Dynamometer, second kind.

E

24 Engine for cutting my Patent Wheels in small and middling dimensions. 25 Engine for cutting my large bevil Wheels and wooden Models, either on my System, or the usual one. N. B. These objects will occupy considerable space in the work. 26 Engraving Machine for Calico Printers, being an important application of my Cog or toothed Wheels. 27 Engraving Machine for large patterns. 28 Essay to derive power from expanding Solids. 29 Evaporation (Machine to promote.) 78 30 Eyes (Machine for making rapidly.)

F

31 Fire escape (on a retarding principle.) 32 ---- (by breaking the fall.) 33 Fires (Portable

Engine to extinguish.) 34 Fires (Watch Engine always ready for.) 35 Flax (Machine for breaking) with rapidity. 36 Forging Bar iron and steel (Machine for.) 37 Friction (to prevent.) 38 Friction (to prevent) Thoughts on.

G

39 Geering and ungeering (Machine for). 40 Do. Do. for swift motions. 41 Grating or cutting green Roots, Tobacco, &c. (Machine for.) 79

H

42 Helico-Centrifugal Machine, for raising water in large quantities. 43 Horse Wheel for saving room and gaining speed. 53 44 Horse Wheel (reciprocating) for Mangles, &c. 45 Horse Wheel, with means for turning the Horse when he acts in two directions. 46 Horizontal Pump of large produce, driven by wind. 47 Hot Air as _power_ while heating liquids, rooms, &c.

L

48 Lamp for the Table; suspending the oil by it's weight. 49 Lithographic, or Copper-plate Press, with several curious and useful properties.

M

50 Machine for clearing turbid liquors. 51 Machine for driving Boats on Canals, under Tunnels, &c. without disturbing the Water. 52 Machine to assist in taking Medicine, Pills, &c. (Humani nihil alienum.) 53 Mangle (perpetual or rotatory). 54 Marine-Level (two essays on a.) 55 Micrometer for measuring very minute spaces. 83 56 Mirrors to collect Solar Heat, (method of forming.) 57 Mover, by dropping weights. 76

N

58 Nails (Machine for moulding.) 59 Nails (Machine for forging.)

P

60 Pencyclograph, or Instrument for describing portions of Circles, and finding their centres by inspection. 51 61 Peristaltic Machine, for raising _much_ water, to small heights. 69 62 Persian Wheel modified, for raising water. 63 Pitch-fork, for musicians, with variable tones. 64 Power-wheel by heated Air. 43 65 Press, direct and differential. 66 66 Press (eccentric Bar.) 67 Printing Machine (two coloured.) 68 Protracting Motion (Machine for.) 49 69 Pullies (my Patent much improved.) 33 70 Pump (my equable.) 45 71 Pump, triple, in one column. 72 Pump (portable) worked by pedals. 73 Punch Machine for Engravers. 74 Punch Machine on another principle. 75 Do. rotatory, for my Engraving Machine.

R

76 Reciprocating Motion, (long) for Mangles, &c. 77 Reflector parabolico conical, or plano parabolical for light houses, &c. 78 Regulator: (not centrifugal) for Wind or Water Mills, Steam Engines, &c. 79 Retrographic Machine (Machine for Writing backwards) for Engravers. 80 Rotato-gyratory Churn.

S

81 Screw, with greatly diminished friction. 81 82 Screws, (Machine for forging) &c. 83 Spinning Machines, (my Patent), Eagles, &c. 84 Spinning Machinery: another system, adapted chiefly to wool. 85 Spring, to keep a door strongly closed, yet open easily. 86 Steel Yard, differential: for weighing _vast_ weights with short levers. 87 Syphon, (mechanical) to expel part of the water at the highest point.

T

88 Tallow (Machine for cutting and trying.) 89 Tea-table (commodious help for the.)

V

90 Ventilator, rotatory, yet by pressure. 91 Vessel (expanding) for Pumps, Steam Engines, &c.

W

92 Washing Apparatus: for Hospitals, &c. _confining the offensive matter until cleansed away_: thus promoting salubrity. 93 Water-wheel, (horizontal) probably the best of the impulsive kind. 94 The same, for high falls. 95 Water-wheel, (inclined) employing the weight of the fluid. 96 Water, (Machine for raising large quantities.) 97 Weaving by Power: manner of driving the Shuttle, (executed A. D. 1780.) 98 Wedge Machine (perpetual.) 99 WHEELS (my System of cog or toothed.) 100 Windmill of great power.

ERRATA.

Page 16, line 17, for fig. read plate. „ 22, „ 4, for posistion, read position. „ 22, „ 7, for 17, read 15. „ 22, „ 9, for fig. read plate. „ 22, „ 23, for fig. read plate. „ 24, „ 16, for clylinder at P, read cylinder at K. „ 24, „ 22, for fig. read plate. „ 26, „ 16, for E, read C. „ 28, „ 5, for diamenter, read diameters. „ 35, „ 10, for inconvencies, read inconveniences. „ 36, „ 8, for of pulley, read of the pulley. „ 40, „ 25, for as, read of. „ 41, „ 4, for loose 1; read loose -- „ 41, „ 5, for pulleys, read pulley. „ 43, „ 18, for furnish surplus, read furnish a surplus. „ 43, „ 22, for occpied, read occupied. „ 46, „ 17, for power, read motion. „ 49, „ 22, for diffential, read differential. „ 55, „ 21, } „ 55, „ 24, } for 20,200, read 20200. „ 55, „ 26, } „ 55, „ 28, for 99,990, read ,99990. „ 58, „ 23, for figures, read figure. „ 62, „ 2, end the quotation marks at “lifting.” „ 62, „ 8, for gasping, read anxious. „ 63, „ 7, for wishd, read wished. „ 64, „ 2, for ladders, read ladder. „ 66, „ 11, for occasionally, read occasionally. „ 67, „ 7, for G N, read L N. „ 68, „ 2, for _two hundred_ read _three hundred_. „ 75, „ 4, for 300lbs. read 100lbs. „ 82, „ 16, for fig. 9, read fig. 10. „ 83, „ 11, for an of inch, read of an inch.

PART SECOND. A NEW CENTURY OF Inventions.

INTRODUCTION.

In the progress of a work like the present, no competent reason could have been assigned for omitting to bring forward _my System of Toothed Wheels_ the Patent for which has lately expired:--a System which a few years ago, excited in this town, so much interest, aroused so much animosity, and was treated with so much illiberality:-- But which, also, was fostered with so much public spirit, tried with so much candour, and adopted with so much confidence. It was I say, incumbent on me to bring the merits of this System into public view, had it only been to justify myself for proposing, and my friends for adopting it. But stronger reasons point now to the same measure. From the intimate connection the System holds with the subjects of this essay, it _must_ be often adverted to; and I have been already obliged to speak of it in terms which can hardly have been understood by those readers who had not previously considered the general Subject. I should therefore be still in danger of filling these Pages with unintelligible assertions, did I not begin by marking out the foundations on which my statements are built; or by explaining to a certain degree, the _Principles_ of the new System. Without then abandoning the tacit engagement I have taken with my unlearned readers--not to entangle them in too much theory, I think it indispensable to quote the Memoir I read before the Literary and Philosophical Society of Manchester, in December, 1815; which small work will form the basis of the _practical_ remarks I shall have to make on the subject, as _this_ work proceeds. The Memoir is thus introduced in the transactions of that learned body:

MEMOIR

ON A NEW SYSTEM OF

COG OR TOOTHED WHEELS,

By Mr. James White, Engineer.[1]

COMMUNICATED BY T. JARROLD, M. D.

(_Read December 29th, 1815._)

[1] N. B. A Patent was taken out for the Invention some years ago.

“The subject of this paper, though merely of a mechanical nature, cannot fail to interest the Philosophical Society of a town like Manchester, so eminently distinguished for the practice of mechanical science; unless as I fear may be the case, my want of sufficient theoretic knowledge or of perspicuity in the explication, should render my communication not completely intelligible. To be convinced of the importance of the subject, we need only reflect on the vast number of toothed wheels that are daily revolving in this active and populous district, and on the share which they take in the quantity and value of its productions; and it is obvious that any invention tending to divest these instruments of their imperfections, whether it be by lessening their expence, prolonging their duration, or diminishing their friction, must have a beneficial influence on the general prosperity. Now I apprehend that all these ends will be obtained in a greater or less degree, by having wheels formed upon the new system.

I shall not content myself by proving the above theoretically, but shall present the society with wheels, the nature of which is to turn each other in _perfect silence_, while the friction and wear of their teeth, if any exist, are so small as to elude computation, and which communicate the greatest known velocity without shaking, and by a steady and uniform pressure.

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