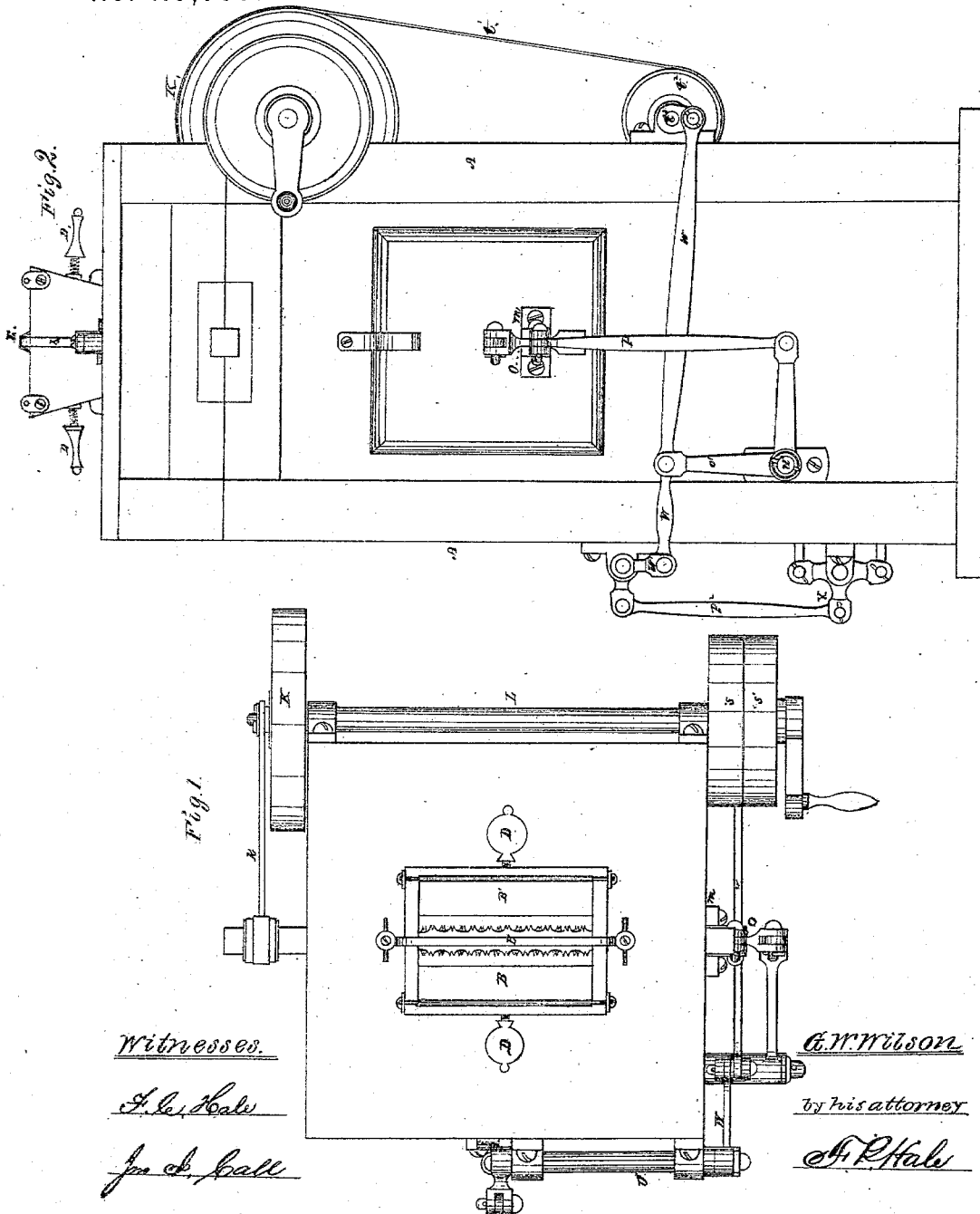


GEORGE W. WILSON.

Improvement in Apparatus for Combining or Mixing  
two or more Substances.

No. 115,799.

Patented June 6, 1871.



Witnesses.

A. L. Hall

J. A. Hall

G. W. Wilson

by his attorney

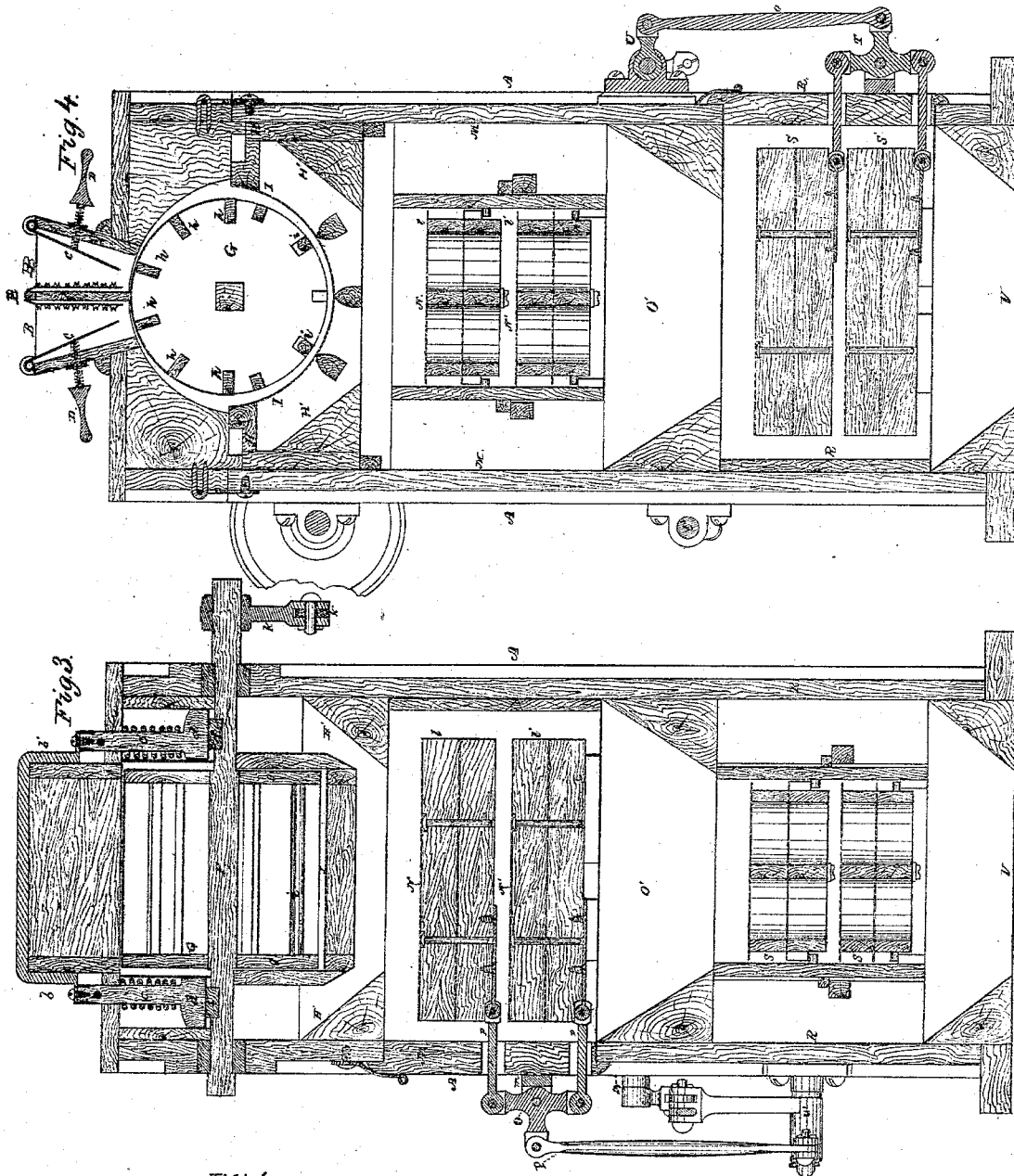
A. R. Hall

GEORGE W. WILSON.

Improvement in Apparatus for Combining or Mixing  
two or more Substances.

No. 115,799.

Patented June 6, 1871.



Witnesses.  
H. C. Hale  
Jos. A. Hall

G. W. Wilson  
by his attorney  
J. P. Hale

# UNITED STATES PATENT OFFICE.

GEORGE W. WILSON, OF CHELSEA, MASSACHUSETTS.

IMPROVEMENT IN APPARATUS FOR COMBINING OR MIXING TWO OR MORE SUBSTANCES.

Specification forming part of Letters Patent No. 115,799, dated June 6, 1871.

*To all to whom these presents may come:*

Be it known that I, GEORGE W. WILSON, of Chelsea, in the county of Suffolk and State of Massachusetts, have invented a new and useful Apparatus for Combining or Mixing two or more Substances so as to produce a perfectly homogeneous mass; and do hereby declare the same to be fully described in the following specification and represented in the accompanying drawing, of which—

Figure 1 denotes a top view, and Fig. 2 a side elevation, of my said apparatus. Figs. 3 and 4 are central and vertical sections taken in planes at right angles to each other.

It is a fact well known to those conversant with the compounding of comminuted or pulverulent substances in large quantities that the production of a purely homogeneous compound from a given number of elements is one that is rarely attained, and that the methods heretofore adopted for approximately reaching such results have been attended with great labor and care. An organized apparatus to lessen such labor and produce such desired end has long been a desideratum. To supply this want is the object of my invention.

In the said drawing, A denotes a rectangular case or structure for supporting the main operating parts. On the top of the said box is a duplex hopper, B B', denoting the two parts thereof. Each of the said parts has a false adjustable side or gage plate, C, hinged at its top to one edge thereof, and is provided with a set-screw, D, by which the area of the opening at the bottom of the hopper may be regulated at pleasure. To effect this with the utmost precision an index or scale of division may be applied to each side of the hopper to operate with the gage-plates. E is a corrugated or roughened saddle, which straddles the middle wall or partition between the hoppers, and is so applied as to play freely up and down thereon so as to continually agitate or move the mass of materials that may be in the hoppers; or the said partition may be corrugated and so applied as to be capable of having vertical reciprocating motions imparted to it. The arms *b b'* of this saddle or agitator extend down and are affixed to two vertical standards or rods, *c c'*, which project up from the sliding blocks *d d'*, disposed as shown in Fig. 3, each of the rods having a spring coiled

around it, as shown in such figure; the object of such springs being to restore the agitator to its normal position after having been acted on or raised by the wipers or rockers *f f'* disposed on the rocker-shaft F, on which the cylindrical mixer G is arranged. The said device G is a hollow cylinder having two solid heads, *g g'*, provided with a series of ribs or beaters, *h*, extending from one to the other, and disposed around the periphery thereof, the same serving a twofold purpose—first, to support the wire-netting which extends around the upper half thereof, and, second, to beat the materials falling through the meshes of the wire. Between the beaters of the lower half of the mixer G two rollers, *i i*, are arranged, the journals of which are loosely supported in the heads *g g'*. The said mixer and beater G has its lower half disposed within a rectangular box, H, provided with a semicircular cradle or mixer, I, which is made of woven wire, within which it works. The said beaters and rollers operate to beat and press the materials through the meshes of the mixer I. Furthermore, the said device G has a vibratory motion upon its axis through an arc of about forty-five degrees, which is effected by means of two connecting-rods, *k k'*, attached, respectively, to the rocker-shaft F, and a pulley, K, disposed on the main-driving-shaft L, which is arranged and supported as shown in Fig. 1. By thus giving the said device a short vibratory motion the materials to be mixed are maintained near the center of the mixers, and are not thrown off or against the sides of the case, as would result were it moved through the full arc of a circle. H H' are two inclined chutes extending from the sides of the case, and serve to direct any waste material into the center of the next subjacent mixer. Below the said mixer I another box, M, is arranged, the same being provided with two sets of horizontal reciprocating mixers, N N', which consist of two rectangular open frames, *l l'*, arranged one above another, and each having one or more strata of wire-netting attached thereto, as seen in Figs. 3 and 4. The mixers N N' are so disposed as to move at right angles to the mixer G and the mixer I, the object of such being to break up the movement of the mass of materials in lines or streaks and cause such materials to move at right an-

gles to that it moved through the former mixer. Each of the said mixers  $N N'$  is attached by a pitman,  $p$ , to one arm of a tri-armed rocker-lever or crank,  $O$ , pivoted to a projection,  $m$ , disposed on the side of the said case, as shown in Figs. 2 and 3. Each of the last-mentioned mixers, during each movement thereof, has an opposite reciprocation. To the outer arm of the said crank  $O$  a pitman,  $P$ , is jointed, which, through the intervention of sundry connections, as shown in the drawing, receives its motion from the main driving-shaft and thereby imparts the desired short reciprocating movements of the said mixer. Underneath the said mixers  $N N'$  is an auxiliary hopper,  $O'$ , which is of frusto-pyramidal form, the same being for the purpose of directing all the materials from the last-named mixers into the center of another box,  $R$ , arranged just below the said hopper. This said box  $R$  is also furnished with a series of duplex mixers,  $S S'$ , of similar construction to those last mentioned, but so arranged as to have their movements at right angles thereto, whereby the line of movement of the materials while acted on by such mixers will be again diverted so as to move at a right angle to that it had under the action of the last-described mixers. Each of the said mixers  $S S'$  is connected with a tri-armed crank,  $T$ , which is jointed to a projection disposed on the outer side of the case  $A$ , as seen in the drawing, its other arm being jointed to a pitman,  $o$ , which is connected with the wrist of a cranked shaft,  $U$ , which is connected by sundry connecting devices, as shown in the drawing, with the main driving-shaft, by which its proper reciprocatory movements are attained. The bottom of the said case  $A$  is provided with an opening,  $V$ , through which the compound from the last mixers passes, and is received into any receptacle arranged underneath the same.

I would remark that each of the materials to compose the compound is to be first sifted, so as to be of the desired degree of fineness, preparatory to being acted on by my apparatus, such not being designed as a sifter or bolter, but simply as a mixer, and the meshes of each mixer are to be of such a size as to allow each element of the compound to pass through the same with equal facility.

The mechanism for operating the two reciprocating series of mixers  $N N'$  is as follows: Such consists of the driving-shaft  $L$ , which is supported on the outside of the case  $A$  and near the top thereof, as seen in the drawing, and rotated by hand or by means of power, as may be desirable, such shaft having a fast and loose pulley,  $s s'$ , affixed at one end, its other end carrying another pulley,  $K$ , which is connected, by a band,  $t^1$ , to another pulley,  $t^2$ , disposed on another horizontal cranked shaft,  $t^3$ , arranged in a plane below the main shaft. To the wrist of such crank one end of a pitman,  $W$ , is jointed, its opposite end being jointed to one arm,  $O'$ , of a bell-crank,  $u'$ , the other arm

thereof being jointed to the pitman  $P$ , which is connected with the tri-armed crank  $O$ .

The mechanism for actuating the lower series of mixers  $S S'$  consists as follows: The pulley  $K$ , (on the main driving-shaft,) the band  $t^1$ , pulley  $t^2$ , crank-shaft  $t^3$ , pitman  $w$ , bell-crank  $u'$ , pitmen  $W$  attached to the upper arm of such bell-crank, jointed to the wrist of the rocker-lever  $W'$ , whose other end is provided with a wrist having a pitman,  $P^2$ , jointed thereto, the other end of the said pitman being in turn jointed to an arm of the tri-armed lever or crank  $X$ , to which the said mixers are attached by means of pitmen, as shown in the drawing. In operating with the said apparatus, in making a compound of one thousand pounds for instance, such compound being composed of five elements, and each of the elements being in unequal quantities—suppose element No. 1 contains five hundred pounds; element No. 2, two hundred pounds; element No. 3, one hundred and fifty pounds; element No. 4, one hundred pounds; and element No. 5, fifty pounds. Elements Nos. 4 and 5 being the smallest proportions are first to be compounded, they being in the ratio of 1 to 2. In order that both of these quantities shall pass through its hopper in the same time, the lower openings of the hoppers are to be so adjusted that the area of the one to receive the less amount shall be one-half that of the other. The two substances having been put into their respective hoppers synchronously, and having passed through the same and the series of mixers, we find, as a resultant, a compound containing one hundred and fifty pounds. This we next mix with element No. 3, (also containing one hundred and fifty pounds.) Having adjusted the discharging mouths of the hoppers to a like area, the said two latter masses are to be simultaneously passed into their hoppers, and, having passed through the apparatus, a new compound results, containing three hundred pounds. This compound is to be next incorporated with element No. 2, containing two hundred pounds. The discharging areas of the hoppers being again adjusted in the proportions of the said quantities—that is, as two to three—the said substances are to be introduced at the same time into the hoppers, and, having been acted upon by the several mixers and discharged into the receptacle disposed underneath the apparatus, we have another compound containing five hundred pounds. Finally, this latter compound is to be mixed with element No. 1, also containing five hundred pounds. As the quantities are alike, the lower mouths of the hoppers are to be adjusted to a like area, and the two masses passed into the hoppers and acted upon by the mixers as before, when we shall find a resulting compound of one thousand pounds, in which the several elements have become most thoroughly and perfectly mixed.

From the above it will be seen that by the

peculiar construction and operation of my said apparatus the elements to be compounded are so brought together and operated on by the several devices employed as to become most intimately commingled. In passing from the hopper the materials first fall upon the vibratory cylindrical mixer, and, passing through the meshes thereof, they are met in their fall by the series of beaters, which beat and throw them alternately back and forth. Falling next upon the concave cradle or mixer, they are forced through the same by the action of the rollers of the aforesaid mixer. From the said cradle or concave mixer they are forced, by the action of gravity, upon the upper of the horizontal series of compound mixers, which not only give the same double reciprocating movements in opposite directions, but are so arranged as to change the movement of the materials to right angles from their former course, whereby the line of streaks or veins of the mass is broken up. From the latter mixers the mass is concentrated by the auxiliary hopper underlying the same, upon the lower horizontal series of mixers, which are disposed and operate like those last mentioned, with a double reciprocating movement in a direction at right angles to such latter series, so that the movement of the mass is again diverted and moves at a right angle to its last course, whereby the commingling of the various elements is most perfectly attained.

Having described my invention, what I claim is as follows:

1. The duplex hopper, substantially as set forth.
2. The duplex hopper, in combination with

one or more mixers, substantially as and for the purpose set forth.

3. In combination with the duplex hopper the reciprocating agitator, substantially as and for the purpose set forth.

4. The adjustable gage-plates C C', in combination with the hopper, as and for the purpose set forth.

5. The cylindrical mixer G, provided with beaters and rollers, as described, in combination with the cradle or concave mixer, substantially as hereinbefore specified.

6. The horizontal reciprocating mixers N N', constructed as described, in combination with the mixers S S', arranged in manner and for the purpose stated.

7. The mixers N N' and S S', constructed substantially as set forth.

8. The combination of the vibratory cylindrical mixer provided with beaters and rollers, as described, and the concave mixer I with one or both series of horizontal mixers, arranged in manner and for the purpose set forth.

9. The hereinbefore-described apparatus for mixing pulverulent substances, the same consisting of the duplex hopper, the agitator, the cylindrical mixer, the concave mixer, and the two series of reciprocating horizontal mixers, the whole being arranged within a suitable case or structure, and made to operate together, substantially as and for the purpose set forth.

GEO. W. WILSON.

Witnesses:

F. P. HALE,  
F. C. HALE.