3 Sheets--Sheet 1.

C. W. SIEMENS.

Pneumatic Dispatch Apparatus.

No. 141,294. Patented July 29, 1873.

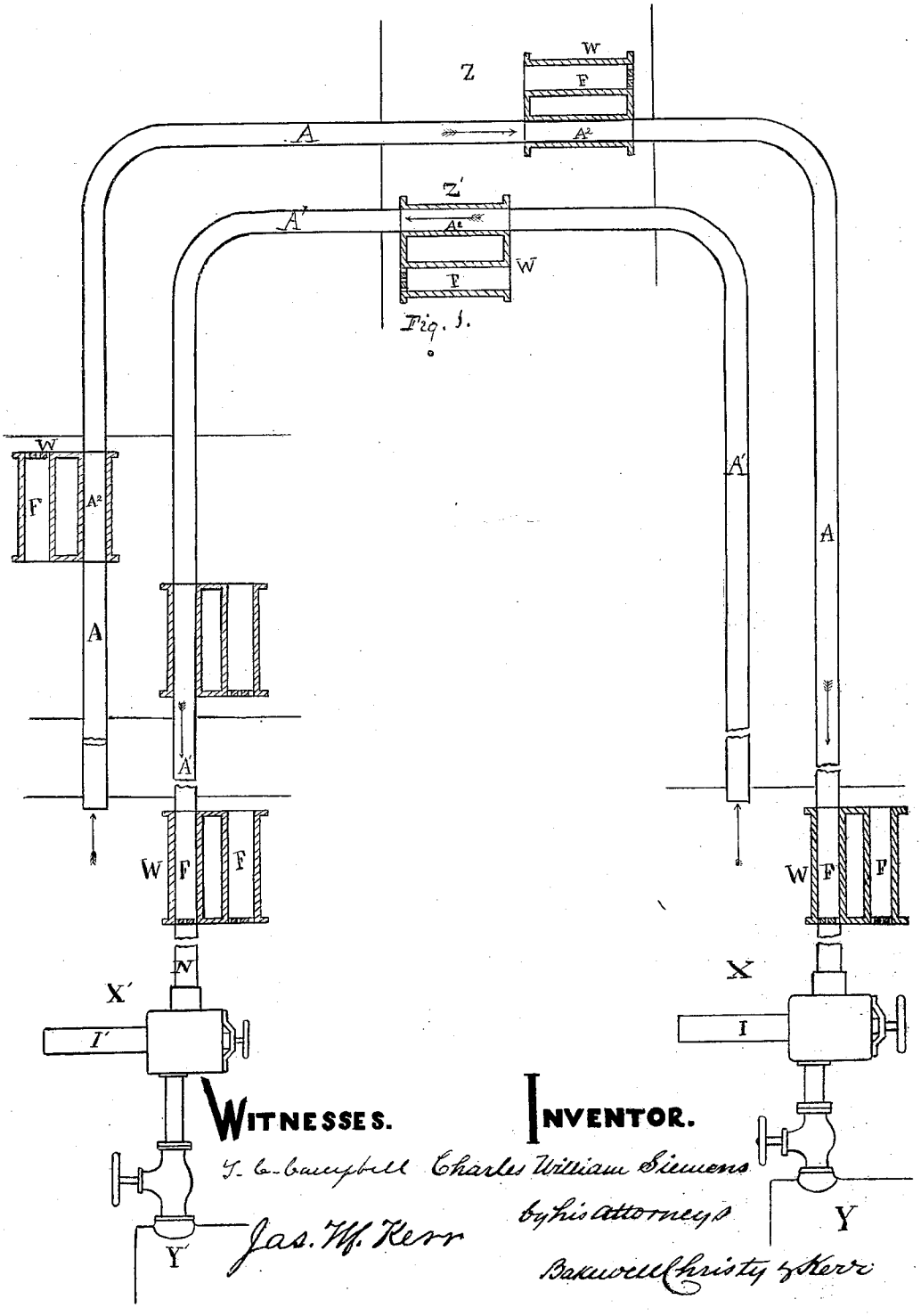

Fig. 1.

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Fig. 2

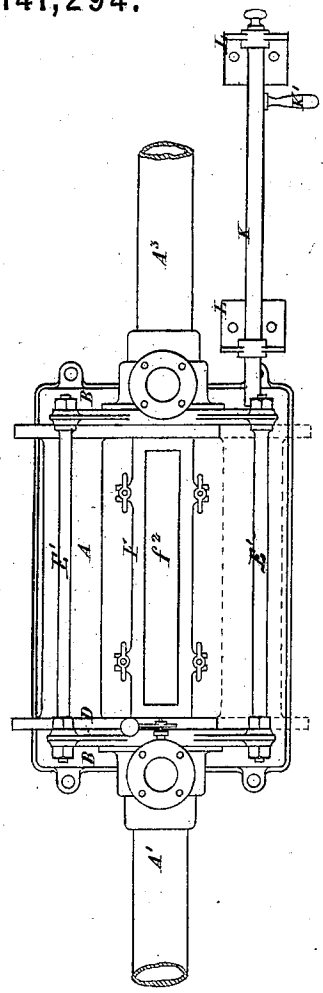

Fig. 3

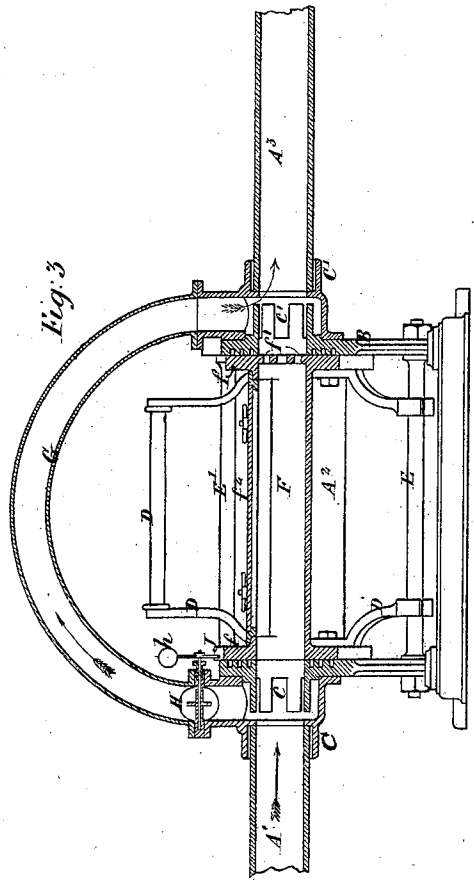

Fig. 4.

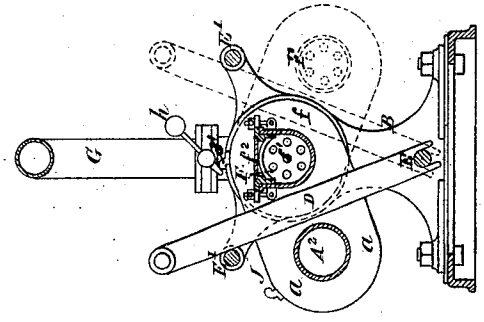

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Fig.5.

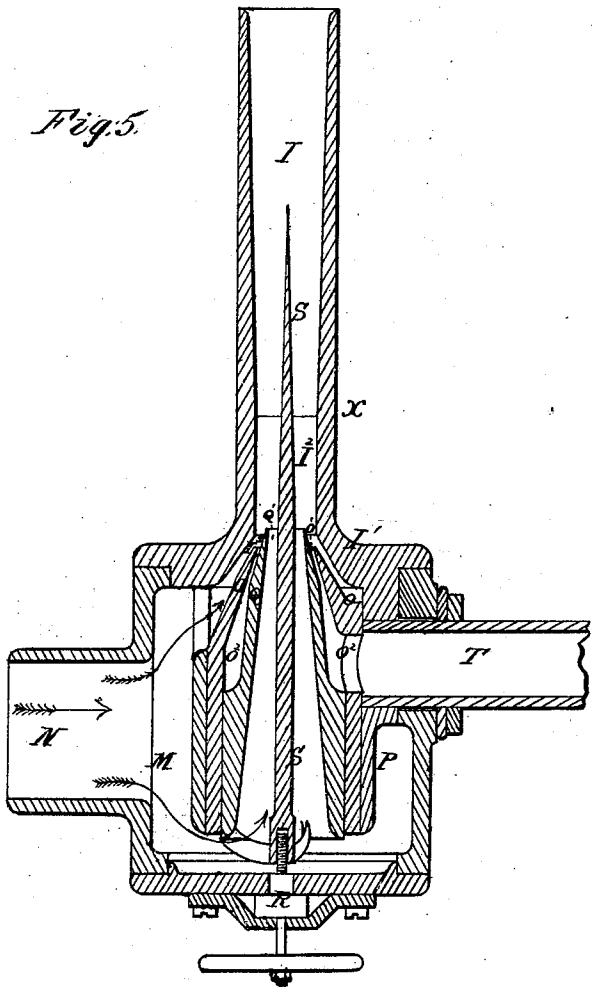
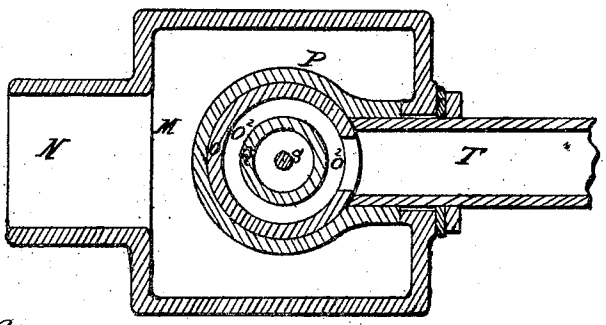


Fig.6.



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Charles D. Abel
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Inventor

Charles William Siemens

UNITED STATES PATENT OFFICE.

CHARLES WILLIAM SIEMENS, OF WESTMINSTER, ENGLAND.

IMPROVEMENT IN PNEUMATIC-DISPATCH APPARATUS.

Specification forming part of Letters Patent No. **141,294**, dated July 29, 1873; application filed December 26, 1871.

To all whom it may concern:

Be it known that I, CHARLES WILLIAM SIEMENS, of Westminster, county of Middlesex, England, have invented an Improved Method of, and Apparatus for, Conveying Dispatches and other Light Objects through Tubes, partly applicable for other purposes; and do hereby declare that the following description, taken in connection with the accompanying drawings hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvement, by which my invention may be distinguished from others of a similar class, together with such parts as I claim and desire to secure by Letters Patent—that is to say:

Pneumatic tubes, as heretofore employed for conveying carriers containing light objects, have been constructed as closed circuits, through which the air has been made to circulate continuously by means of a pump or fan, though in such circuits it has been proposed to employ the ordinary form of steam-jet for the same purpose. Now, according to my present invention, instead of forming the pneumatic tube as a closed circuit, I allow the air to enter freely at the one end of an open loop, where the carriers are introduced, and I connect the other end (being situated at the same station) to an exhausting apparatus of the construction hereinafter described, wherein a jet or jets of steam or other elastic fluid under pressure is caused to induce a current of air from the pneumatic tube through the apparatus, thereby producing the requisite current of air through the tube for propelling the carriers; or, in place of forming a loop with only one end station, as described, the loop may be divided into two separate lengths, with two end stations, such exhausting apparatus being applied to the one length at the one end station, and another to the other length at the other end station, while one or more intermediate stations may be arranged on each length between the end stations. At intermediate and end stations I sever the pneumatic tube, making the two ends terminate a certain distance apart in parallel face-plates held firmly by distance pieces or bolts capable of adjustment. In the space between these faces a rocking frame, containing two or more lengths of straight pipe, is so adjusted as to bring one or other of these pipes in a line with the two separated ends of the pneumatic main tube, so as to form the continuation from the one end to the other; and supposing that a carrier has previously been placed into the movable length of pipe so inserted, it will instantly be caught up by the current passing through the main tube and be delivered at another receiving station. If it is intended to receive a carriage at any intermediate station, or at the terminal station, the rocking-frame is moved so as to bring a length of pipe in a line with the main tube, the off end of which pipe is partially closed, so as to retard the motion of the carrier on passing into the movable pipe and to bring it to a dead stop within the same. By means of a side motion of the rocking frame the length of pipe containing the carrier is brought out of line with the main tube, and the carrier is removed from it by pushing a bolt through the orifice in the closed end thereof in the direction of its axis. A by-pass is provided to maintain the flow of air through the main tube while these changes are being effected. Leakage of air between the surfaces of the face-plates and the end surfaces of the movable pipes is prevented or greatly diminished by means of circular grooves formed in the meeting-surfaces which produce eddies in the passing streamlets of air, whereby their progress is greatly retarded and rendered practically of no account, and a free motion of the rocking-frame without friction between the face-plates is thus rendered admissible. The before-mentioned exhaust apparatus for producing the current of air through the pneumatic tubes is of peculiar construction, and, in combination with a pneumatic-dispatch tube, constitutes part of my present invention, and which is arranged and operates in the following manner: I direct a current of high-pressure steam or other elastic fluid under compression through an annular orifice or orifices opening into a converging passage, and concentrically with such annular orifice or orifices I arrange one or more other annular or other orifices, through which a stream or streams of air proceeding from the tubes to be exhausted, and induced

by the steam jet or jets, is or are made to pass so as to impinge upon the steam jet or jets. The air, while commingling with the steam, is impelled thereby through the said converging passage into a tube of gradually-increasing sectional area, in which the combined stream will move forward with a gradually-decreasing velocity; by this means a vacuity of pressure will be produced at the junction of the contracted neck or passage with the said tube, which will have the effect of increasing the velocity of the combined streams at such point and consequently, also, of the induced currents of air entering the apparatus. The combined stream of steam and air is discharged from the open end of the tube into the atmosphere.

Having thus stated the nature of my invention, I will now proceed more particularly to describe the manner of performing the same, for which purpose I shall refer to the accompanying drawings, on which—

Figure 1 shows a diagram plan of my improved arrangement of pneumatic tubes, with exhausting apparatus applied thereto. Figs. 2, 3, and 4 show, respectively, a plan, a longitudinal section, and a transverse section of my improved receiving and sending apparatus. Fig. 5 shows a vertical section, and Fig. 6 shows a sectional plan of the arrangement of my exhausting apparatus, which I prefer to employ.

In the plan, Fig. 1, A A^1 are the pneumatic tubes, through which the carriers containing dispatches pass. These tubes are in two separate lengths, the one, A, being made to communicate at the one end station, X, with the exhausting apparatus I, while at the other end station, X′, it is open for the reception of carriers, a current being produced in the tube in the direction of the arrow by the exhaust apparatus. The other length of the tube A^1 communicates, in like manner, with the exhaust apparatus I′ at the end station X′, and is open at the station X. The exhaust apparatus I I′ are constructed and operate, in a manner to be presently described, for the exhaustion of the air from the one end of the pneumatic tubes, so as to produce a current of air through the same. They are supplied with steam from the generators Y Y′. At the end stations X X′, as also at intermediate stations Z Z′, are arranged the receiving and forwarding apparatus W W, of which the construction is shown at Figs. 2 to 4. A^1 A^2 A^3 is the circuit-pipe, in which the air is made to circulate in the direction of the arrow, and of which the portion A^2 is removable, being made to fit accurately with planed end flanges *a* against the planed surfaces of the framing B, to which the sockets C C of the parts A^1 A^3 of the circuit-tube are secured. The part A^2 is carried by a rocking frame, D, turning upon the tie-rod E of the framing B at bottom, which frame D also carries the receiving tube or chamber F, for receiving the cylinders, bags, or carriers containing the dispatches from the circuit. This tube is conveniently formed, with its flanges *f* in one piece with the flanges of the tube A^2, so as, in like manner, to fit accurately between the surfaces of the framing B. This tube F is open at the end next to the part A^1 of the circuit-tube from which the dispatches come, and is closed at the other end, with the exception of small apertures f^1.

From this arrangement it will be seen that when the frame D is moved over into the position indicated in dotted lines in Fig. 4, so as bring the tube A^2 in a line with the circuit A^1 A^3, any carriers conveying dispatches, &c., will pass uninterruptedly, in the direction of the arrow, from A^1 through A^2 to A^3, on their way to some other station; but when the framing is moved over into the position shown in full lines, so as to bring the receiving-tube F in a line with the circuit, the carriers will pass from A^1 into the tube F, and will be retained there, the speed at which the carrier enters the tube being gradually absorbed by the carrier being made to force out the air contained before it in the tube, through the small holes f^1, into the tube A^3. As by this interposition of the receiving-tube in the line of the circuit the circulation of the air in the latter would be impeded, this is prevented by the application of a "by-pass," G, connecting the socket C of the tube at R′ with the socket C′ of the tube at A^3, and lateral openings *c c′* are formed in the tubes inside the sockets, through which, when the receiving-tube is in position, the current of air enters the by-pass at A^1, and passes again into the circuit at A^3, as indicated by the arrow. A throttle-valve, H, is provided in the by-pass, having an external weighted lever, *h*, which, when the frame D is moved over so as to bring the receiving-tube into position, is thrown over by tappet J′, carried by the frame, so as to open the valve and allow the air to circulate through the by-pass; but when the tube A^2 is moved into position, a second tappet, J, throws the valve H over so as to close the by-pass. A receptacle containing dispatches, &c., having been received into the tube F, the frame D is thrown over into the dotted position, Fig. 4, thus bringing the central hole f^1 at the closed end of the tube F, opposite a sliding rod, K, carried in a guide, L, Fig. 2, so that, by sliding this rod forward by means of the handle K′, it enters the tube and pushes out the receptacle contained therein. The tube F may be provided with a cover, f^2, with a glass pane in it for observing whether the carrier has entered the tube, and to facilitate the removal of the same, should it be necessary. If at a time that a carrier was received into the station dispatches had also to be transmitted from the station into the circuit the carrier containing them was previously placed in the tube A^2, so that when, by the throwing over of the frame, this was brought in the line with the circuit, the current of air passing through the latter at once conveyed the receptacles out of A^2 into A^3, and thence to its destination.

At the end stations a second tube, F, is substituted for the tube A^2, as all carriers have there to be caught up by the apparatus. In order to prevent leakage of air from between the surfaces in contact of the flanges *a f*, and of the framing B, circular grooves are formed in the latter, as shown, so as to produce eddies in any small currents of air that may pass. The motion of the rocking frame D is confined by the tie-rods *e e'* of the framing B, against which it rests when in the extreme positions.

Figs. 5 and 6 show the construction of my before-described improved apparatus, which I employ for exhausting the air from the pneumatic tubes. M is a chamber with a branch-pipe, N, communicating with the pneumatic tubes, or with a receiver to be exhausted. Upon the top of this chamber is fixed the tube I, having, first, a rapidly-converging portion, I^1; secondly, a portion, I^2, which converge gradually up to the point *x*, from which point the tube gradually increases in diameter (by preference in a parabolic ratio) up to the upder open end. Into the part I^1 of this tube projects a nozzle, O, so as to leave a narrow converging angular passage, I^3, between the nozzle and the tube. The nozzle O is fixed in a socket, P, in the chamber M, and into it is fitted, in a steam-tight manner, a second nozzle, Q, capable of being slid up and down somewhat by means of the adjusting-screw R for the purpose of regulating the width of the narrow annular orifice O' between the two nozzles. The orifice Q' of the nozzle Q is rendered of annular form by the introduction of a tapering rod, S, carried by the adjusting-screw R. The inclosed space O^2, between the two nozzles, communicates with a suitable steam-generator by means of the pipe T, so that steam passes into the space and issues thence through the narrow annular orifice O^1 into the part I^2 of the tube I. By means of the annular passage I^3, and the annular orifice Q' of the nozzle Q, air will be exhausted from the pneumatic tubes into the chamber M, and be made to impinge in the form of annular jets upon the inner and outer surfaces of the annular steam-jet. The air will thus be made to commingle intimately with and to assume a mean velocity with the steam, and will issue with the same into the converging portion I^2 of the tube. On passing thence into the diverging portion I of the tube, the velocity of the combined stream of steam and air will gradually diminish in consequence of the increasing sectional area, whereby a diminution of pressure will occur at the point *x*, having the effect of increasing the velocity of the jets of air and steam at the point where they enter the part I^2 of the tube.

In giving to the inducing jet of steam the annular form described, a comparatively large increase of surface of contact between it and the induced streams of air is obtained, whereupon depends the relative amount of air capable of being urged forward, and consequently the economical result of the arrangement.

By means of the above-described improved apparatus, a greatly-increased effectiveness of the steam-jet in inducing and propelling currents of air in pneumatic dispatch-tubes is obtained, as compared with the arrangements of steam-jets which have been employed heretofore for this purpose.

Having thus described the nature of my invention, and in what manner the same is to be performed, what I claim is—

1. A pneumatic-dispatch apparatus having, in combination, an open circuit-tube for the transmission of the carriers, one or more rocking frames for receiving and sending, and the propelling apparatus described, with concentric steam and air jets O^1 I^1 Q' opening into the converging and diverging passages I^2 I, substantially as described.

2. In receiving and sending apparatus for pneumatic tubes, the movable sections A^2 and F, sliding in a rocking frame between face plates B B, and arranged to be brought alternately in line with the pneumatic tubes A^1 A^3, substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 14th day of November, 1871.

CHARLES WILLIAM SIEMENS.

Witnesses:
CHAS. D. ABEL,
JNO. P. M. MILLARD.