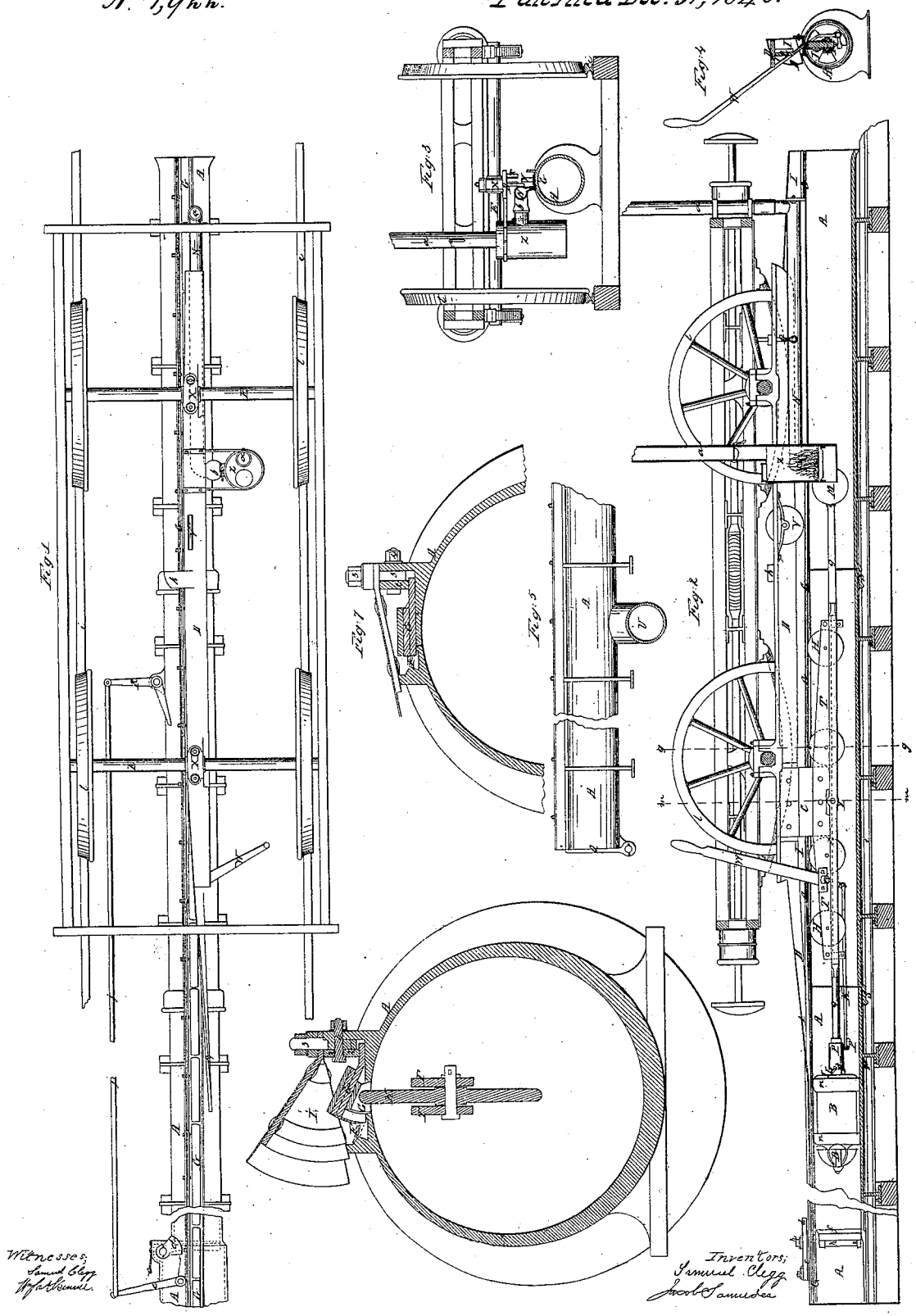
Clegg & Samuda.

Pneumatic Railroad.

No. 1,982. Patented Dec. 31, 1840.



UNITED STATES PATENT OFFICE.

SAMUEL CLEGG, OF GRAYS INN LANE, AND JACOB SAMUDA, OF SOUTHWARK, GREAT BRITAIN.

CONSTRUCTION OF VALVES FOR PNEUMATIC RAILWAYS.

Specification of Letters Patent No. 1,922, dated December 31, 1840.

To all whom it may concern:

Be it known that we, SAMUEL CLEGG, of Sidmouth street, Grays Inn Lane, in the county of Middlesex, in the Kingdom of Great Britain, civil engineer, and JACOB SAMUDA, of Southwark, in the county of Surrey, also in the Kingdom of Great Britain, civil engineer, have invented or discovered a new Improvement in Valves and the combination of them with machinery; and we, the said SAMUEL CLEGG and JACOB SAMUDA, do hereby declare that the nature of our said invention and the manner in which the same is to be performed are described and ascertained by the drawings hereto annexed and the words following—that is to say,

Our improvement consists in a method of constructing and working valves in combination with machinery. These valves work on a hinge of leather or other flexible material which is practically air tight (similar to the valves commonly used in air pumps). The extremity or edge of these valves is caused to fall into a trough containing a composition of bees wax and tallow or bees wax and oil or any substance or composition of substances which is solid at the temperature of the atmosphere, and becomes fluid when heated to a few degrees above it. After the valve is closed and its extremity is lying in the trough the tallow is heated sufficiently to seal up or cement together the fracture around the edge or edges of the valve which the previous opening of it had caused, and then the heat being removed the tallow again becomes hard and forms an air tight joint or cement between the extremity of the valve and the trough. When it is requisite to open the valve it is done by lifting it out of the tallow with or without the application of heat and the before named process of sealing it, or rendering it air tight is repeated every time it is closed. This combination of valves with machinery is made in the application of these valves to railways or other purposes by a line of partially exhausted pipes for the purpose of obtaining a direct tractive force to move weights either on the railway or otherwise. This we effect by laying down a continuous length of pipe containing a lateral slit or opening its whole length; a piston is made to travel in this pipe by exhausting or drawing out the air from the pipe on one side of the piston and allowing free access to the atmosphere on the other side of it; an arm from this piston passes through the lateral opening to attach to the carriages on the railway and draws them along with it. The whole of this lateral opening is covered by the valve before described and that part of it through which the arm passes is lifted to allow it to pass and also for admission of air to the piston by means of an apparatus connected to the arm, the carriage to which this arm is attached we call the driving carriage, to the hinder part of this carriage a long heater is attached which is drawn along by it upon the tallow contained in the trough and reseals the valve ready for the next train which repeats the operation above described. At certain distances which are regulated by the nature of the road, steam engines and air pumps or other apparatus are fixed for exhausting the pipes, (these engines we propose to place about one mile apart in the first instance and to vary the distance either for greater or less as we find to be most economical in practice) and at a short distance beyond the connection from the engine to the pipe, valves are placed, closing the end of one length or section of pipe and the beginning of the next, between which a space is left for stopping the trains if required, these valves also divide the pipe into suitable lengths to be exhausted by each apparatus or close the end where it is not required to be continued as on declivities where the carriages will run by their own gravity; thus every section of pipe is inclosed at the two ends by these valves and is exhausted by its own steam engine and apparatus, these valves which we call the separating valves are opened by the driving carriage to allow the piston to pass and are closed after the train has passed. If the trains are required to be started as frequently as possible the engines are employed constantly exhausting the pipe but if a longer period than is necessary to exhaust the pipe be required to elapse between starting the trains, the engines are employed in the interval to exhaust large vessels or receivers which when the train starts are opened to the pipe to assist to obtain the vacuum therein and to maintain it until the train has passed.

Description of the parts.—In all the figures of the drawings hereunto annexed

which show a method of applying this apparatus to a railway the same letters indicate the same parts.

Figures 1 to 5 inclusive are drawn on a scale of one inch to a foot. Figs. 6 and 7 inclusive are drawn on a scale of six inches to a foot.

Fig. 1, is a plan of the driving carriage to which the arm of the piston is connected with the upper part or body removed to show the valve. Fig. 2, is a longitudinal elevation of the same with one side of the pipe removed to show the apparatus for opening the valve, also showing a section of the furnace for the heater. Fig. 3, is an end elevation of the same. Fig. 4, is a section of the continuous pipe cut at right angles to Fig. 2, at *m*, *m*, showing the valve open and the manner of attaching the arm to the driving carriage, also the gear for opening the safety valve in the piston. Fig. 5, is a side elevation of the end of one of the continuous lengths of pipe showing the communication to the exhausting apparatus and the closing or exit separating valve. Fig. 6, is a transverse section of the continuous pipe and the frame in which the wheels for opening the valve are fixed cut at right angles to Fig. 2 at *g g*. Fig. 7, is the same view as Fig. 6 with the valve and protecting cover closed. A A the continuous pipe, this pipe is lined with a composition of bees wax and tallow similar to that used for sealing the valve. B the piston, this piston has two expanding leathers *n*, *n*, similar to those used in the pistons of air pumps—one of these leathers is fixed about 14 inches in advance of the other, so that no air may leak into the pipe A when the piston passes the recess formed for the separating valve *f*. C the arm which connects the piston to the driving carriage. D perch or bar attached to the axles E of the driving carriage by the bearings X. F the trough or groove containing the tallow in which the edge of the valve G is immersed. G G continuous valve formed of leather or other flexible material riveted between plates of metal in such a manner that the leather forms a hinge as in common pump valves, the fixed side of this hinge is fastened down by a bar of iron 2 laid edgewise longitudinally along it and pressed down on its surface by the screw bolts and nuts 3 this bar is kept in its place against the side of the pipe by the screw bolts and nuts 4 as shown at Figs. 6 and 7, when thus screwed down a composition similar to that used in the trough is poured in at the back of the leather. H wheels for lifting the valve G G working on pins in the frame T which is firmly attached to the arm C. I cover for protecting the valve G and the trough from the weather and accidents. J a valve in the piston B which is opened or shut by sliding it around on its face so as to uncover or cover openings made in the piston. W a lever attached to a cylinder P by a rod K, the cylinder P slides on a key fitted in the piston rod *g* which prevents it from turning around; a pin P′ in the cylinder P slides in the spiral chase L formed in the neck of the valve J for that purpose, the valve is opened by pushing the long end of the lever W which draws the rod K and with it the cylinder P to which it is attached and thus by causing the pin P′ to move in a right line turns the valve around. M balance weight to keep the piston B from pressing unequally against the sides of the pipe A A. Y universal joint to allow the balance weight to act and also to allow for inequalities in the pipe or rails. N tube or flue receiving heat and flame from the fire place Z, the bottom side of this tube rests on the tallow contained in the trough F; this tube we call the heater. O small rod or universal joint by which the heater N is attached to the perch D. *f* valve working on a hinge *h*, *h*, for closing the pipe near the end at which the piston enters. This we call an entrance separating valve. Q Fig. 5 valve for closing the other end of the pipe. This we call an exit separating valve. C, lever catching into the stop *d*, for keeping the separating valve *f* shut or open. *e* spring for pressing the lever C up to the stop *d*. R a second lever attached to the lever C by the rod *j* which should be about thirty feet long. *k* cam or stud projecting from the perch D for opening the valve *f*. *i* the rails on which the carriages travel. *l* the wheels of the driving carriage. U a branch for connecting the pipe A to the exhausting apparatus. This branch should be about thirty feet from the valve Q. V wheel attached to the perch D by a spring *r*. This wheel presses on the valve G. *b* spherical joint between the heater and fire place.

Operation: In order to put the system into operation the first section of the continuous pipe A A between two separating valves is partially exhausted; when the driving carriage is at rest the entrance separating valve *f* is opened by an attendant but when in motion by the cam *k* coming in contact with the lever R which draws the rod *j* and disengages the lever C from the catch *d*. The valve then being disengaged will open by the atmospheric pressure and fall back into a recess cast in the pipe. The lever is kept up to the catch by the spring *e* which causes it to catch again when the valve is wide open and keep it from closing; the valve *f* being opened, one side of the piston B is exposed to the rarified atmosphere in the pipes, while the other side receives the full pressure of the external atmosphere, this difference of pressure causes the piston to move forward and draw with it the driv-

ing carriage to which it is attached, this carriage as it goes along constantly raises the valve G G by means of the wheels H to admit the external atmosphere freely to the back of the piston and to allow a space for the correcting arm C. The cover I is at the same time lifted by the perch of the driving carriage as shown at Fig. 2. The wheel V which follows the arm C presses down the valve G ready for the heater N which is attached to and follows the driving carriage to remelt the tallow which has been broken up by lifting the valve G. This heater is kept hot by a fire lighted in the fire place Z the flame and heat from which passes through the tube N and the valve is thus resealed and left in a fit state for the approach of the next train; when the train is stopped the damper shown by the dotted lines in that part of the tube at (*b*) is closed and that in the chimney (*a*) is opened which causes the flame to escape at the chimney (*a*) instead of passing through the heater (N) and escaping at (*a'*) the length of this heater is regulated by the speed at which the trains are intended to travel. When the train arrives near the end of a portion of the pipe the piston after passing the branch U condenses or compresses the air in the remainder of the pipe which by its pressure opens the valve Q. This valve may be closed after the train has passed by an attendant. The movement of the universal joint Y is limited so as to be only sufficient for the inequalities of the rails and continuous pipe but it will not allow the piston to diverge from its line enough to prevent it entering the next portion of the pipe, the end of which is made larger or bell mouthed to receive it. When it is necessary to retard the speed of the train it may be done by a common brake or by slightly opening the valve J in the piston by means of the lever W, this admits a portion of atmospheric air from the back of the piston B into the rarified or exhausted part of the pipe A in front of the piston and by this means lessens the difference of pressure between the front and back of the piston. When it is required to stop the train with the piston in the pipe the valve J must be opened full, this valve must be of sufficient dimensions to establish an equilibrium or nearly so on both sides of the piston and consequently to destroy the moving power of the train.

In every socket or joint of each pipe a space is left between the packing it contains as shown at S Fig. 2. This space is filled with a fluid or semi fluid which will be drawn into the pipe before any leakage of air can take place and which may be occasionally replenished.

The composition we prefer is a mixture consisting of three parts tallow and one part bees wax but these proportions may be varied according to circumstances so long as it forms always a solid substance at the temperature of the atmosphere and can be rendered partially fluid as above described.

Now that we have described the nature construction and action of our improved valves and the application thereof to railways and other purposes we do not claim the precise size or form of the various parts or the using of the precise materials herein described but

We claim exclusively—

The method of constructing and using valves as above described and combining the said valves in the manner above described herein for rendering available the application of direct tractive force either on railways or otherwise.

SAMUEL CLEGG.
JACOB SAMUDA.

Witnesses:
WALTER HUGHES,
WM. JAS. SKINNER.