Oct. 21, 1941. H. S. PARDEE 2,260,051

TRAFFIC SEPARATOR

Filed June 24, 1940 4 Sheets-Sheet 1

FIG. 1.

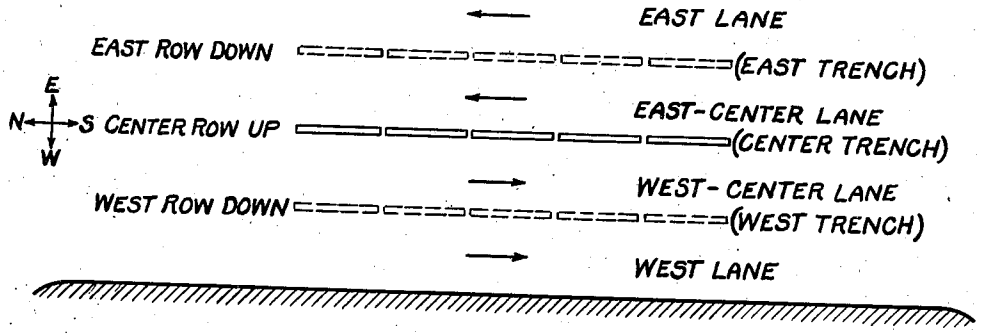


FIG. 2.

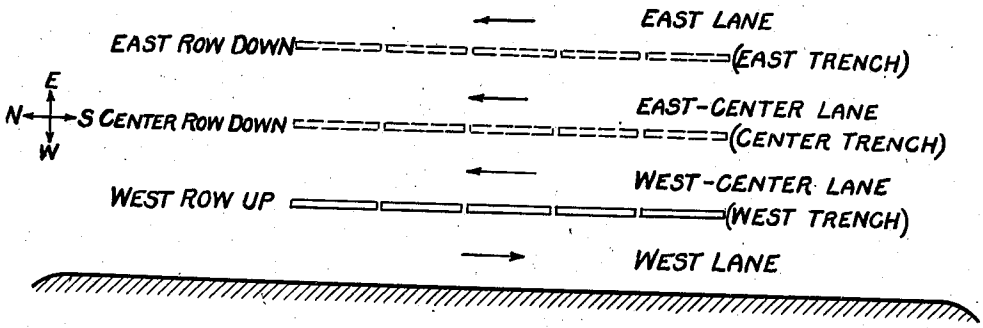
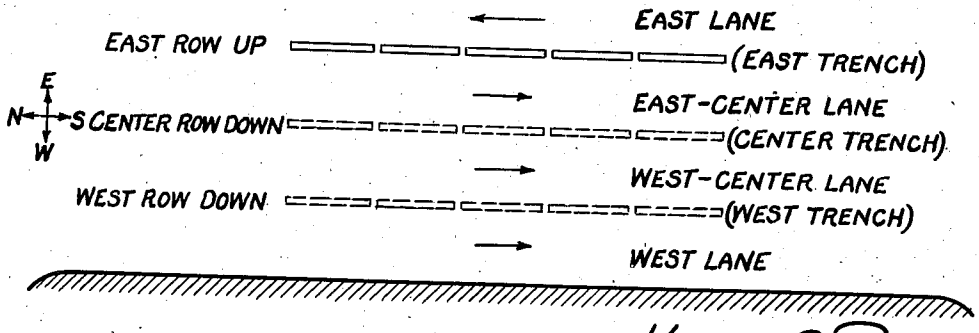


FIG. 3.



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TRAFFIC SEPARATOR

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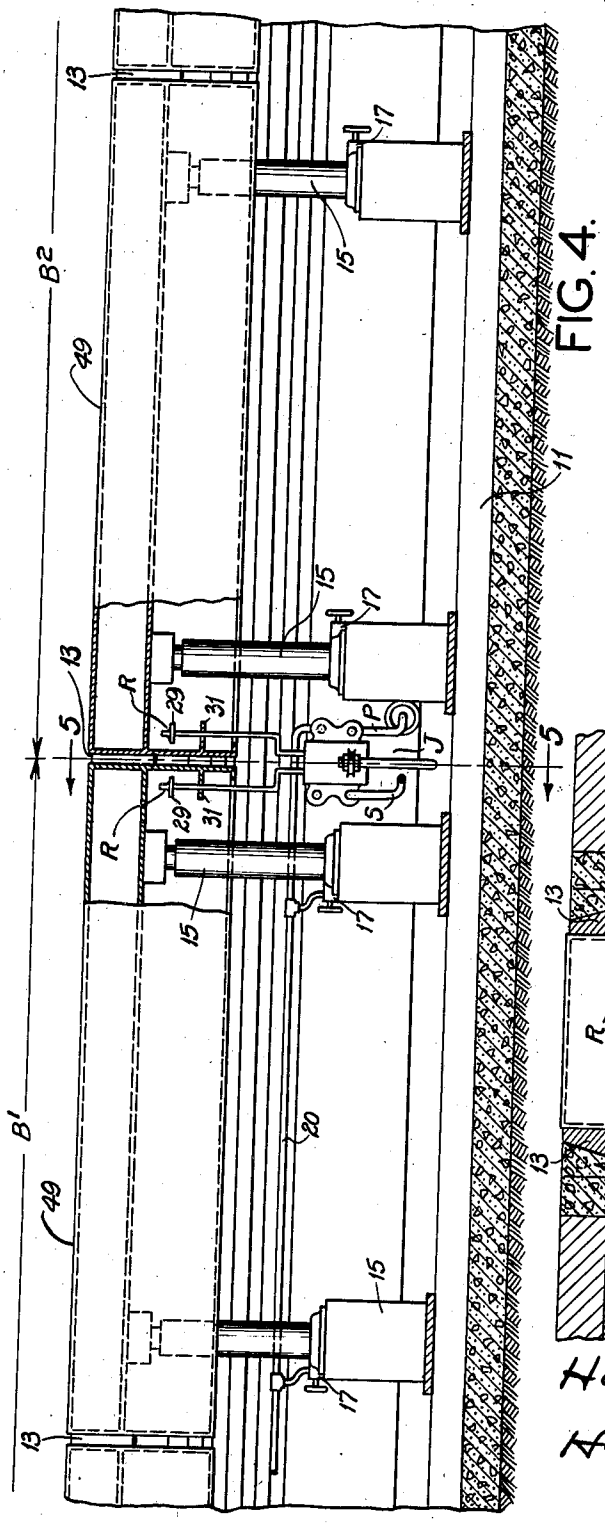


FIG. 4.

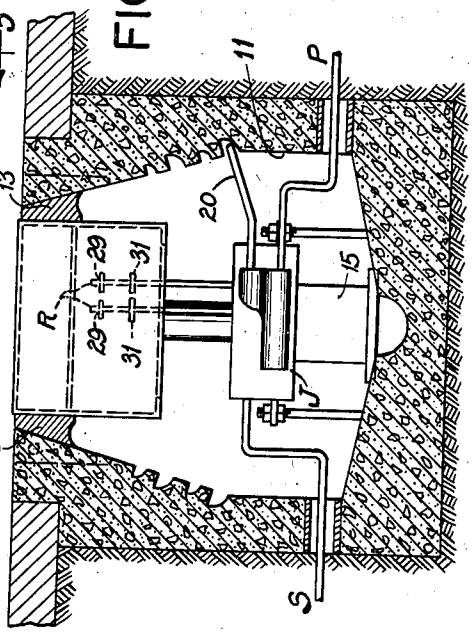


FIG. 5.

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TRAFFIC SEPARATOR

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FIG. 6.

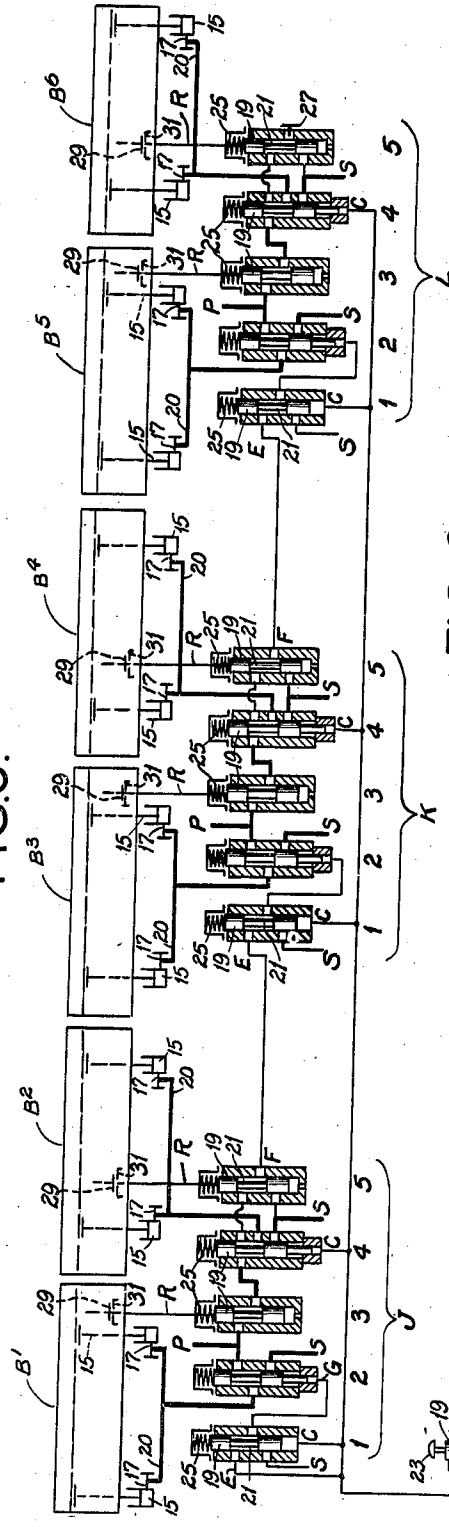
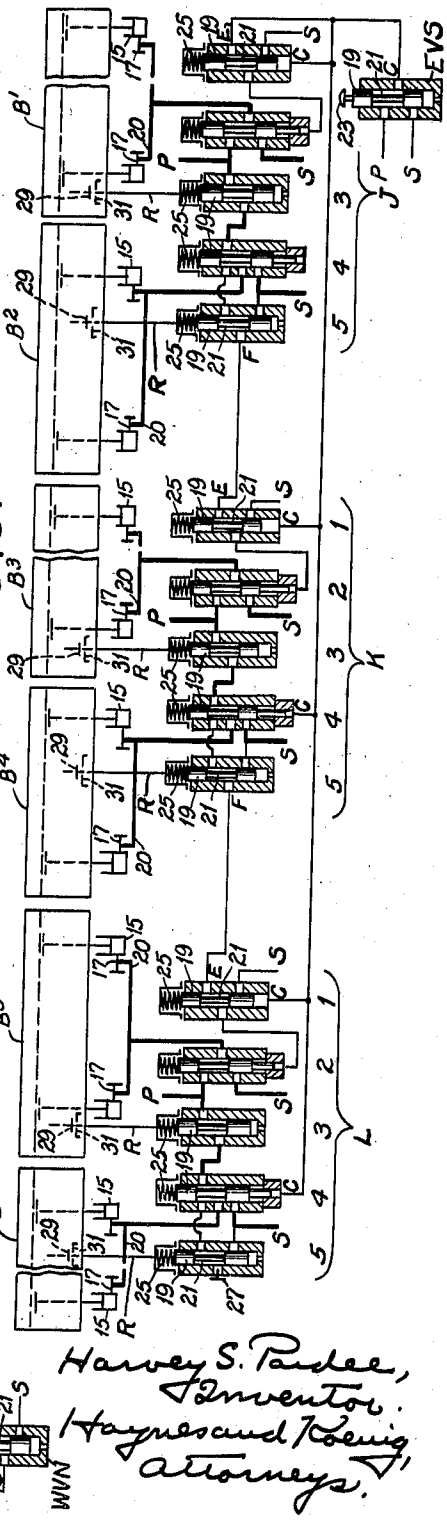


FIG. 8.



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TRAFFIC SEPARATOR

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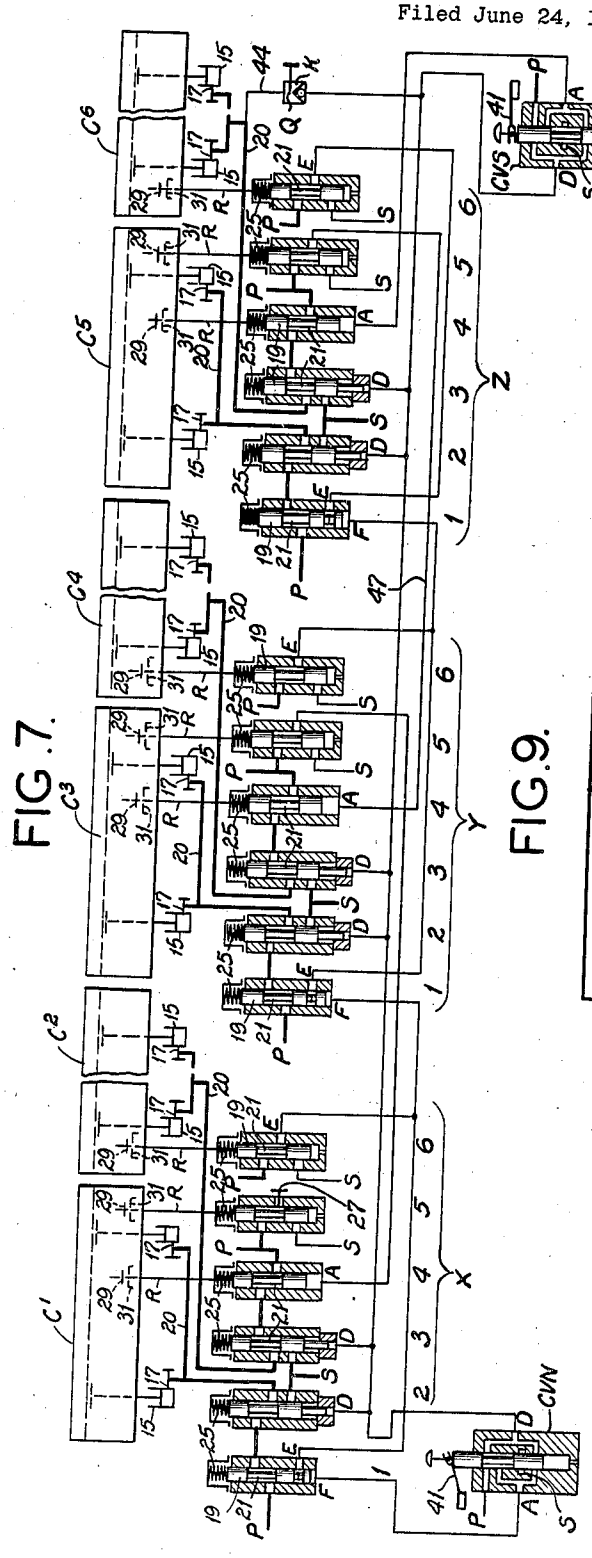


FIG. 7.

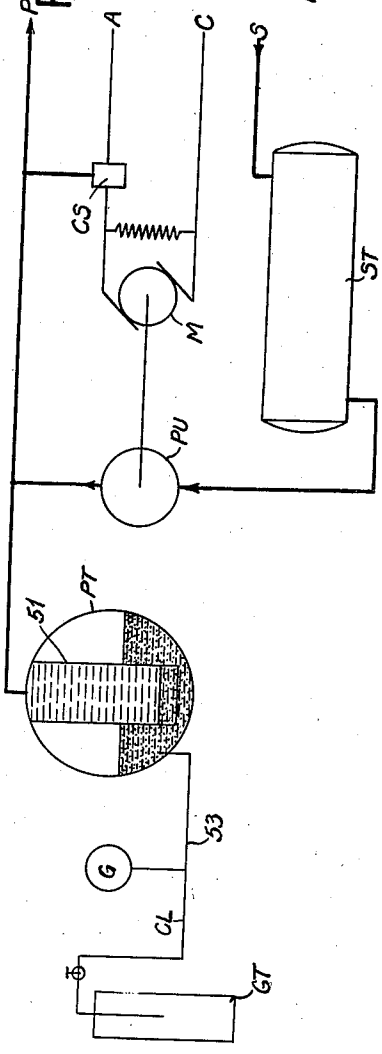


FIG. 9.

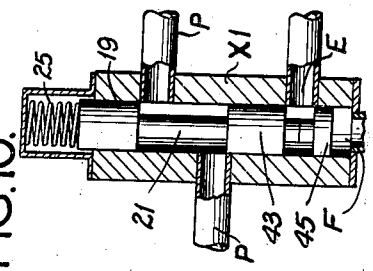


FIG. 10.

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Patented Oct. 21, 1941 2,260,051

UNITED STATES PATENT OFFICE

2,260,051

TRAFFIC SEPARATOR

Harvey S. Pardee, Ravinia, Ill.

Application June 24, 1940, Serial No. 342,089

11 Claims. (Cl. 94—1)

This invention relates to a traffic separator and traffic control method, and more specifically to means for varying the effective width of a roadway by means of vertically movable traffic-separating barriers arranged to divide the traffic into equal or unequal portions.

The invention is an improvement upon the construction shown in United States Patent No. 2,182,697 issued to O. K. Jelinek on December 5, 1939.

Among the several objects of the invention may be noted the provision of an improved control means and method for raising and lowering barriers to accommodate, without confusion, various conditions and especially volume of traffic in either of two opposite directions; the provision of control means of the class described which may be safely changed from one setting to another while traffic is in motion; and the provision of reliable operating means for effecting the end in view, the operations for which may easily be learned. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, steps and sequence of steps, features of construction and manipulation, and arrangement of parts which will be exemplified in the structures and methods hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which is illustrated one of various possible embodiments of the invention:

Figs. 1, 2 and 3 are traffic diagrams illustrating the use of the invention for various traffic volumes;

Fig. 4 is a longitudinal section showing certain mechanical features;

Fig. 5 is a vertical section taken on line 5—5 of Fig. 4;

Fig. 6 is a longitudinal schematic diagram showing certain barriers in an arbitrarily designated west trench of Figs. 1–3;

Fig. 7 is a view similar to Fig. 6 but in an arbitrarily designated center trench of Figs. 1–3;

Fig. 8 is a view similar to Fig. 6 but in an arbitrarily designated east trench of Figs. 1–3;

Fig. 9 is a diagrammatic view of certain pumping apparatus; and,

Fig. 10 is an enlarged valve detail.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

In the above-mentioned Jelinek patent there is illustrated a rack and gear mechanism for raising an entire barrier, which may be of any desired length. This is actuated by a pull on the rack in one direction simultaneously to raise all parts of the barrier, and by a pull in the other direction simultaneously to lower it at all points.

In the system described herein the barrier is basically divided into short sections, say 25 ft. each, and each section is raised and lowered by means of hydraulic hoists, the hydraulic connections to which are arranged to effect any desired sequence or speed of operation by means of suitable valves and controls. This is intended to be exemplary of various means for obtaining sequential operation.

Referring now more particularly to Fig. 1, to illustrate the end in view, we may start with the highway divided into two equal east and west portions. The center barrier row (shown in solid lines) is in raised position, preferably about 8 in. above the road, while the east and west barrier rows are in lowered positions flush with the level of the road. Thus the west and west-center lanes are open for southbound traffic while the east and east-center lanes are open for northbound traffic, as shown.

When the time comes that the volume of northbound traffic greatly exceeds the southbound, it is desired to provide three lanes open for northbound traffic and one for southbound, as in Fig. 2. This may be effected by raising the west row of barriers and lowering the center row. However, in practical operation, from the standpoint of safe traffic control, it is desirable first to reverse the direction of traffic in the west-center lane (of Fig. 1) and this reversal is accomplished preferably in the following manner:

An operator at the north end of the system deflects the flow of traffic entering the west center lane and directs it into the west lane. At the same time he starts the raising of the west row of barriers. This raising is progressive, according to a wave motion, starting at the north end and the speed of the wave motion is something less than the normal speed of traffic. Thus the raising of the barriers in the west row keeps behind the last vehicles in the west-center lane and the barriers therefore do not rise out of the ground while vehicles are passing over them. This has the effect of preventing vehicles directed into the west lane from again moving out into the west-center lane before they reach the end of the lane as newly defined by the lifting barriers. This is an advantage over the Jelinek construction and avoids confusion in this west-center lane during change.

As the last of the vehicles clear out of the west-center lane at the south end, the west row of barriers is fully raised shortly thereafter, and the operator at the south end, being stationed where he is aware of this fact, actuates a control to lower the center row of barriers preferably simultaneously for the whole length, and then admits northbound traffic to the west-center lane. This completes the operation with three lanes northbound and one southbound, as shown in Fig. 2.

When the traffic again approaches equal volume in both directions, and it is desired to restore the conditions of two equal lanes in each direction (as in Fig. 1), the traffic in the west-center lane of Fig. 2 must again be reversed. To effect this the operator at the south end deflects the northbound traffic entering the west-center lane and directs it into the east-center lane. He then operates a control at his end to initiate the progressive raising of the center row of barriers starting from the south end. When the traffic has cleared out of the west-center lane at the north end the operator at the north end actuates a control to lower the west row which preferably takes place along the whole length simultaneously. At the same time the north operator admits southbound traffic to the west-center lane thus reversing the traffic in that lane.

When the southbound traffic exceeds in volume that of the northbound traffic (Fig. 3), the direction of traffic in the east-center lane is reversed from the south end in the manner described for reversing the traffic in the west-center lane and the east row of barriers is raised and the center row lowered. In a similar manner equal, two-lane traffic in each direction is again restored with the center row in raised position and the others down.

In effecting the progressive wave motion of barrier raising it is not necessary that each individual 25 ft. length partake of the wave motion but they may be operated in groups, say of 12, comprising a 300 ft. length of roadway. Thus if each 300 foot group takes approximately 10 seconds to raise to barrier position, and the next group starts to rise immediately afterwards the progress of the wave will be approximately 20 M. P. H. and this rate will keep reasonably behind traffic clearing out of the respective lane at, say, 30 M. P. H.

It is to be understood that the center row of barriers need not be at the exact center of the road, as where the traffic is normally greater in one direction than another, and for this reason this row of barriers may be more broadly designated as a mid or main row. For example, a mid or main row may divide a five-path highway into two lanes of two and three paths respectively, the basic principle, still applying.

The wave sequence may be effected by any suitable means such as a program clock to operate the successive sections at any predetermined intervals by controlling the respective hydraulic valves to be described. I prefer, however, to actuate each section (after the first which is manually started) by utilizing the movement of the preceding section to actuate the valve for the succeeding section. Thus if an abnormal condition prevents the raising of one section the following sections are prevented from rising until the normal conditions are restored.

While any suitable means may be used for effecting the sectional raising according to the above described system of operation, I prefer to divide the barrier row into vertically movable portions in the form of steel, or concrete, boxes **49** open on the under side and in length about 25 ft. by 20 in. wide. These are set down into a slot or trench **11** in the roadway which is lined on the exposed edges with metal castings **13** (see Figs. 4 and 5). Under each box near each end a hydraulic hoist **15** is placed and these are arranged to raise the box to project about 8 inches, above the roadway.

In the base of each hoist is an adjustable throttling orifice **17** to limit the flow of fluid from hoist lines **20** and thus predetermine the time of raising and lowering. In a 300 ft. length of road there will normally be twenty-four hoists fed from a single hydraulic line. This line is supplied with hydraulic fluid through a valve, hereinafter to be described. The fluid is preferably derived from a hydro-pneumatic power system such as described in my United States Patent No. 1,927,752 issued September 19, 1933. Fig. 9 shows the essential parts of this system for the present purpose. The liquid stored under pneumatic pressure in the hydro-pneumatic tank PT is supplied by a pump PU drawing from a sump tank ST. The pump PU is automatically cut in and out of service as the pressure falls below and reaches predetermined pressure limits. This is done by a pressure controlled switch CS in the electric circuit AC of the motor M which drives pump PU. The discharge from the hoists during the lowering movement is directed into the sump tank over lines S.

It is possible of course to have one pressure tank and one sump tank for the whole system and run supply and return lines the entire length. However, in order to minimize piping, I find it convenient to sectionalize the power system with a pressure tank, or group of pressure tanks, and the corresponding sump tank, located approximately at 600 ft. intervals, i. e., for each pair of 300 ft. sections.

The hoist control valves are located in the trench at the point of junction of the first and second 300 ft. sections; at the junction of the third and fourth sections, and so on. In Fig. 6 is shown a typical system for the west barrier row with six controlled sections (of 300 ft. length each, for example) and three groups of hoist control valves. It should be noted that in Fig. 4 we see only the end boxes **49** of box groups forming the controlled sections B^1, B^2, B^3 etc., of Figs. 6 and 8, and C^1, C^2, C^3 etc., of Fig. 7. In Figs. 6–8, since each group of boxes acts as a barrier unit, only the end ones of the hoists of each unit have been shown and the whole section is otherwise diagrammed as a unit. This suggests that for short lengths of roadway, individual boxes may be sequentially or progressively controlled, and for longer lengths groups of boxes may be controlled as sections, as detailed herein.

At the extreme north end of the system (Fig. 6) is located the operating valve WVN. The system for the east row is identical with that of the west row but in reversed position (see Fig. 8), wherein the operating valve is lettered EVS and is at the south end of the system.

The valve stems shown at **19** are of the sliding piston type with the central portion **21** reduced in area to provide passage for fluid. These valves are shown conventionally and separately for the sake of clearness, although in actual construction they may be assembled with other parts in a single casting and the interconnections provided by cored passages. The circuit principles are clear, however, from the diagrammatic illustration. Heavy lines indicate power fluid pipes while light lines indicate control and relay circuits.

As above stated, letters P indicate connections to the hydro-pneumatic power supply PT, and letters S are connections to the sump tank. The valve WVN is the manually operated valve preferably located on a pedestal at the north end of the system, for controlling the west row. The piston of this valve is provided with a button or

handle 23 manually operated upward for raising the barriers and downward for lowering them. In Fig. 6 all the valves are shown in position with the barriers in raised positions. In Fig. 4 the barriers are down.

When the button 23 of WVN is raised (as shown in Fig. 6), hydraulic pressure is admitted to line C and fluid pressure is transmitted to the under side of pistons of valves 1 and 4 of each hoist-control valve unit J, K, L, for the entire line C and these valve pistons 1 and 4 are immediately raised against the action of springs 25 respectively bearing downward on the top of each piston valve. Fluid pressure is also admitted to line E of valve J1 and through this valve to line G to the under side of piston valve J2, which also raises this valve. Valve J2 being thus opened, fluid pressure is admitted from P (heavy line) through J2 to the respective hoist line 20 of barrier B1 and this barrier or section of barriers starts to rise at a rate determined by the setting of the orifices 17 in the various hoists (two of which are shown).

The set of valves J is located under the junction point between sections B1 and B2 and a lost-motion mechanical connection is provided between the last box of section B1 and the piston valve J3. Any type of lost-motion mechanical connection is satisfactory, the one shown being a head 29 on stem R engageable after suitable motion by a surrounding collar 31 fastened to the box B1.

When the box has risen a predetermined amount the valve J3 is mechanically pulled open and fluid pressure from P is admitted to valve piston J4 which has already been opened by action of the fluid pressure in line C. Pressure thus flows to hoist line 20 of B2 and this section starts to rise. The first (or only, if there is merely one) box in this section B2 is mechanically connected at R (with lost-motion) to the piston valve J5 and fluid pressure is then admitted to relay line F. This is transmitted to port E of valve K1 and the sequence of operations is repeated for sections B3 and B4 in valve K the same as described for valve J. The same sequence follows for valve K and so on for as many sections as are provided, as suggested at L. The last No. 5 valve in L is not used, being plugged at 27. The plug is preferably installed to facilitate future extensions of the system. Thus the entire line of sections is raised progressively in a wave progression.

The velocity of the wave can be varied at will by regulating the flow through the hoist orifices 17 and by adjusting the lost-motion in the mechanical connections 29, 31. Thus if the valves are opened when the boxes are near the tops of their movements, the progress of the wave will be slower, while if the lost-motion is taken up near the bottom of the movement the progression will be accelerated.

In lowering the barrier row, the operator moves the piston of valve WVN to the lower position and thus connects control line C to the sump line S and thus discharges the pressure in line C to the sump tank ST. All the valves 1, 2 and 4 then immediately and simultaneously drop to discharge position by action of the compression springs 25 on top. The hoist lines 20 discharge to the sump ST and the barrier sections all lower simultaneously for the entire line.

It is to be noted that in the operation of this row of barriers both the raising and lowering operations take place from the same end. There is thus but one operating valve WVN for the row located at the north end for the west row of barriers, and one valve EVS at the south end for the east row.

Fig. 8 is like Fig. 6, except that it illustrates the adaptation to operation from the south end. Like numerals are used, except as to valve EVS which is equivalent to WVN.

In the case of the center row, however, it is normally necessary to be able to raise or lower from either end at will. In this case the relay action is two-way and the hoist control valve has six elements.

In Fig. 7 CVS represents the operating valve on the south end of the system for operating the center row of barriers from the south end, and CVN is an identical valve on the north end for operation from that end. C^1 and C^2 represent conventionally the 300 ft. sections of boxes adjacent to the north end; C^2 and C^3 the next pair of sections to the south and so on, to C^5 and C^6 the last pair of sections at the south end. Hoist control valve X, with elements X1, X2, X3, X4, X5 and X6, is located under the junction of sections C^1 and C^2; valve Y also with six elements under the junction of sections C^3 and C^4; and valve Z under the junction point of sections C^5 and C^6. As many additional sections as needed may, of course, be used.

The operating valves CVS and CVN are provided with three positions, upper (for raising), mid-position, and lower (for lowering). Each valve is spring-biased (see spring 41) so that it automatically returns to mid-position when manual movement is released. The valve CVN is shown in position for raising; the valve assemblies X, Y and Z are all shown in position for raising the barriers, and operating valve CVS is shown in mid-position.

When CVN is raised to upper position, fluid pressure is admitted to the line D from P which raises all the piston valves numbered 2 and 3. At the same time pressure is admitted to line A leading to the under side of valve piston X1. The lower portion of this valve is made of two separable parts 43, 45 (Fig. 10) so that it may be raised by admitting pressure to either F or E. All of the valve pistons are returned to lowering position by action of springs 25 on top. When X1 is raised by pressure in F from CVN, fluid pressure is admitted through X2, which has already been raised by pressure in the line D, to the hoist line 20 of C1 which causes these barrier boxes (or barrier section) to rise at the rate predetermined by the orifice setting.

The last box of C1 is mechanically connected (with lost-motion) to the pistons of valves X4 and X5 (see 29, 31). As C1 rises, valve X4 is mechanically pulled open at some predetermined point of the stroke and pressure is admitted through valve X3 (already open) to the hoist line 20 of C2. As C2 rises to some predetermined point, piston valve X6 is mechanically pulled open and pressure is admitted from P through X6 to the relay line E and thence to the under side of piston Y1. The cycle described for valve X is then repeated for Y and so on through valve Z at the south end of the system. It is noted that the line E at 6 also feeds back to E at valve X1 but this has no effect at this time because X1 is already opened by pressure under F. It is also noted that the operating valve CVS is in mid-position and the line D closed at the time the barrier row is being raised from the north end.

The system may now be lowered from either end. When either CVN or CVS is operated to its lowering position the line D is connected to sump and all of the valve pistons of 2 and 3 drop to the discharge position simultaneously, by action of their top springs 25, and the hoist lines 20 are all discharged to the sump at the same time. This lowers the barriers simultaneously.

Now suppose it is desired to raise the barrier row from the south end. The operating button of CVS is moved to raising position (valve CVN being at midposition) which places fluid pressure in the line D and raises all the valves 2 and 3 as before. Pressure is also admitted to the line A which raises the piston valve Z4. This admits hydraulic power from P through Z4 and Z3 (already raised) to the hoist line 20 of C6. As the box at the north end of this particular section raises, it mechanically pulls open the valve Z6 at some predetermined point of the stroke and pressure is then admitted from P to line E to piston valve Z1 at the point where the two parts 43, 45 of the piston are separable. This causes the upper part of the valve to rise and admit pressure from P through Z2, already raised by action of pressure in the line D, to the hoist line of section C5. As C5 rises it mechanically pulls open valve Z5, at some predetermined setting of the stroke, and this admits pressure through relay line 47 to port A under piston of valve Y4 and raises this valve to admit pressure to hoist line of C4 and the sequence of operations above described for the first pair of barrier sections is repeated for sections C4 and C3 and so on to the other end of the system.

After the sections are all raised progressively they may be lowered simultaneously by manual actuation of CVS or CVN to the lowering position, as above described.

In manual operation of the operating valves, it is usually necessary to hold the valve in raising or lowering position only a few seconds sufficiently to raise or drop the valves 2, 3. It may then be released and it automatically returns to midposition. Although the line D is under pressure this may gradually leak away at the piston valves 2, 3. To prevent this and to maintain pressure in this line when the operating valves are in midposition, I provide a line 44 connected to the nearest hoist line through a check valve k and restricting orifice Q to the line D. When pressure is admitted to the hoist line 20 of C6 it passes through line 44 through the orifice Q and check k to the line D and maintains the pressure in this line regardless of the slight leakage in the valves 2, 3. The line D is thus kept under pressure until one of the operating valves is moved to lowering position. The object of the orifice Q in the line 43 is to restrict the flow in this line to make up for the leakage only and to supply a negligible amount when the operating valve is in lowering position. The check valve is to prevent flow towards the hoist line 20 of C6 when the line D is first energized.

Fig. 9 illustrates a typical pumping station. PT is preferably a spherical pressure tank constructed otherwise in principle as described for Figs. 1, 3 and 4 of my United States Patent 1,927,752, the valve TV therein shown not being used in this application in connection with the pumping unit. In the spherical tank unsaturated working fluid shown simply by dash lines is retained in the central cylindrical tube 51 and saturated fluid shown by dash lines and dots is mostly outside the same. CL is a gas-charging line 53 connected to the gas tank GT for initially charging the system with gas pressure. G is a gauge for indicating the pressure in the tank. PU is the conventional pump driven by the motor M which is started and stopped according to predetermined limits by a conventional pressure cut-out CS and fed from the electric power lines AC. ST is the sump tank from which liquid is pumped into the pressure tank, and into which the liquid flows from the hoist cylinders when lowering and from the control lines when deenergized. S is the sump line connected to the points marked S on Figs. 4–7 and P is the pressure line connected to the points marked P on said Figs. 4–7.

It will be seen that by sectionalizing the system, that is, by providing sump and pressure tanks for pairs of sections (or less than the whole number of sections), the main power is transmitted only for short distances. The distance is 300 feet each way from each storage pressure tank PT.

On the other hand, the action of the valves themselves is controlled by the small connecting lines which are shown between them, which may be termed relay control lines, since they simply relay the pressure from one valve to another. These small lines, unlike the main lines, need not transmit substantial amounts of energy. For example, the relay lines such as between E and F in Fig. 6 are composed of ⅜ in. tube over a distance of 600 ft. or so in one example. Transmission of substantial hydraulic power required for actual lifting, if it were to be transmitted for a mile or so, for example, would require about 3 or 4 in. pipe. By sectionalizing for power transmission over short distances only, the size of pipe necessary may be reduced to one inch or less.

Another feature of the invention is in the use of a hydraulic power system for barrier operation which uses stored energy, instead of relying for its energy upon direct power as it is generated by pumps. For example, each pumping station herein, as shown in Fig. 9, has a small motor M of about one H. P. Nevertheless, while barrier operations proceed, about 100 H. P. is expended at each pumping station. That is to say, the energy is stored in the compressible gas at a low rate and expended at a high rate. Withdrawal is made principally upon stored energy in the gas and substantial withdrawals are not made directly from pumps, as would be the case if only liquid were used in the closed hydraulic system.

The barriers in the east and west trenches may be termed lateral barriers, as distinguished from the barriers of the center or mid trench.

The term "barrier units" as used herein refers to single barriers such as the single barrier boxes, or to unit groups of them operating together, the operation of successive unit groups being according to an automatically controlled wave motion. Thus operation may be sequential as to successive single barriers or as to successive groups of barriers, each group being considered as a barrier unit in the latter case. The broad principle of automatically controlled wave operation is the same in either case.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above constructions without departing from the scope

of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A highway traffic separator comprising a series of barrier units forming a line, power means for moving each barrier unit from a depressed to an elevated position, and automatic means for sequentially applying power from said power means to move successive barrier units in the series.

2. A highway traffic separator comprising a series of barrier units forming a line, power means for lifting each barrier unit from a depressed to an elevated position, and vice versa, automatic means for sequentially applying power from said power means to lift successive barrier units in the series, and means for effecting simultaneous depression of all of the elevated barriers.

3. A highway traffic separator comprising a series of separate barrier units forming a line, power means for lifting each barrier unit from a depressed to an elevated position, and automatic means for sequentially applying power from said power means to lift successive barrier units in the series to effect barrier movements in sequence from either end of the line.

4. A highway traffic separator comprising a series of separate barrier units forming a line, power means for lifting each barrier unit from a depressed to an elevated position, automatic means for sequentially applying power from said power means to lift successive barrier units in the series to effect barrier movements by units from either end of the line, manually operable means for initiating action of said power means at either end of the line, and means operable manually from either end of the line for effecting simultaneous depression of all elevated barrier units.

5. A highway traffic separator comprising a sectional main linear barrier normally dividing right from left traffic, automatic means for moving various sections of said barrier from depressed to elevated positions sequentially either from one end or the other, manual control means for initiating each sequence of movement, said manual control means being located respectively at the starting end of said main barrier where the respective controlled sequence starts, manually operable means controllable from either end of the main barrier for lowering all sections, and sectional lateral barriers on opposite sides of the main barrier, automatic means for moving various sections of said lateral barriers from depressed to elevated positions sequentially from one end to the other in the direction of normal traffic movement and controllable respectively from the end of the respective barrier from which the sequence starts.

6. A highway traffic separator comprising a sectional main linear barrier normally dividing right from left traffic, automatic means for moving various sections of said barrier from depressed to elevated positions sequentially either from one end or the other, manual control means for initiating each sequence of movement, said manual control means being located respectively at the starting end of said main barrier where the respective controlled sequence starts, manually operable releasing means controllable from either end of the main barrier for lowering all sections at once, sectional lateral barriers on opposite sides of the main barrier, automatic means for moving various sections of said lateral barriers from depressed to elevated positions sequentially from one end to the other in the direction of normal traffic movement and controllable respectively from the end of the respective barrier from which the sequence starts, and manually operable releasing means at the same ends of the lateral barriers for lowering respectively all sections at once.

7. A highway traffic separator comprising a series of separate barrier units forming a line, power means for moving each barrier unit from a depressed to an elevated position, and a series of means individually responsive to operation of individual barrier units to apply the power means to moving the next successive unit for automatically sequentially effecting barrier movements, whereby the movement of one barrier requires as a condition precedent the movement of a preceding barrier.

8. A highway traffic separator comprising a series of separate barrier units forming a line, power means for moving each barrier unit from a depressed to an elevated position, and a series of means individually responsive to operation of individual barrier units to apply the power means to moving either adjacent unit for automatically sequentially effecting barrier movements in either direction, whereby the movement of one barrier requires as a condition precedent the movement of an adjacent barrier, means making the sequence reversible, manual means for initiating sequential power movements from either end of the series of units and manual means for moving all barriers down together from elevated to depressed positions.

9. A highway traffic separator comprising a series of barriers forming a line, hydraulic lift means for moving successive barriers from depressed to elevated positions in a wave sequence, said hydraulic means comprising an enclosed system including a liquid, a compressor and compressible means for relatively slowly storing energy from the compressor and for relatively fast subsequent expenditure during lifting.

10. A highway traffic separator comprising barriers forming a line, hydraulic means for moving successive barriers from depressed to elevated positions, means for successively effecting barrier movements from said hydraulic means, said hydraulic means comprising a sump tank, pressure tank and pump forming a power unit serving less than the entire number of barriers, valves between successive barriers for effecting successive barrier operation, and relay lines between valves serving a number of barriers greater than served by said power unit.

11. A highway traffic separator comprising groups of barriers forming a line, hydraulic means for moving each barrier group from depressed to elevated positions, means for sequentially effecting barrier group movements from said hydraulic means, said hydraulic means comprising a sump tank, pressure tank and pump forming a power unit serving a pair of barrier groups, valves between barrier groups for effecting sequential group operation, and relay control lines between valves serving a greater number of barrier groups than are served by said power unit.

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