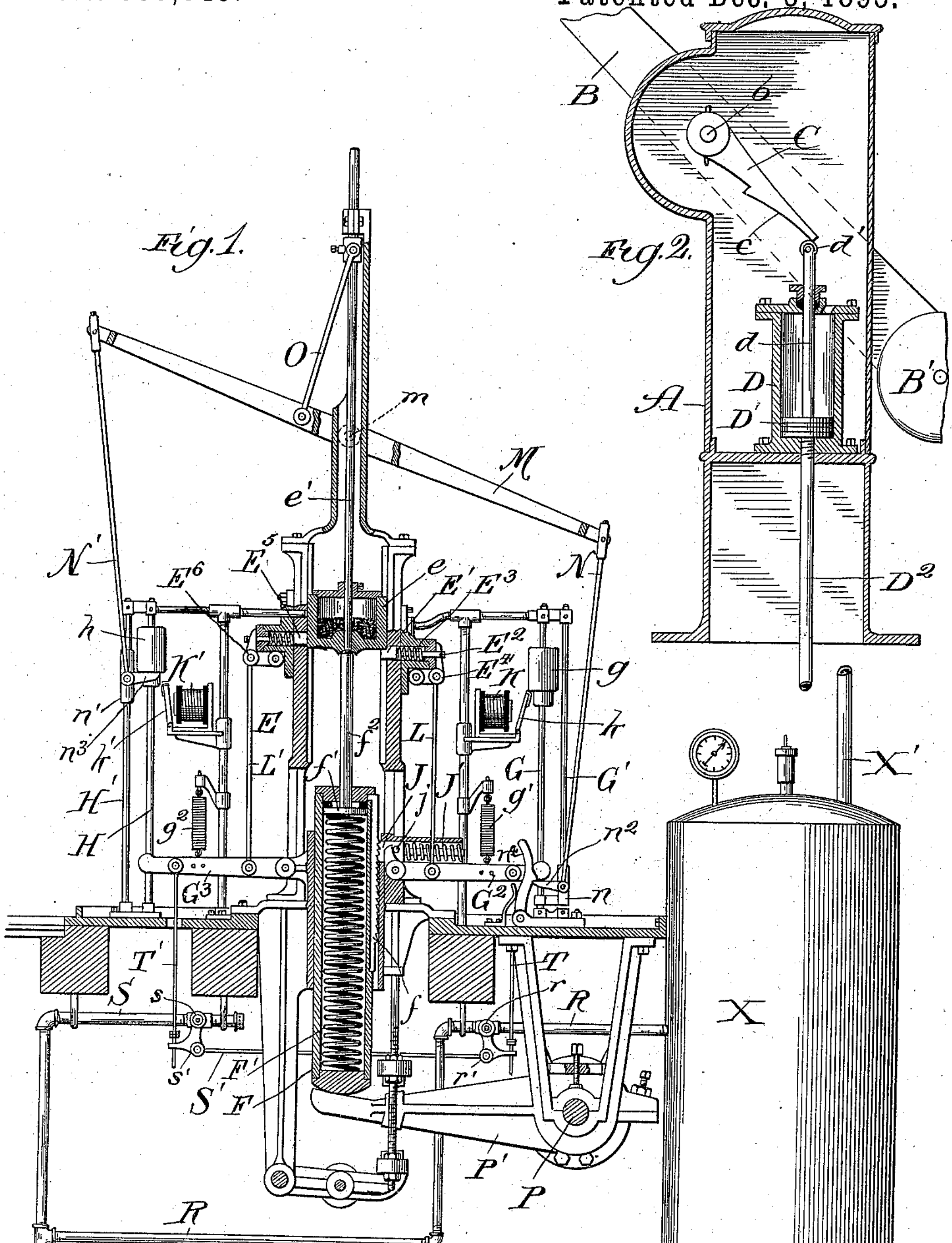
(No Model.) 2 Sheets—Sheet 1.

J. F. SMALL.

AUTOMATIC RAILWAY GATE.

No. 550,649. Patented Dec. 3, 1895.



Witnesses:

Chas. E. Gaylord,

Lute J. Alter

Inventor:

John Francis Small,

By Samuel E. Hibben, Atty.

(No Model.)

2 Sheets—Sheet 2.

J. F. SMALL.

AUTOMATIC RAILWAY GATE.

No. 550,649.

Patented Dec. 3, 1895.

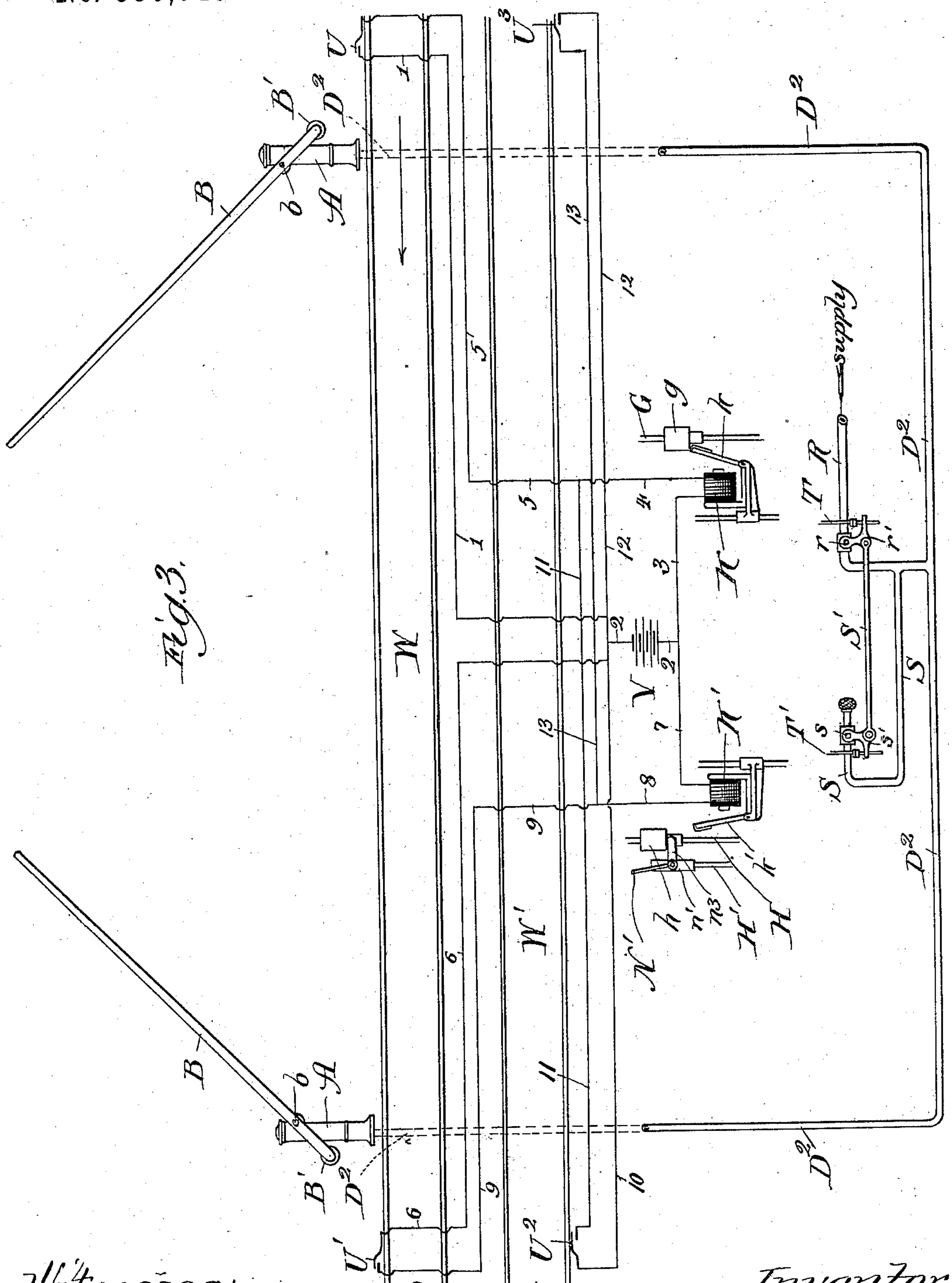


Fig. 3.

Witnesses:
Chas. E. Gaylord,
Lute J. Alter

Inventor:
John Francis Small,
By Samuel E. Hibben
Att'y.

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

UNITED STATES PATENT OFFICE.

JOHN FRANCIS SMALL, OF CHICAGO, ILLINOIS, ASSIGNOR TO MARY E. H. RUTTER, OF SAME PLACE.

AUTOMATIC RAILWAY-GATE.

SPECIFICATION forming part of Letters Patent No. 550,649, dated December 3, 1895.

Application filed February 5, 1895. Serial No. 537,348. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRANCIS SMALL, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Automatic Railway-Gates, of which the following is a specification.

My invention has particular relation and application to that type of railway-gates operated by fluid-pressure in an automatic manner; and its object is to provide a positive, reliable, and efficient mechanism for admitting the fluid-pressure, such mechanism being under the control of electrical devices which are actuated automatically by the movements of trains upon the track; and my invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a sectional view of the mechanism for controlling the fluid-pressure; Fig. 2, an enlarged sectional view of one of the gate-posts, showing the pump-cylinder, &c.; and Fig. 3, a diagrammatic view of the tracks and arrangement of the circuits.

My improved gate consists of a hollow post A of the proper size and proportions. These posts are generally four in number at each crossing and are similar in construction, so that the description of one will apply to all.

The gate-arm B is of the ordinary and well-known construction and is journaled upon the post by means of the bearing-pin *b*. The gate herein shown and described is of the gravity type, and in order to retain the gate-arm in a normal substantially vertical position, its short arm is weighted in the ordinary manner to a sufficient degree by the preferably adjustable weight B′, heavier than the usual counterweight, so as to overcome the balance.

Rigidly secured to the bearing pin or shaft *b* is an arm C, extending into the interior of the post. Its lower surface has the contour shown in the drawings, consisting of a curved surface or face *c*.

Upon a suitable support within the gate-post I mount a single-acting pump-cylinder D, provided with a piston-head D′ and piston-rod *d*. The head of the cylinder is of course provided with a suitable bleed or exhaust to allow the air above the piston to escape. The end of the piston-rod carries a roller-bearing *d′*, impinging against the curved surface *c*. Leading to the cylinder and communicating with its interior below the piston-head is a fluid-pressure pipe D^2, connected to a suitable source of supply.

As shown in Fig. 2, the parts are so arranged and proportioned that at normal times—that is, when the gate is open—the roller is in contact with the end of the curved surface of the arm C.

The operation of my gate will be readily apparent from the drawings, in connection with the foregoing description.

When it is desired to lower the gates, fluid-pressure is admitted through the pipe D^2, forcing the piston head and rod upward. As the roller impinges upon the curved surface *c*, it will force or rock the arm C upward and thereby lower the gate-arm B, which will remain in such lowered position as long as the fluid-pressure is maintained in the cylinder.

As a means for automatically regulating the admission of fluid-pressure to the cylinder, I employ the novel form of mechanism hereinafter described. Upon a suitable framework I mount a guide-frame E, in which travels a weight *e*, having a vertical rod *e′*. A reciprocating dog E′, carrying a pin E^2, which passes through the guide-frame, is forced inward under the weight, so as to support it by means of the coiled spring E^3. The free arm of a bell-crank E^4 is connected to the pin and thereby operates the dog. A similar dog E^5 is mounted in the guide-frame, but on a slightly higher plane than the other dog. The dog E^5 is adapted to prevent the upward movement of the weight and is released from engagement at the proper time by a bell-crank E^6. When the dog E′ is forced outward, the other dog is flush, and vice versa.

Arranged in the same framework and in substantial axial alignment with the weight is a barrel F, having a suitable bearing and provided with a rack of ratchet-teeth *f*. This barrel is preferably hollow and contains a compressible spring F′, bearing at its upper end against a piston-head or disk *f′*, carrying a vertical rod f^2, adapted to bear against the weight thereabove.

Suitably mounted upon the frame are four vertical rods G G′ and H H′, arranged in pairs, preferably on either side of the parts above described. The rod G carries a sliding weight or ball g, adapted to travel up and down thereon. Arranged in the path of the ball and adapted to be tripped thereby in its descent is a lever G^2, held in a normal horizontal position by a spring g'.

Opposite to the ratchet-teeth on the barrel is a block J, provided with corresponding teeth adjacent to the barrel. A spring J′ abuts against the block and normally holds the teeth in engagement. A stud j is secured on the block and engaged by the short upturned arm of the lever G^2.

The rod H is provided with a similar weight h, adapted to strike in its descent the free end of a lever G^3, which is held in normal position by spring g^2. Electromagnets K K′ are located adjacent to the weights g and h, respectively, and are provided with pivoted armatures k k', which will support the weights when the magnets are demagnetized. The plan of the double circuit is clearly depicted in Fig. 3 and needs no detailed description.

Between the bell-cranks E^4 E^6 and their respective levers I provide connecting-rods L L′, whereby as the weights trip the levers the dogs or catches will be released.

A device for lifting the tripping-weights is provided, consisting of a rocking beam M, pivoted at m in the upper portion of the guide-frame. The free ends of this beam carry similar pivoted rods N N′, carrying at their lower ends sleeves n n', sliding, respectively, on the guide-rods G′ H′. To these sleeves are rigidly secured similar arms n^2 n^3, each projecting in the path of its respective tripping-weight. At one side of the pivotal point of the beam is pivotally secured a rod O, adjustably secured at its other end to the vertical rod e.

A rocking shaft P, connected to tread-levers (not shown) on a railway-track, is mounted in the frame and carries an arm P′ in contact with the bottom of the barrel. The particular function of the spring-barrel and concomitant parts is to operate the beam M to elevate the tripping-weights at the proper time; but it will be understood that other mechanism for accomplishing the same result may be substituted and yet be within the scope of my invention.

I employ fluid under pressure to actuate the gates, and I prefer to use a tank X, fed by a feed-pipe X′ and located adjacent to the other mechanism. Fluid-pressure may be fed to the tank from any convenient source, or, if desired, a separate pump, operated by a motor, may be arranged in the housing in which the tank and the mechanism shown in Fig. 1 are supposed to be located. Leading from the tank is a supply-pipe R, having a valve or cock r and extending through feed-pipe D^2 to the gate-cylinder. Also communicating with the pipe is an exhaust S, regulated by a valve or cock s. Similar bell-cranks r' s' are attached to the stems of these valves and are connected together by a connecting-rod S′, so that as one valve is opened the other is necessarily closed. Similar adjustable rods T T′ are connected to their respective bell-cranks and to levers G^2 G^3, whereby the movement of the latter will be communicated to the valves.

At points sufficiently distant from the crossing I arrange circuit-closers U U′ of ordinary construction and adapted to be operated by trains passing on track W. These devices complete the circuit through magnets K and K′, respectively. For convenience I have shown a double-track road, and I provide the other track W′ with similar circuit-closers U^2 U^3, adapted to complete the circuit to excite magnets K and K′, respectively, in the ame manner as upon the other track.

My apparatus being constructed and arranged as above set forth operates as follows: Assuming that a train is approaching on track W from the right, Fig. 3, the circuit through magnet K will be completed by the closing of circuit-closer U, the current traversing wires 1 and 2, battery V, wire 3, magnet K, wires 4 and 5, back to the closer. The armature k will thereby be attracted, allowing the ball or weight g to drop and trip the lever G^2. The block J will be retracted, as well as the dog mechanism E′, which is actuated by means of the vertical rod L. The barrel will thereupon be free to fall, say about four inches, and the weight e, being no longer supported, will follow. The dog mechanism E^5 will then advance above the weight e and prevent its rising, while the dog E′ will be kept flush with the side of the guide-frame and the lever-arm G^2 thereby forced to remain in its tripped or lowered position. When this lever G^2 is tripped, it forces the rod T downward, reciprocating the connecting-rod S′ to the left, Fig. 1, thus opening the supply-valve r and closing the exhaust-valve s. Fluid-pressure is thereby admitted directly to all the gate-cylinders and the rod d is forced outward and caused to impinge upon the curved surface c of the cam, whereby the gate-arm is positively rocked downward against its counterbalance. The gates are now in their lowered position and will remain so as long as the pressure is maintained in the cylinder D. When the weight e drops, its rod e' actuates the walking-beam M and causes the lifting-finger n^2, which had been disengaged from the lock n^4, to elevate the weight g. The corresponding lifting device on the opposite side will simultaneously be lowered, so as to allow free descent of the weight h when it is time for it to act. When the train is passing over the track-levers located in the neighborhood of the crossing, the shaft P and its arm P′ will be rocked, forcing the barrel upward against the contained spring, which will consequently be compressed. As soon as the train has cleared the crossing and operated the circuit-closer U′ the circuit of magnet K′ will be completed, the current traversing wires 6 and 2 through battery, wire 7 to magnet, and wires 8 and 9 back to the circuit-closer. The armature k' will therefore be attracted, permitting the weight h to drop and trip the lever G^3, thereby thrusting rod T′ downward and reciprocating connecting-rod S′ to the right, Fig. 1. Valve r will be closed and exhaust-valve s opened, whereby the cylinders will exhaust back through pipe S. Since the positive force against the gate-arms is now removed, they will be returned to their normal upright position by the counterbalance. Simultaneous with the operation of the valves the dog mechanism E^5 is withdrawn through connection with the trip-lever G^3 by means of the vertical rod L′ and bell-crank E^6. The tension of the compressed barrel-spring will then be exerted to raise the weight e and the rocking beam to their normal position. (Shown in Fig. 1.) The dog E′ will then advance beneath the weight e and prevent it from falling.

In the drawings I have shown for convenience and clearness of illustration the arrangement of the circuits for a double-track road, although it will be understood that by the employment of suitably-operating circuit-closers and arrangement of circuit the gates may be operated by trains running in both directions upon the same track.

When a train approaches the crossing from the left, Fig. 3, and reaches circuit-closer U^2, the current will pass through wires 10 and 2 to battery, wire 3 to magnet K, and wires 4 and 11 back to the circuit-closer. The gates are now lowered. When the train operates circuit-closer U^3, it will complete the circuit through magnet K′, the current traversing wires 12 and 2, battery, wire 7 to magnet K′, and thence wires 8 and 13 back to the circuit-closers. The gates are now allowed to rise, as hereinbefore described.

By the use of my invention I provide a very reliable and efficient mechanism for positively operating railway-gates, which mechanism is controlled in a simple manner by the movements of trains upon the tracks. The services of a gate-tender at each crossing are thereby dispensed with and the raising and the lowering of the gates at the proper time, which is predetermined, are always positive, whereby the crossing is at all times securely guarded.

It will be understood that my novel gate-operating mechanism shown in Fig. 2 may be actuated by a gate-tender or otherwise, although I prefer the automatic method of operation, as hereinbefore set forth.

Although I have described more or less precise forms and details of construction, I do not desire to be understood as limiting myself thereto, as I contemplate changes in form, proportion of parts, and the substitution of equivalents, as circumstances may suggest or render expedient, without departing from the spirit of my invention.

I claim—

1. In a railway gate, the combination with a gate arm, of fluid pressure controlled mechanism for actuating the gate arm, a fluid pressure supply pipe provided with a valve and a weight adapted to fall and operate the valve upon the approach of a train whereby the gate arm will be automatically actuated.

2. In a railway gate, the combination, with a gate arm, of fluid pressure controlled mechanism for actuating the gate arm, a fluid pressure supply pipe, an exhaust pipe therefor, valves arranged in such pipes respectively, a connection between the valves so that as one valve is opened the other is necessarily closed, a weight adapted to fall and open the valve in the supply pipe upon the approach of a train and a second weight adapted to fall and open the valve in the exhaust pipe after the train has cleared the crossing or other predetermined point whereby the gate arm will be operated automatically by fluid pressure.

3. In a railway gate, the combination with a gate arm, of fluid pressure controlled mechanism for actuating the gate arm, a fluid pressure supply pipe provided with a valve, a weight adapted to fall and thereby operate the valve, electrically controlled means for normally retaining the weight in its elevated position and releasing it upon the approach of a train whereby the falling of the weight will operate the valve to admit pressure and thereby actuate the gate arm.

4. In a railway gate operated by fluid pressure controlled mechanism, a fluid pressure supply pipe, an exhaust pipe connected thereto, valves arranged in such pipes respectively, a connection between the valves so that as one valve is opened the other is necessarily closed, a weight adapted to fall and open the valve in the supply pipe, a second weight adapted to fall and open the valve in the exhaust pipe, electro-magnets arranged in normally open circuits and adapted to retain the weights in their elevated position and circuit closers operated by a moving car whereby the gate will be actuated automatically by the movement of a car upon the track.

5. In a railway gate operated by fluid pressure controlled mechanism, a fluid pressure supply pipe R provided with a valve r, a weight g adapted to fall and operate the valve, an electro-magnet K interposed in a normally open circuit and adapted to hold the weight in an elevated position and a circuit closer arranged at or near the railway track and adapted to be operated by a moving car whereby the circuit will be closed to release the weight and thereby operate the valve to admit pressure to the gate mechanism.

6. In a railway gate operated by fluid pressure controlled mechanism, a fluid pressure supply pipe provided with a valve, a tripping weight mounted to fall, a pivoted lever projecting in the path of its descent, a connection between the lever and valve and elec-

trically controlled mechanism adapted to retain the weight in its elevated position and adapted to release it upon the approach of a train whereby the falling of the weight will operate the valve to admit pressure and thereby actuate the gate.

7. In a gravity railway gate, a gate arm provided with a counterbalance adapted to retain the arm in an upright position, a cylinder provided with a piston rod, an operating arm connected to the gate arm and independent of the piston rod whereby as pressure is admitted to the cylinder the piston rod will be forced into contact with the operating arm and the gate thereby lowered.

8. In a gravity gate, a gate arm normally held in a substantially upright position, an operating arm connected to the gate arm and having its under surface curved, and a cylinder provided with a piston-rod, whereby as pressure is admitted to the cylinder the piston-rod will impinge against the curved surface of the operating arm and thereby swing the gate arm to a lowered position.

9. In a gravity gate, a gate arm, an operating arm connected thereto and having its under surface curved, a cylinder and a piston rod therefor provided at its free end with a roller bearing adapted to bear against the curved surface of the operating arm, whereby as pressure is admitted to the cylinder the gate arm will be swung to a lowered position.

10. In a gravity gate, a post A, a gate arm arranged upon a shaft *b* journaled in the post, the gate arm being provided with a counterbalance adapted to retain the gate arm in an upright position, an operating arm C secured upon the shaft *b* and provided with a curved surface *c*, and a cylinder D provided with a piston-rod *d* whereby as fluid pressure is admitted to the cylinder the piston-rod will be caused to impinge against the curved surface of the operating arm and thereby rock the shaft to lower the gate arm.

JOHN FRANCIS SMALL.

Witnesses:

JOHN S. BIGGAR,

E. NEMETT.