3 Sheets—Sheet 1.

T. M. FOOTE & C. A. RANDALL.

PRINTING TELEGRAPH.

No. 114,793. Patented May 16, 1871.

Fig 1.

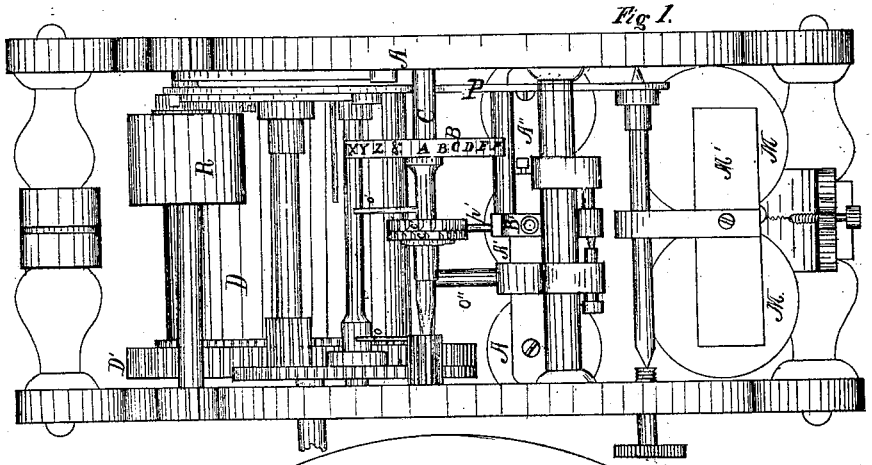
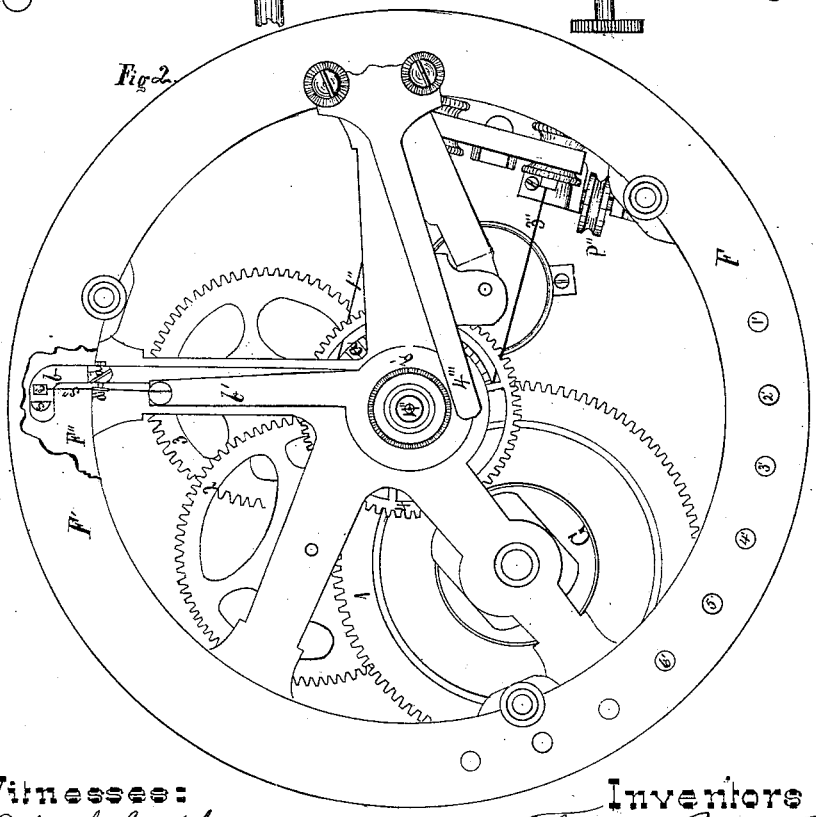


Fig 2.



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3 Sheets—Sheet 2.

T. M. FOOTE & C. A. RANDALL.

PRINTING TELEGRAPH.

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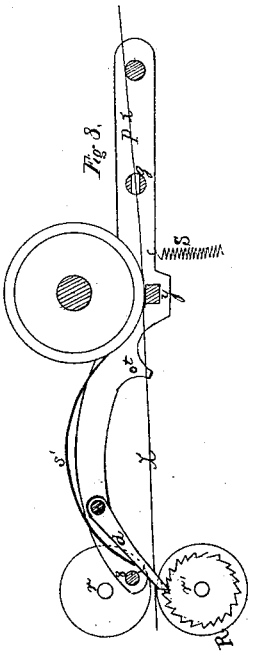

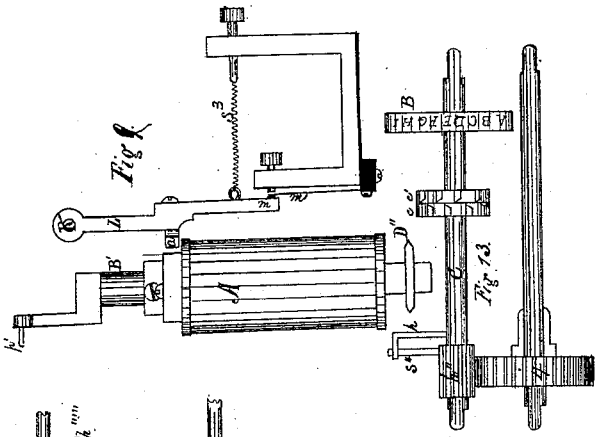

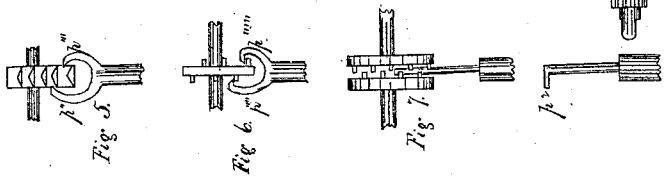

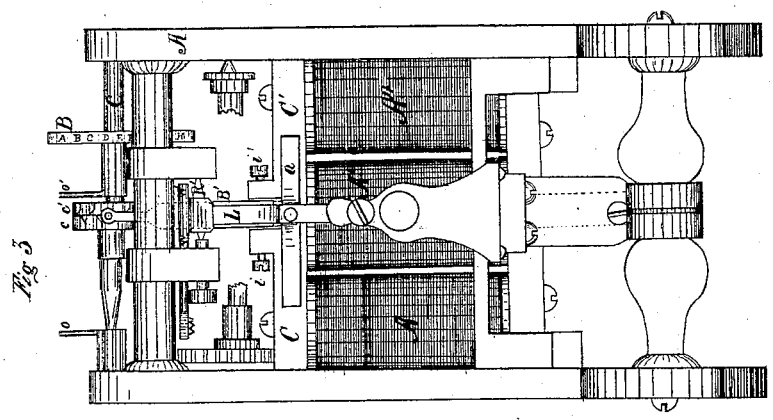

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T. M. FOOTE & C. A. RANDALL.

PRINTING TELEGRAPH.

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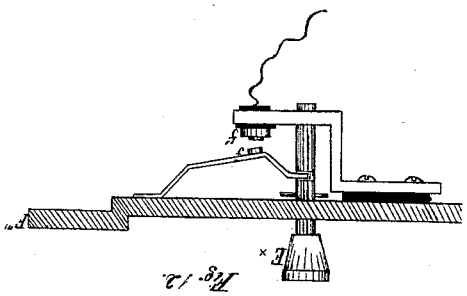

Fig. 12.

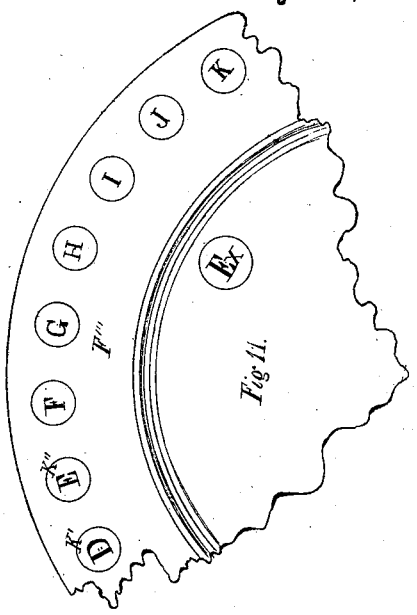

Fig. 11.

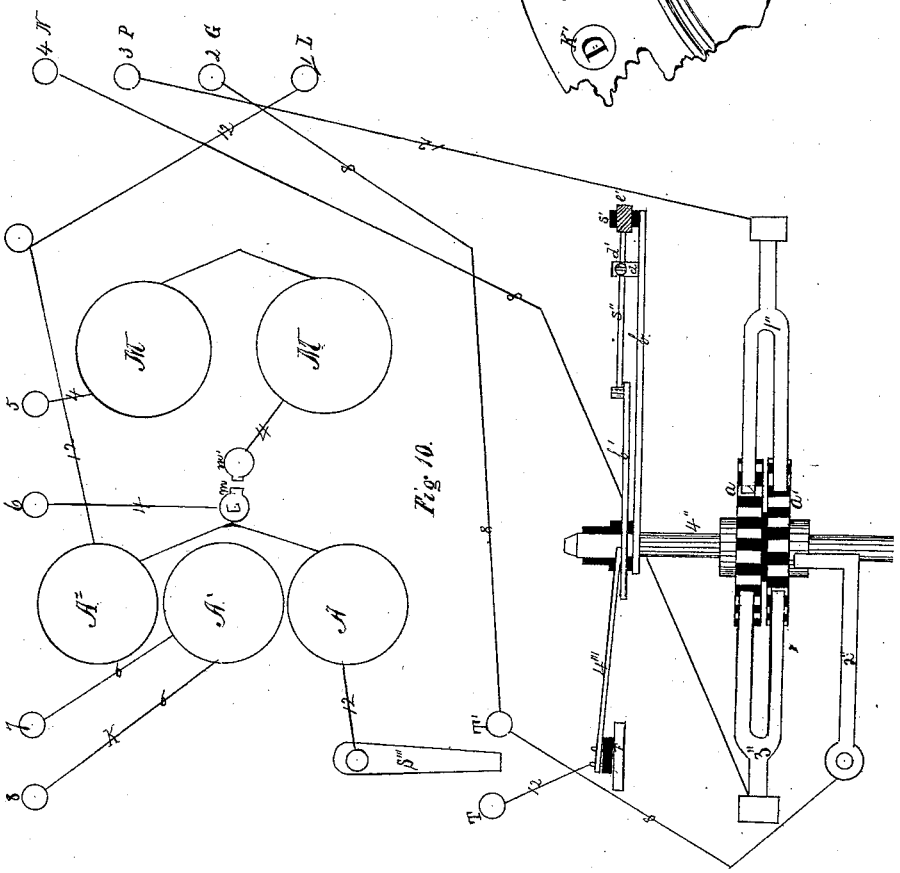

Fig. 10.

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United States Patent Office.

THEODORE M. FOOTE AND CHARLES A. RANDALL, OF BROOKLYN, E. D. NEW YORK.

Letters Patent No. 114,793, dated May 16, 1871.

IMPROVEMENT IN PRINTING-TELEGRAPHS

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, THEODORE M. FOOTE and CHARLES A. RANDALL, of Brooklyn, E. D., county of Kings and State of New York, have invented new and useful Improvements in Printing-Telegraph Apparatus; and we do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to which this invention appertains to make and use the same, reference being had to the accompanying drawing forming a part of this specification, in which—

Figure 1 is a top plan view of instrument.

Figure 2 is a top plan view of transmitter with key-board removed.

Figure 3, end view of instrument with the electro-magnets M M removed.

Figures 4, 5 6, 7 are modifications of escapement.

Figure 8, printing-lever and paper-feeding apparatus.

Figure 9, side view of compound magnet and vibrating armature and circuit-closer.

Figure 10, pole-changer, circuit-closer, and connections.

Figure 11, section of key-board and keys.

Figure 12, the repeating-key and connections.

This improvement relates to that class of printing-telegraphs using as a motor for rotating the type-wheel a train of wheels and weight, with an escapement, in combination with electricity for governing the train and for placing the type-wheel in a desired position with accuracy by a rapid step-by-step movement.

The chief features of this invention are—

First, an escapement whereby a type-wheel is stopped and securely held at the position desired, and in no case allowed to pass by a single letter in advance of the transmitting apparatus, as is the case in printing-telegraphs of this class, the escapements generally being of such a form and construction that they are inefficient to overcome the momentum of a rapidly-rotating type-wheel and to secure it firmly and certainly at just the point desired.

Second, a compound magnet, having a soft-iron bar or vibrating armature acting as an escapement-lever, and the magnet acting also as a circuit-breaker.

Third, a transmitting apparatus, constructed in a simple and convenient manner.

In the drawing, fig. 1, sheet 1.

A designates the frame.

B, the type-wheel.

C, type-wheel shaft.

D D′, drum and driving-wheel of a train of wheels, upon the outer shaft C of which, in this case, is secured the type-wheel B.

c c′, the wheels of the escapement.

p′, the pallet.

A A′ A″, a compound magnet, with the armature B′ or escapement-lever vibrating on pivot D″.

M M, the printing-magnet and its armature M′.

P, the printing-lever.

o o′, fig. 1, pins in type-wheel shaft acting upon swivel-anchor W.

R *r r′ d* 8 S′ S, fig. 8, the paper-feeding apparatus.

g, guide for the paper *x*, taken from a roll not shown.

y, the printing-pad.

Fig. 2, F, bottom frame of key-board, with holes 1′ 2′ 3′ 4′ 5′ shown for keys to work in.

At F′ a part of frame F is removed, showing top frame F″ of transmitting apparatus, and the arm *b* with non-metallic stud S′ and point *d* upon it, and the spring S″ and insulated end *e′* and point *d′* upon arm *b′*.

Fig. 11, section of top frame F‴ of key-board, showing keys K′ K′ and repeating-key E *x*.

1 2 3 4, fig. 2, train of wheels carrying the pole-changer *a a′* on shaft 4″, best seen in fig. 10, and circuit-closer *b b′* S″ *d d′* S′ *e′*.

G, fig. 2, the governor.

Similar letters and marks refer to corresponding parts.

In the present case we have adopted the use of weights for running the respective trains, but it is well understood that springs may be used as well.

In the present case the escapement is made of two steel wheels, *c c′*, with teeth cut upon them, having one side, which we term the face, on a radial line.

These wheels are set rigid to shaft C, with their flat surfaces together, the teeth of one wheel being opposite the spaces of the other, and the inner end of each tooth beveled at any acute angle with the face before mentioned to allow of the pallet *p′* escaping easily between the teeth.

When the power is applied to the train the oscillation of the lever B′ carrying the pallet *p′*, which, working upon the face and between the teeth of the escape-wheels *c c′*, allows of a step-by-step motion and escape of the type-wheel, and the straight or bottom surface of the pallet *p′* catching at each oscillation of the lever B′ upon the face of the teeth of the escape-wheels *c c′*, holding firmly at every point, without the tendency or possibility of its disengaging or allowing the type-wheel to move beyond a desired position, and the movement of the lever B′ being adjusted by screws *i i′*, makes it at once a simple, rapid, and reliable escapement, and the pallet *p′*, when in motion, describing the arc of a circle, the friction of the bearing parts is reduced to the least possible amount, so that a slight battery power will work the lever and a

light weight will cause the train to start instantly upon being released.

In Figure 13 is shown type-wheel shaft C, type-wheel B, escapement *c c'*, and pin or arm *h*, rigid in shaft C.

Upon shaft C is loosely fitted the pinion *h''*, having the straight flexible spring S^4 attached, and the pinion being driven by the wheel 4, which is one of the train shown in other figures.

When the pinion *h''* is rotated or driven by the wheels composing the train, the spring S^4, coming in contact the arm *h*, carries the shaft C and type-wheel B, and upon arresting the type-wheel B the momentum of the train acts upon the pinion in such a manner that a strain or tension is produced upon the spring S^4, which, upon releasing the type-wheel, acts as a reserved power for effecting the instant movement of the type-wheel, overcoming the inertia of the wheel and preventing any slow or sluggish movement at starting.

It is well understood that this especial arrangement of parts is not necessary, as the spring S^4 may be attached to the shaft and the arm *h* to the pinion, the effect being the same.

Figs. 4, 5, 6, 7 show in detail modifications of the escapement already described, in which it is shown that the teeth may be cut upon one wheel instead of two, fig. 4, and also that one wheel having a tooth, shown in drawing, fig. 5, and double pallets, *p'' p'''*, and also figs. 6, 7, having steel pins instead of teeth, and double pallets *p'''' p''''*, or single pallet p^2, may be used.

There are other modifications of the principle shown herein that may be used substantially the same, and we do not confine ourselves to these especial arrangements or devices.

The pins O *o'* act upon the anchor W in the following manner:

As the type-wheel shaft C revolves, the pin *o'* in the shaft C acts upon the end *w'* of the bar *w*, swinging on a pivot, *o''*, shown in fig. 1, depressing the end *w'* and throwing the end *w* in the path of the pin *o*, whereby the type-wheel and shaft are arrested and are liberated by the printing-lever P or some part attached thereto. The printing-lever or its equivalent, striking upon the anchor W at *w'* when the type-wheel has been arrested, throws the end *w* out of the path of the stop-pin *o*, releasing the type-wheel and shaft C thereby, so that they may be rotated again at will.

By this arrangement any number of instruments in the same line circuit may be automatically kept in unison at each rotation of the type-wheel; or, by printing a letter before the type-wheel or wheels make a revolution, they, the type-wheel or wheels, will rotate freely any desired time, and may be brought to unison by discontinuing the printing or the upward movement of the printing-lever.

Swinging upon the rock-shaft R', figs. 3, 9, is a lever, L, upon which is fastened the armature *a*, and attached to it also is the spring s^3, the use of which will be hereafter explained.

The paper-feeding apparatus R *r r' t d* S S' *g* does not differ materially from that which forms the subject of a separate application, and, therefore, need not be fully described; but in this case the pin or stop 8 in printing-lever is used as an adjuster to the movement of the printing-lever.

Fig. 10 shows the pole-changer, composed of two metallic pieces, *a a'*, in the form of a wheel, having an equal number of teeth and insulated spaces.

The pieces *a a'* are attached to one of the shafts, 4'', of a train of wheels, and *a'* is insulated from it; and from the wheel *a*, also attached to said shaft 4'', are the arms *b b'*, the arm *b'* being insulated from it and from the arm *b*

The springs 1'' 2'' 3'' bearing upon the surface and periphery of these circuit-wheels *a a'*, and the spring 4''' attached to the bottom-frame of the key-board F and insulated from it, bearing upon the top of arm *b'*, form such connections with a battery, line, and ground connections that when the pole-changer is in motion alternate positive and negative currents are transmitted to the line.

We believe it to be advantageous to construct it in the manner just shown, dispensing with the pins and cylinder generally used, it being more simple, rapid, and less liable to get out of order.

The details of the circuit-closer before alluded to are shown in fig. 10.

Attached to arm *b'* is a spring, *s''*, having a platina point, *d'*, and an insulated end, *e'*, and on arm *b* is a stud, *d*, having a platina point and also a non-metallic stud, S'.

When the transmitting apparatus is in motion the points *d d'* upon arms *b b'* revolve between the frames F F'' and under the end of the keys K' K'; upon depressing either of the keys the point *e'*, coming in contact with the depressed key, the points *d d'* are broken, the movement of the arms *b b'* is arrested, the key resumes its original position by means of a spiral spring in the well-known manner, and, the point *e'* being released, the spring S'' closes the circuit again at *d d'* before the arms *b b'* commence to revolve, they being held in place, by the stud S', in contact with the key after *e'* has been released.

The key E *x* and its use and the governor G are fully described in another application.

The operation of the magnet A A' A'' we will describe at this point:

While a current is passing over the helices A A'', in the extended cores C C' of the helices A A'' are developed alternately-opposite polarities. A current is made to pass over the helix A', causing the soft-iron bar B' to become electro-magnetized with a polarity of an opposite nature to one of the cores C C', and by this method we obtain a to-and-fro movement of the bar B', and also by this method we may obtain any amount of power required, and also have it, at all times, of uniform strength, avoiding the defects of all permanently-polarized magnets, the loss of power, uncertain polarity, &c., and the trouble consequent upon the use of the same.

In operating our apparatus the pole-changer *a a'*, fig. 10, and also the arms *b b'*, being allowed to revolve, alternate positive and negative currents pass to line, and, the line circuit being broken, a local circuit is formed automatically at each receiving-station and the printing effected.

The directions of the currents are as follows:

A negative current passes from post 4 N, over wire 8, to spring 3'', circuit-wheel *a'*, spring 2'', wire 8, to post 2 G; and a positive current passes from post 3, wire 12, to spring 1'', circuit-wheel *a*, shaft 4'', arm *b d d'*, spring S'' *b'*, spring 4''', wire 12, to button T, switch S''', wire 12, helices A A'', wire 12, to post 1 or to line, and from thence over the circuits of as many instruments as may be found practicable in one line circuit.

The negative current is sent to line when the pole-changer or the platinas of the wheel *a* are in contact with the spring 3'', and the platinas of the wheel *a'* are in contact with spring 1'', and the course of the currents is then from post 3 P, over wire 12, wheel *a'*, spring 2'', wire 8, to post 2 G, ground, and from post 4 N, wire 8, spring 3'', wheel *a*, shaft 4'', arm *b*, points *d d'*, spring S'', arms *b'*, spring 4''', wire 12, button T, switch S''', wire 12, helices A A'', wire 12, to post 1 L, to line.

The alternate negative and positive currents passing over the circuits described, and over the coils A A'', causing the armature *a* on lever L to be constantly attracted, breaking the points *m m'*, and there being a polarity developed in the bar B', as hereinbefore de-

scribed, it is made to vibrate rapidly to-and-fro, carrying the pallet p' and allowing the escape of the type-wheel, as hereinbefore explained.

Pressing upon either of the keys K′ at this point in the operation, the key depressed coming in contact with e' on spring S″ as it revolves, the points d d' are separated and the revolution of the pole-changer a a' is stopped simultaneously, the type-wheel or type-wheels working synchronously with the pole-changer are arrested with the letter corresponding to the key depressed directly over the printing-pad $\bar{y}$ attached to the printing-lever p.

When the points d d' are broken, the cores C C′ ceasing to attract the armature a, the spring S^3 draws the lever L from the magnet A A′ A″ and closes the points m m', whereby a local circuit is formed through post 6, wire 4, lever L, points m m', magnet M M, wire 4, to post 5, causing the armature M′ to be attracted and the printing effected.

In many cases it is desirable to repeat a letter, to do which the sending operator has only to depress the key E x, closing the points f f', thereby closing the line circuit with the current last used, whether negative or positive, causing the cores of the helices A A″ again to attract the armature a without moving the type-wheel B and breaking the points m m', and consequently the circuit over the magnet M M, releasing the armature M′, causing the paper to be fed along by the retractile force of the spring S in the well-known manner, bringing a blank space under the type-wheel.

Allowing, now, the key E x to resume its original position, the points f f' are broken, and consequently the line circuit and the printing effected as before.

We do not claim distinctively the use of negative and positive currents to rotate the type-wheel, and the actuating of mechanism to effect the printing on an open-line circuit, as that is shown in the patent of P. A. J. Dujardin, September 29, 1868, No. 82,502; but

What we claim, and desire to secure by Letters Patent, is—

1. The combination of the magnet A A′ A″ with the circuit-closer L m m' S^3 and pole-changer a a' and circuit-closer b b' S″, as set forth.

2. In a printing or dial-telegraph apparatus, an escapement, constructed substantially in the manner herein shown and described.

3. In a printing or dial-telegraph apparatus, an escapement, constructed substantially in the manner herein shown and described, in combination with a train of wheels, as set forth.

4. In a printing-telegraph of this class, using as a motive power to carry the type-wheel a train of wheels and weight or spring, the unison mechanism o o' and anchor W, in combination with the printing-lever P and type-wheel B, as set forth.

5. In combination with the type-wheel shaft, the loose pinion h'' thereon, the spring S^4, and arm h, as and for the purpose as described.

To the above specification of our invention we have signed our names and set our hands this 5th day of April, 1871.

THEODORE M. FOOTE.
CHARLES A. RANDALL.

Witnesses:
JAMES L. NORRIS,
J. C. WILDMAN.