

(No Model.)

3 Sheets—Sheet 1.

D. C. STOVER.
TYPE WRITING MACHINE.

No. 409,073.

Patented Aug. 13, 1889.

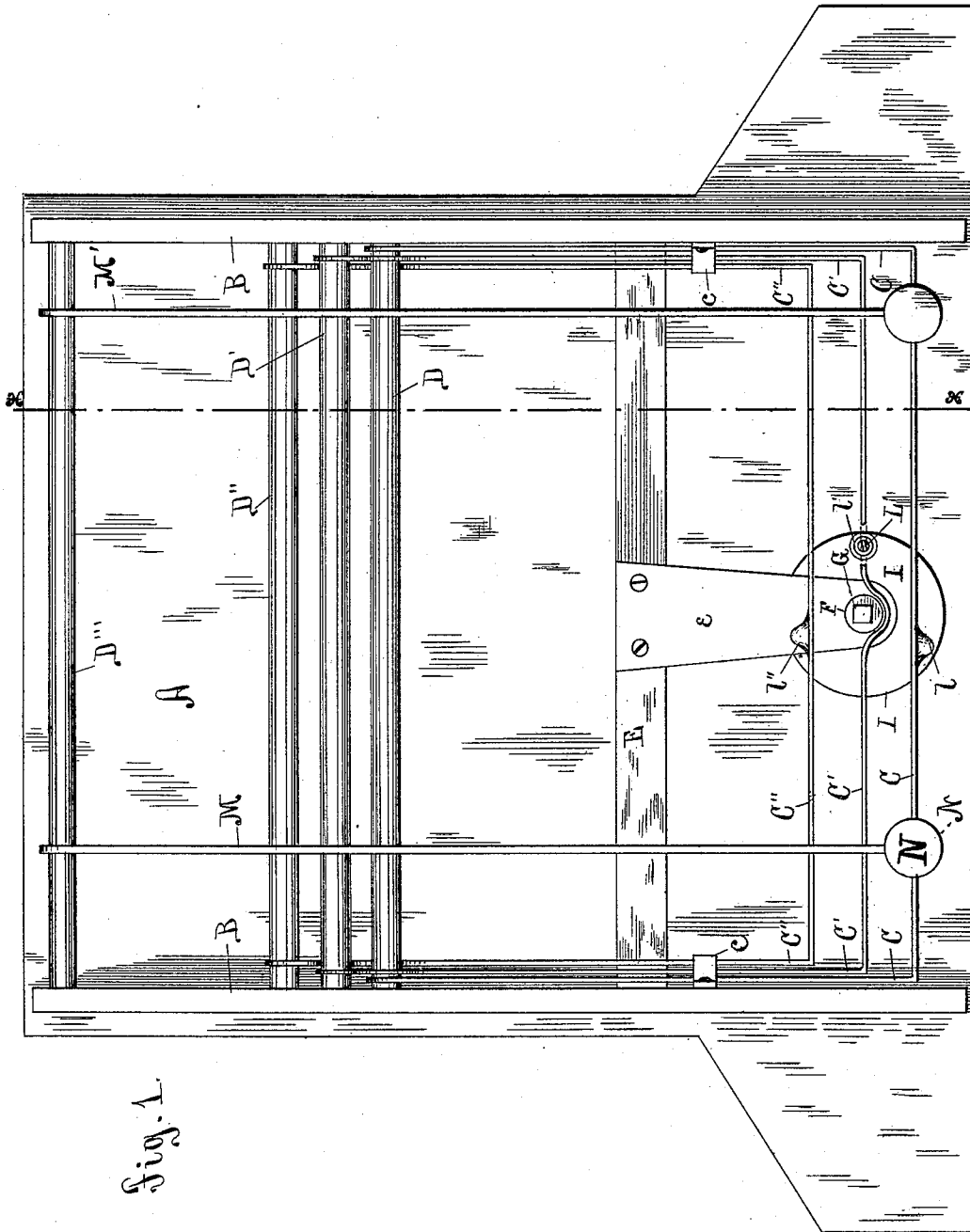


Fig. 1

Witnesses

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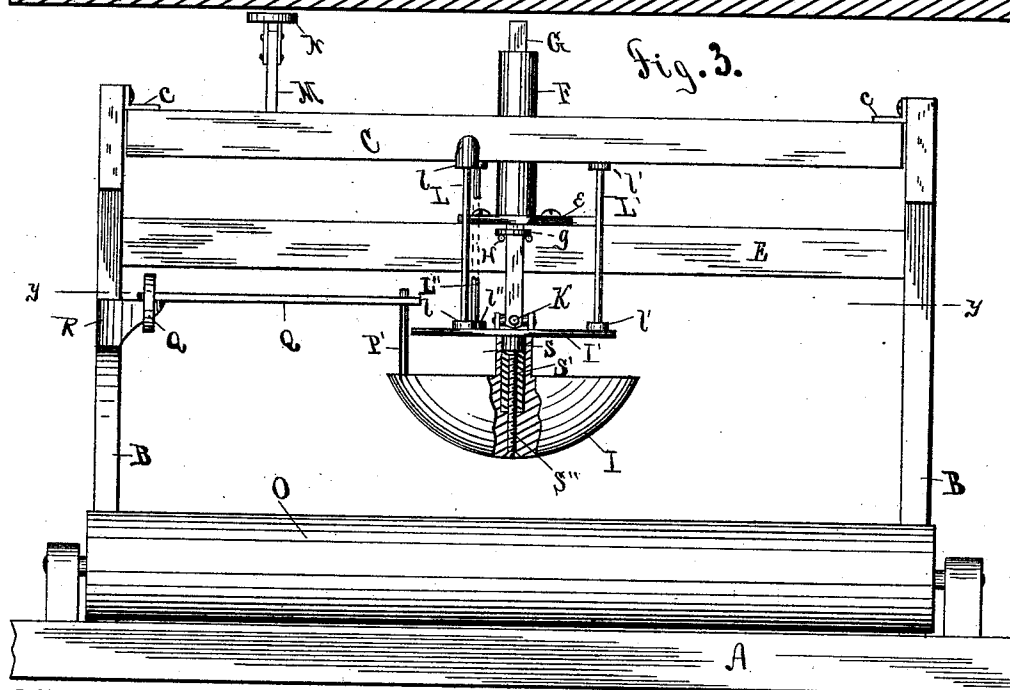
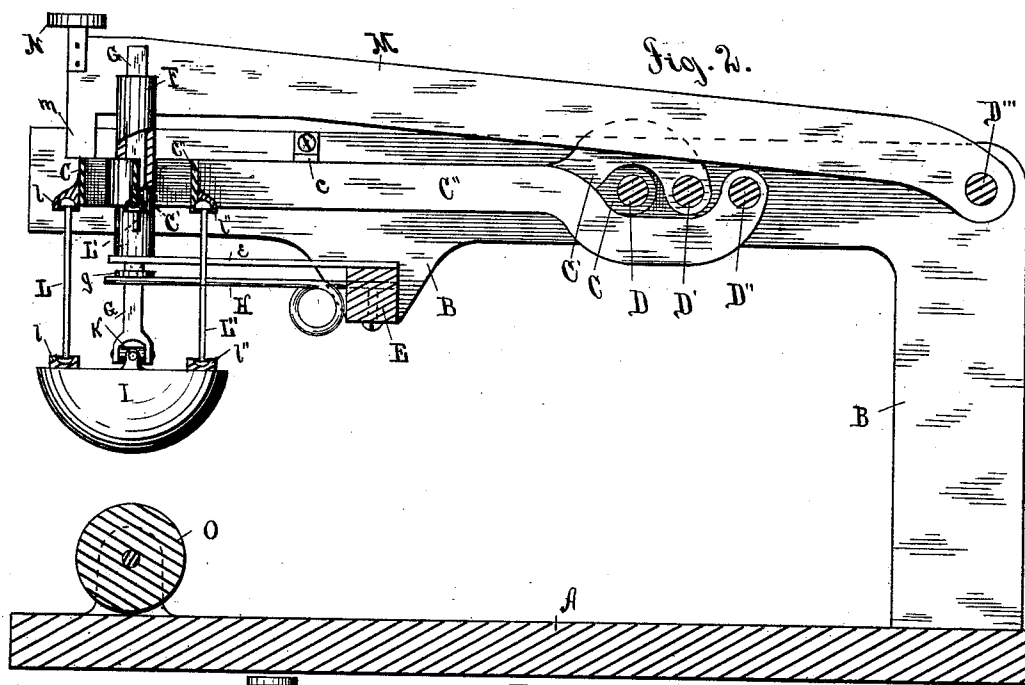
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UNITED STATES PATENT OFFICE.

DANIEL C. STOVER, OF FREEPORT, ILLINOIS.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 409,073, dated August 13, 1889.

Application filed May 23, 1888. Serial No. 274,784. (No model.)

To all whom it may concern:

Be it known that I, DANIEL C. STOVER, a resident of Freeport, in the county of Stephenson and State of Illinois, have invented certain new and useful Improvements in Type-Writing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in type-writers, and is fully described and explained in this specification, and shown in the accompanying drawings, in which—

Figure 1 is a top plan of a type-writer embodying my improvements, but one of the type-actuating keys being shown. Fig. 2 is a vertical section of the machine through the line X X, Fig. 1. Fig. 3 is a front elevation of a modification of the machine shown in Figs. 1 and 2. Fig. 4 is a horizontal section through the line Y Y, Fig. 3, the view being downward. Fig. 5 is a bottom plan of the type-carrying spherical segment shown in Figs. 3 and 4. Fig. 6 is an end view of the working extremity of the lever Q.

In Figs. 1 and 2 A is a bed or base of suitable size and form. B B are two parallel vertical brackets extending from front to rear of the base and forming supports for various operative parts of the machine. Across the front of the machine and between the brackets B B are three cross-bars C C' C'', connected by corresponding side bars with shafts D D' D'', respectively, the ends of said shafts being journaled in the brackets. All the side bars connecting the cross-bars C C' C'' with the corresponding shafts D D' D'' are of the same length, and the cross-bars and shafts, with their connections, form three independent rectangular frames of the same length from front to rear, each of said frames being free to oscillate vertically about the axis of the shaft which forms one of its sides. Movement of these frames above an approximately-horizontal plane is prevented by stops *c*, attached to the brackets B B and extending across the groups of side bars, and the side bars are normally pressed upward against these stops by means hereinafter set forth.

Below the rectangular frames above described is a cross-piece E, whose ends are sup-

ported by the brackets B B, and a platform *e* is fastened to and extends forward from the cross-piece to a point somewhat in front of the center cross-bar C'. A stationary vertical sleeve F, having a square or otherwise non-cylindrical axial opening, is supported by the platform *e*, and a shaft G, corresponding in shape to the opening in the sleeves, slides freely up and down therein, and is provided at a point below the platform with a collar *g*, which receives the upward pressure of a spring H, fastened to the cross-piece E, or to any other stationary portion of the machine. The lower end of the shaft G is connected by a universal joint K with a type-block I, having a convex lower face on which are rigidly mounted any desired number of raised characters separated by suitable spaces.

The convex surface of the type-block is preferably a segment of the surface of a sphere, and it is so shown in the drawings and described in the specification, the center of movement of the universal joint being preferably coincident with the center of the sphere. Three vertical rods L L' L'' are interposed between the upper surface of the type-block and the cross-bars C C' C'', each of the vertical rods being provided at its ends with spherical heads resting in sockets *l l' l''*, formed upon the upper surface of the block and upon the cross-bars C C' C''. The vertical rods are placed at the three angles of a preferably equilateral triangle, and the three rods connect the three cross-bars respectively with three corresponding points on the upper surface of the block. The upward pressure of the spring H upon the collar *g* raises the shaft G and the type-block supported thereby, and presses the rods L L' L'' upward against the cross-bars C C' C'', which are thus held normally in contact with the stops *c* already referred to. It is evident that this upward pressure holds the rods L L' L'' securely in position without any fastening except that afforded by placing the spherical heads of the rods in the cup-shaped sockets *l l' l''*. It is evident that if the cross-bar C be pressed downward the socket *l* at the lower end of the rod L will move downward and inward toward the axis of the shaft G, and that various points on the surface of the sphere in a vertical plane passing through the socket

and the center of the sphere will successively cross the axis of the shaft G and temporarily assume positions directly below the center of the sphere. If either of the cross-bars C' C'' be pressed downward, a similar movement of the socket l' l'' results, and by combining the downward movements of the cross-bars any point upon the surface of the spherical segment may be brought into a position directly below the center of the sphere. If a type upon the surface of the segment be brought into a position below the center of the sphere by proper movements of the cross-bars and all the cross-bars be then pressed downward together, the type will move vertically downward in the line of the axis of the shaft G; and in order therefore to print with a type seated at any point on the sphere it is only necessary to provide means for first actuating the cross-bars in such a way as to bring the type to the axis of the shaft G and then to press all the cross-bars downward together.

Figs. 1 and 2 show a type-actuating lever M, pivoted at its rear end on a transverse shaft D'', and provided at its front end with a key N and a single ward m, which rests upon the cross-bar C.

It is evident that if the key N be pressed downward the cross-bar C alone will be depressed until the lower edge of the lever in rear of the ward strikes the cross-bar C' C'' simultaneously, when all the cross-bars will be pressed downward by a further movement of the key. The result of this operation will be the same as that first described above, the rod L and the socket l' being pressed downward until the type corresponding to the key N is brought into position under the center of the sphere, and the entire segment being then pressed directly downward until the type reaches the paper upon which it is to operate.

The wards upon the type-levers must of course be varied in form to suit the various positions of the type upon the segment, and in order that each type may be brought into proper position by the corresponding key no two of the levers must have wards of the same form and arrangement. Those type which are nearest the lowest point of the segment will evidently be brought into working position by a less movement of the cross-bars than those which are higher up on the segment, but will have a correspondingly greater vertical movement after being brought into such working position. As the center of oscillation of the universal joint is at the center of the sphere, however, the entire downward movement of the operating-lever and the key attached to it is the same in either case, no matter what may be the position of the corresponding type on the segment.

The paper which receives the impression of the type may be supported in any desired manner—as, for instance, upon a roller O, extending across the front of the machine directly under the segment—and may be fed

both longitudinally and laterally by any known means. My present invention relates wholly to the means for supporting and operating the type, and I do not limit it to the combination of this means with any especial form of paper-supporting or paper-feeding mechanism.

Figs. 1 and 2 illustrate a machine in which each type-lever is adapted to actuate a single type upon the segment, and for certain classes of machines this is all that is necessary. It is sometimes convenient, however, to use a greater number of characters than the number of keys or type-levers of the machine; and in Figs. 3, 4, and 5 I have illustrated a modified form of my invention whereby each key may be made to operate either one of two independent type upon the segment. In this modification the rods L L' L'', instead of being connected directly with the type-bearing segment, are connected with the plate I' above the segment, the plate and the segment being connected by means of a rod S, extending downward from the plate, and the sleeve S', extending upward from the segment and surrounding the rod, the rod being fastened in place by a screw S'', passing through a portion of the segment into the rod. The segment is thus free to rotate about a vertical axis with reference to the plate, its rotation being limited, however, by a pin P, attached to the rod S and lying in a slot in the sleeve S'.

Rotation of the segment within the prescribed limits may be effected by means of a bell-crank lever Q, pivoted upon a support R and having its end slotted and in engagement with a pin P' upon the upper surface of the segment. If the free end of the lever Q be moved in the direction indicated by the arrow α , Fig. 4, the segment is evidently rotated in the direction indicated by the arrow α' in said figure, and reverse movement of the lever produces reverse rotation of the segment. The segment may be secured at either limit of its rotation by any desired means adapted to prevent its accidental movement with reference to the plate I'. When the segment is at either limit of its rotation about the vertical axis, the plate and segment together form a structure corresponding exactly to the solid segment shown in Figs. 1 and 2; and the operation of the segment in bringing any type upon its surface to bear upon the paper is precisely the same as that already described in speaking of the device illustrated in the first two figures.

The manner in which each key is made to operate two independent characters upon the segment is indicated in Fig. 5, which is a bottom plan of the segment shown in Figs. 3 and 4. As illustrated in this figure, the various type are arranged upon a series of concentric circles, four of which are shown, the center of the circles being the lowest point of the segment when it is in operative position. Upon the innermost circle are arranged eight

type, separated by equal spaces, the angular space between the centers of any two contiguous type being forty-five degrees. The relative positions upon this circle of any two type adapted to be operated by the same key is determined by the angular space through which the segment may be rotated by the movement of the lever Q. If this movement be limited to forty-five degrees, each pair of type to be operated by a single lever must lie together, as shown. Thus if it be desired to print with a single key the upper and lower case characters for the same letter, as A a, B b, &c., the upper and lower case type for each letter must be placed next each other upon the circle; and it is evident that if when the segment is at one limit of its rotation a given key will operate the character B the rotation of the segment through an angular space of forty-five degrees in the direction indicated by the arrow in Fig. 5 will bring the character b into the same position formerly occupied by the character B, and will adapt it to be operated by the same key which in the original position of the segment operated the upper-case character. Each of the other circles is divided into a larger number of spaces than the inner one, sixteen type being placed upon the second circle, twenty-four upon the third, and thirty-two upon the fourth. As the segment, however, is rotated through an angular space of forty-five degrees at each change of position, it is necessary that on each of these circles the two type to be operated by the same key must be separated by an arc of forty-five degrees.

The positions of various corresponding characters upon the different circles are indicated in the drawings—as, for instance, the characters “E e” on the second circle, “O o” on the third circle, and “R r” on the fourth circle. The principle of arrangement of the letters on the different circles or in any desired positions on the segment is apparent, it being only requisite that the two type to be operated by the same key must be so placed that the limited rotation of the segment with reference to the supporting-plate I’ shall bring the two type alternately into the same position. The body of each type upon the segment is preferably radial with reference to the sphere, and the face should be parallel to the plane tangent to the sphere at the center of the type.

The angular space through which the segment may be rotated is not necessarily limited to forty-five degrees, though I have found that space most convenient in practice. It is evident that if the limit be varied, however, the spacing of those pairs of type which are to be actuated by a single key must be correspondingly changed. Thus if the limit of rotation of the segment with reference to the plate I’ and the shaft G be sixty degrees the duplicate type to be operated by the same key must be sixty degrees apart.

The use of the suspended spherical segment

in combination with my improved means for bringing any point of its surface into a given position with reference to the center of the sphere and for then depressing the segment bodily against the surface to be acted upon is not necessarily limited to type-writing machinery, but may be extended to various classes of machines of analogous operation. I propose, for instance, to use this mechanical movement in dating and canceling machines, in hand-machines for punching drafts or checks to indicate their amount, in punching and eyeletting machines, and in other similar devices.

As I have already stated, the convex type-bearing surface of the type-block is preferably a spherical segment; but it is evident that this is not essential to the successful operation of the device. The fact that the use of the spherical segment places all the type at the same distance from the center of oscillation, and thereby equalizes the stroke of all the type-actuating keys, is the principal advantage of the use of the segment rather than any other form of convex surface, and it may be found in practice that the use of other convex surfaces presents other advantages fully equal to this.

Having now described and explained my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine of the class described, the combination, with a suitably-suspended type-block free to oscillate about its center of suspension and having a convex type-bearing surface, of a series of independent keys and mechanism whereby each key in its descent imparts swinging and then bodily rectilinear motion to said block, substantially as set forth.

2. In a machine of the class described, the combination, with a suitable support and a type-block connected therewith by a universal joint and having a convex type-bearing surface, of three independently-oscillating bars connected, respectively, with three corresponding points upon said type-block, preferably equidistant from said universal joint, and means, substantially as shown and described, for operating said bars, whereby said type-block may be oscillated about said universal joint and any type upon said convex surface be brought into a given position with reference thereto.

3. In a machine of the class described, the combination, with a yielding support and a type-block connected therewith by a universal joint and having a convex type-bearing surface, of three independently-oscillating bars connected, respectively, with three corresponding points upon said type-block, preferably equidistant from said universal joint, and means, substantially as shown and described, for operating said bars, whereby said type-block may be first oscillated about said universal joint and any type upon said convex surface be brought into a given position

with reference thereto and may then be moved bodily in a predetermined direction, substantially as and for the purpose set forth.

4. In a machine of the class described, the combination, with a yielding support, a spring adapted to press said support upward, and a type-block suspended below said support by a universal joint and having a convex lower face provided with raised type, of three independent vertically-oscillating bars connected, respectively, with three points upon said type-block by means permitting the free oscillation thereof, and type-actuating levers extending across said bars and having upon their lower edges wards of different arrangement upon the different levers, whereby a given downward movement of the various levers produces correspondingly different relative movements of said oscillating bars and brings the various type upon the convex surface of the type-block successively into a position directly below said universal joint.

5. The combination, with the vertically-reciprocating support G, the spring H, adapted to press said support upward, and the type-block I, suspended from said support by a universal joint and having an approximately-spherical lower face provided with raised type, of the vertically-oscillating bars C C' C'', connected, respectively, with three points upon the upper surface of the type-block by rods L L' L'', stops limiting the upward motion of the bars C C' C'', and type-actuating levers M, extending across said bars and provided with variously-arranged wards on their lower edges, whereby downward pressure upon the different levers produces different downward movements of the bars C C' C'' and brings different type upon the convex surface of the type-block into a position directly below said universal joint, substantially as and for the purpose set forth.

6. In a machine of the class described, the combination, with a suitable support and a type-block suspended therefrom by a universal joint, of a type-bearing spherical segment forming the lower portion of the type-block and susceptible of limited rotation about a vertical axis with reference to the body thereof, means, substantially as shown and described, for imparting such limited rotation to said segment, three independent vertically-oscillating bars connected, respectively, with three points upon the upper surface of the type-block by means permitting the free oscillation thereof about said universal joint, and a series of levers crossing said bars and provided with differently-arranged wards, whereby downward movement of the different levers produces different relative movements of said bars and different oscillations of the type-block and brings different type upon said segment into a position directly below said universal joint.

7. The combination, with the vertically-re-

ciprocating support G, the spring H, pressing said support upward, and the plate I', suspended from said support by the universal joint K, of the spherical type-bearing segment I, pivoted to the lower face of said plate and having a limited rotation with reference thereto, the oscillating lever Q, adapted to impart such limited rotation to the segment, the bars C C' C'', and the rods L L' L'', connecting them respectively with corresponding points upon the plate I', and the levers M, crossing said bars and formed with wards, whereby downward movement of the levers actuates the bars C C' C'' and produces varying oscillations of the segment, bringing different type upon its surface into a position directly below the universal joint K, substantially as and for the purpose set forth.

8. The combination, with a suitable support G, a plate I', suspended therefrom by a universal joint, and a spherical segment I, pivoted to the lower face of said plate and susceptible of reciprocal rotation within a limited angle with relation thereto, of two type mounted upon the surface of said segment at points equidistant from the center of rotation thereof and separated by an angular space equal to the angle of rotation of the segment with reference to the plate I', whereby, when said segment is at one limit of its rotation, a given oscillation of the type-block brings one of said type into a position directly below said universal joint, and when the segment is at its opposite limit of rotation the same oscillation of the type-block brings the other of said type into said position.

9. The combination, with the support G and the plate I', connected therewith by a universal joint, of the spherical segment I, pivoted to the lower face of the plate and susceptible of limited rotation about a vertical axis with reference thereto, the vertically-oscillating bars C C' C'', connected with corresponding points upon the plate I' by rods L L' L'', a lever M, crossing said bars and adapted by its downward movement to depress said bars in a given order and to bring a given point upon said segment into a position directly below said universal joint, and two type mounted upon said segment, one at said given point and the other at a second point equidistant therewith from the center of rotation of the segment and separated from said given point by an angular space equal to the limit of rotation of the segment with reference to the plate I', substantially as and for the purpose set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

DANIEL C. STOVER.

Witnesses:

R. H. WILES,
J. A. CRAIN.